

# CS7346 Lab 1: AWS Storage and Database Services

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To support the following lab exercises, please read the following chapters in the AWS Certified Solutions Architect Study Guide.

Chapter 3 and Chapter 5

**Lab:** Please complete the following lab exercises in the AWS Certified Solutions Architect Study Guide. When you are done, delete all the resources that you provisioned to avoid charges.

3.1 through 3.5 (inclusive)  
5.1 through 5.4 (inclusive)

## Environment

Laptop: MacBook Air M2 2022, macOS 13.3

# Chapter 3

## 3.1

### EXERCISE 3.1

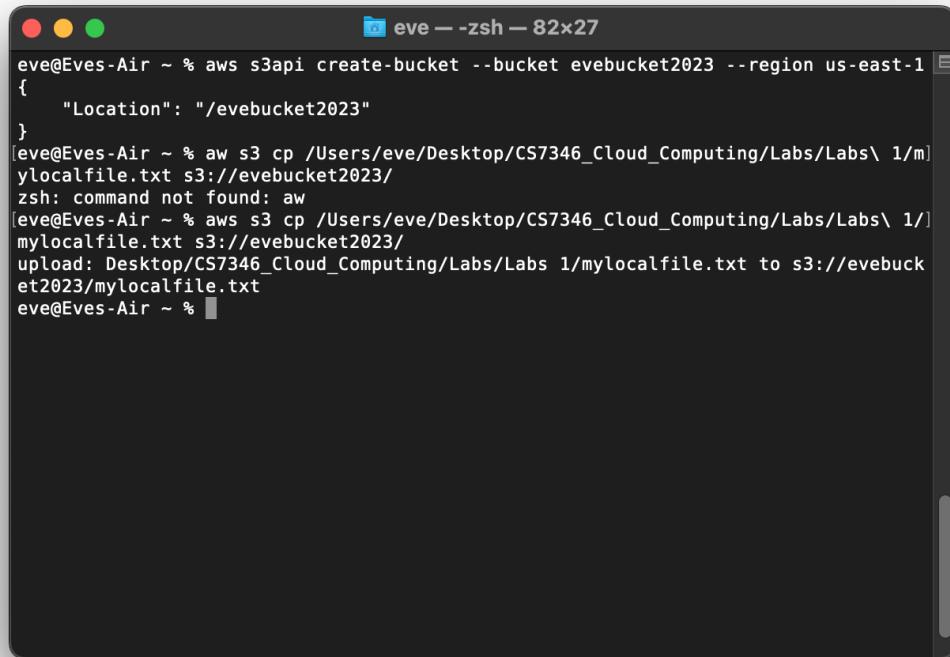
#### Create a New S3 Bucket and Upload a File

1. From the AWS S3 dashboard, create a new bucket and use either the dashboard or the AWS CLI (`aws s3 cp mylocalfile.txt s3://mybucketname/`) to upload one or more files, giving public read access to the object.
2. Use the AWS CLI to list the contents of your new bucket to confirm that the new file or files are there:

```
aws s3 ls s3://mybucketname
```

#### Solution:

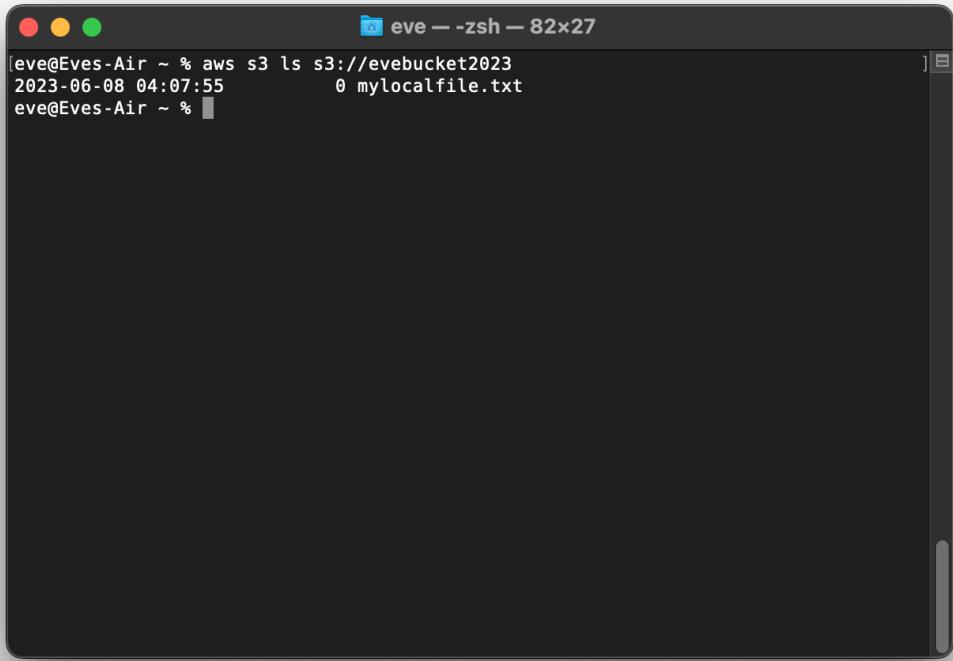
1.



The screenshot shows a terminal window titled "eve — -zsh — 82x27". The user has run the command `aws s3api create-bucket --bucket evebucket2023 --region us-east-1`, which returns a JSON object indicating the bucket was created successfully with the location `/evebucket2023`. The user then attempts to upload a file named `mylocalfile.txt` from their local desktop to the newly created bucket using the command `aws s3 cp /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 1/mylocalfile.txt s3://evebucket2023/`. However, they receive an error message stating "zsh: command not found: aws". To resolve this, they run the command again, and it succeeds, uploading the file to the specified location in the S3 bucket.

```
eve@Eves-Air ~ % aws s3api create-bucket --bucket evebucket2023 --region us-east-1
{
    "Location": "/evebucket2023"
}
[eve@Eves-Air ~ % aw s3 cp /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 1/m
ylocalfile.txt s3://evebucket2023/
zsh: command not found: aw
[eve@Eves-Air ~ % aws s3 cp /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 1/]
mylocalfile.txt s3://evebucket2023/
upload: Desktop/CS7346_Cloud_Computing/Labs/Labs 1/mylocalfile.txt to s3://evebuck
et2023/mylocalfile.txt
eve@Eves-Air ~ % ]
```

2.



```
[eve@Eves-Air ~ % aws s3 ls s3://evebucket2023
2023-06-08 04:07:55          0 mylocalfile.txt
eve@Eves-Air ~ %
```

## 3.2

### EXERCISE 3.2

#### Enable Versioning and Life Cycle Management for an S3 Bucket

1. Select your bucket and edit its properties to enable versioning.
2. Upload a file to that bucket, edit the copy on your local computer, and upload the new copy (keeping the filename the same). Make sure you give the new file any access permissions you might need.
3. With the contents of the bucket displayed in the dashboard, select Show Versions. You should now see two versions of your file.
4. Add a couple of directories with files to your bucket.
5. On the bucket's Management tab, create a life cycle rule and specify a prefix/tag filter that matches the directory name of one of the directories you uploaded.
6. Configure a life cycle rule by adding transitions and configuring the transition timing (in days) and target for each one.

You'll need to be patient to test this configuration because the minimum lag between transitions is 30 days.

---

**Solution:**

1.

The screenshot shows the AWS S3 console interface. The left sidebar has 'Buckets' selected. The main area shows the 'evebucket2023' bucket with one object listed: 'mylocalfile.txt'. The object details are as follows:

Name	Type	Last modified	Size	Storage class
mylocalfile.txt	txt	June 8, 2023, 04:07:55 (UTC-05:00)	0 B	Standard

The screenshot shows the AWS S3 console interface with the 'Properties' tab selected for the 'evebucket2023' bucket. The 'Bucket overview' section includes:

AWS Region	Amazon Resource Name (ARN)	Creation date
US East (N. Virginia) us-east-1	arnaws3::evebucket2023	June 8, 2023, 04:03:59 (UTC-05:00)

The 'Bucket Versioning' section is set to 'Disabled'. The 'Multi-factor authentication (MFA) delete' section is also set to 'Disabled'. The 'Tags (0)' section shows no tags associated with the bucket. The 'Default encryption' section indicates server-side encryption is automatically applied to new objects.

**Bucket Versioning**

Versioning is a means of keeping multiple variants of an object in the same bucket. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures. [Learn more](#)

**Bucket Versioning**

**Suspend**  
This suspends the creation of object versions for all operations but preserves any existing object versions.

**Enable**

**Multi-factor authentication (MFA) delete**  
An additional layer of security that requires multi-factor authentication for changing Bucket Versioning settings and permanently deleting object versions. To modify MFA delete settings, use the AWS CLI, AWS SDK, or the Amazon S3 REST API. [Learn more](#)

**Disabled**

**Save changes**

**Successfully edited Bucket Versioning**

To transition, archive, or delete older object versions, [configure lifecycle rules](#) for this bucket.

**evebucket2023**

**Bucket overview**

AWS Region US East (N. Virginia) us-east-1	Amazon Resource Name (ARN) arn:aws:s3::evebucket2023	Creation date June 8, 2023, 04:03:59 (UTC-05:00)
---	---	---

**Bucket Versioning**

Versioning is a means of keeping multiple variants of an object in the same bucket. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures. [Learn more](#)

**Bucket Versioning**

**Enabled**

**Multi-factor authentication (MFA) delete**  
An additional layer of security that requires multi-factor authentication for changing Bucket Versioning settings and permanently deleting object versions. To modify MFA delete settings, use the AWS CLI, AWS SDK, or the Amazon S3 REST API. [Learn more](#)

**Tags (0)**

**Edit**

2.

The screenshot shows a terminal window with Vim running in the background. The Vim buffer contains a Python script named `mylocalfile.txt` with the following code:

```
mylocalfile.txt+
" Press ? for help
.. (up a dir)
</Labs/Labs 1/
mylocalfile.txt

~
```

The output of the script is displayed in the terminal window:

```
| 1 Hello World!
```

The terminal window also shows the current working directory as `<Cloud_Computing/Labs/Labs 1` and the status bar indicates `2W < 100% =1/1%:12`. A command-line prompt `:wq!` is visible at the bottom.

```
[eve@Eves-Air ~ % aws s3 ls s3://evebucket2023
2023-06-08 04:07:55      0 mylocalfile.txt
[eve@Eves-Air ~ % aws s3 cp /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 1\mylocalfile.txt s3://evebucket2023/
upload: Desktop/CS7346_Cloud_Computing/Labs/Labs 1/mylocalfile.txt to s3://evebucket2023/mylocalfile.txt
eve@Eves-Air ~ % ]
```

3.

```
eve@Eves-Air ~ % aws s3api list-object-versions --bucket evebucket2023
{
    "Versions": [
        {
            "ETag": "\"8ddd8be4b179a529afa5f2ffae4b9858\"",
            "Size": 13,
            "StorageClass": "STANDARD",
            "Key": "mylocalfile.txt",
            "VersionId": "qdQkw3IKB6BPvEPgsloiWol8C4QLZjvX",
            "IsLatest": true,
            "LastModified": "2023-06-08T19:57:12+00:00",
            "Owner": {
                "DisplayName": "evecs7346",
                "ID": "eb13d97a3dc82b63df449411f854167fa96f40bbd929c1b1985e0669fdc1b034"
            }
        },
        {
            "ETag": "\"d41d8cd98f00b204e9800998ecf8427e\"",
            "Size": 0,
            "StorageClass": "STANDARD",
            "Key": "mylocalfile.txt",
            "VersionId": "null",
            "IsLatest": false,
            "LastModified": "2023-06-08T09:07:55+00:00",
            "Owner": {
                "DisplayName": "evecs7346",
                "ID": "eb13d97a3dc82b63df449411f854167fa96f40bbd929c1b1985e0669fdc1b034"
            }
        }
    ]
}
eve@Eves-Air ~ %
```

The screenshot shows the AWS S3 console interface. On the left, there's a sidebar with various navigation options like Buckets, Storage Lens, and Feature spotlight. The main area shows a file named 'mylocalfile.txt' in the 'evebucket2023' bucket. The 'Versions' tab is selected, displaying two versions of the file:

Version ID	Type	Last modified	Size	Storage class
qdQkw51KB6BPvEPgslolWol8C4QLZjvX (Current version)	txt	June 8, 2023, 14:57:12 (UTC-05:00)	13.0 B	Standard
null	txt	June 8, 2023, 04:07:55 (UTC-05:00)	0 B	Standard

4.

The terminal window title is 'testDirectories -- zsh -- 80x24'. The user is in the directory 'testDirectories'. The command 'ls \*' is run, and the output is:

```
[eve@Eves-Air testDirectories % ls *
1:
file1.txt

2:
file2.txt

3:
file3.txt

4:
file4.txt
eve@Eves-Air testDirectories % ]
```

The screenshot shows the AWS S3 console interface. The left sidebar has 'Amazon S3' selected under 'Services'. The main area shows the 'evebucket2023' bucket with 6 objects listed:

Name	Type	Last modified	Size	Storage class
DS_Store	DS_Store	June 8, 2023, 15:51:14 (UTC-05:00)	6.0 KB	Standard
1/	Folder	-	-	-
2/	Folder	-	-	-
3/	Folder	-	-	-
4/	Folder	-	-	-
mylocalfile.txt	txt	June 8, 2023, 14:57:12 (UTC-05:00)	13.0 B	Standard

Below the table are buttons for 'Upload' and 'Actions' (with options like Copy 53 URI, Copy URL, Download, Open, Delete, Create folder).

5.

S3 Management Console Update

s3.console.aws.amazon.com/s3/management/evebucket2023/lifecycle/create?region=us-east-1

Services Search [Option+S] Global evecs7346

Amazon S3 > Buckets > evebucket2023 > Lifecycle configuration > Create lifecycle rule

### Create lifecycle rule Info

**Lifecycle rule configuration**

**Lifecycle rule name**  
lifecyclerule1  
Up to 255 characters

**Choose a rule scope**  
 Limit the scope of this rule using one or more filters  
 Apply to all objects in the bucket

**Filter type**  
You can filter objects by prefix, object tags, object size, or whatever combination suits your usecase.

**Prefix**  
Add filter to limit the scope of this rule to a single prefix.  
1  
Don't include the bucket name in the prefix. Using certain characters in key names can cause problems with some applications and protocols. [Learn more](#)

**Object tags**  
You can limit the scope of this rule to the key/value pairs added below.  
[Add tag](#)

**Object size**  
You can limit the scope of this rule to apply to objects based on their size. For example, you can filter out objects that might not be cost effective to transition to Glacier Flexible Retrieval (formerly Glacier) because of per-object fees.

Specify minimum object size  
 Specify maximum object size

**Lifecycle rule actions**  
Choose the actions you want this rule to perform. Per-request fees apply. [Learn more](#) or see [Amazon S3 pricing](#)

Move current versions of objects between storage classes  
 Move noncurrent versions of objects between storage classes  
 Expire current versions of objects  
 Permanently delete noncurrent versions of objects  
 Delete expired object delete markers or incomplete multipart uploads  
These actions are not supported when filtering by object tags or object size.

**Transition noncurrent versions of objects between storage classes**  
Choose transitions to move noncurrent versions of objects between storage classes based on your use case scenario and performance access requirements. These transitions start from when the objects become noncurrent and are consecutively applied. [Learn more](#)

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The screenshot shows the AWS S3 Management Console with the URL [s3.console.aws.amazon.com/s3/management/evebucket2023/lifecycle/view?region=us-east-1&id=lifecyclerule1](https://s3.console.aws.amazon.com/s3/management/evebucket2023/lifecycle/view?region=us-east-1&id=lifecyclerule1). The page displays the details of a lifecycle rule named "lifecyclerule1".

**Lifecycle rule configuration:**

- Lifecycle rule name:** lifecyclerule1
- Status:** Enabled
- Scope:** Filtered
- Prefix:** 1
- Object tags:** -
- Minimum object size:** -
- Maximum object size:** -

**Review transition and expiration actions:**

Current version actions	Noncurrent versions actions
Day 0 No actions defined.	Day 0 <ul style="list-style-type: none"><li>Objects become noncurrent</li></ul> ↓ Day 30 <ul style="list-style-type: none"><li>0 newest noncurrent versions are retained</li><li>All other noncurrent versions move to Standard-IA</li></ul>

**Delete expired object delete markers or incomplete multipart uploads:**

Expired object delete markers	Incomplete multipart uploads
-	-

At the bottom, there are links for CloudShell, Feedback, Language, © 2023, Amazon Web Services, Inc. or its affiliates., Privacy, Terms, and Cookie preferences.

6.

S3 Management Console Update

aws Services Search [Option+S] Global evecs7346

Lifecycle rule actions

Choose the actions you want this rule to perform. Per-request fees apply. [Learn more](#) or see [Amazon S3 pricing](#)

Move current versions of objects between storage classes  
 Move noncurrent versions of objects between storage classes  
 Expire current versions of objects  
 Permanently delete noncurrent versions of objects  
 Delete expired object delete markers or incomplete multipart uploads

These actions are not supported when filtering by object tags or object size.

Transition current versions of objects between storage classes

Choose transitions to move current versions of objects between storage classes based on your use case scenario and performance access requirements. These transitions start from when the objects are created and are consecutively applied. [Learn more](#)

Choose storage class transitions Days after object creation Remove

Standard-IA	30	<input type="button" value="Remove"/>
Intelligent-Tiering	60	<input type="button" value="Remove"/>
One Zone-IA	90	<input type="button" value="Remove"/>

Add transition

Transition noncurrent versions of objects between storage classes

Choose transitions to move noncurrent versions of objects between storage classes based on your use case scenario and performance access requirements. These transitions start from when the objects become noncurrent and are consecutively applied. [Learn more](#)

Choose storage class transitions Days after objects become noncurrent Number of newer versions to retain - Optional Remove

Standard-IA	30	<input type="button" value="Remove"/>
Can be up to 100 versions. All other noncurrent versions will be moved.		
Intelligent-Tiering	60	<input type="button" value="Remove"/>
Can be up to 100 versions. All other noncurrent versions will be moved.		
One Zone-IA	90	<input type="button" value="Remove"/>
Can be up to 100 versions. All other noncurrent versions will be moved.		

Add transition

Review transition and expiration actions

Current version actions Noncurrent versions actions

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The lifecycle configuration was updated. Lifecycle rule "lifecyclerule1" was successfully updated.  
It may take some time for the configuration to be updated. Press the refresh button if changes to the rule are not displayed.

Amazon S3 > Buckets > evebucket2023 > Lifecycle configuration

Lifecycle configuration [Info](#)

To manage your objects so that they are stored cost effectively throughout their lifecycle, configure their lifecycle. A lifecycle configuration is a set of rules that define actions that Amazon S3 applies to a group of objects. Lifecycle rules run once per day.

**Lifecycle rules (1)**

Use lifecycle rules to define actions you want Amazon S3 to take during an object's lifetime such as transitioning objects to another storage class, archiving them, or deleting them after a specified period of time. [Learn more](#)

[Create lifecycle rule](#)

Lifecycle rule name	Status	Scope	Current version actions	Noncurrent versions actions	Expired object delete markers	Incomplete multipart uploads
lifecyclerule1	Enabled	Filtered	Transition to Standard-IA, then Intelligent-Tiering, then One Zone-IA	Transition to Standard-IA, then Intelligent-Tiering, then One Zone-IA	-	-

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### 3.3

#### EXERCISE 3.3

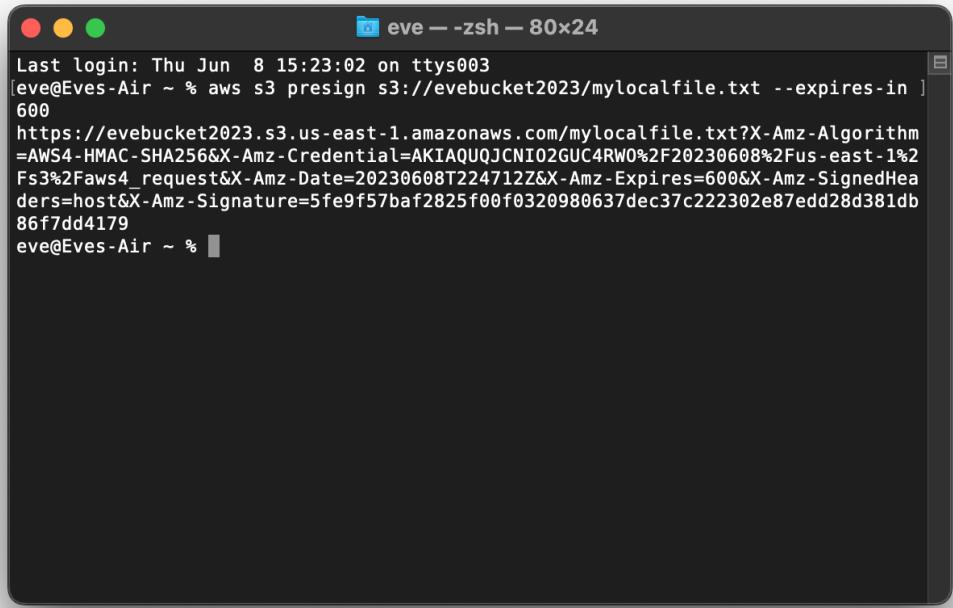
##### Generate and Use a Presigned URL

1. Use the complete URL of a private object in an S3 bucket belonging to you to generate a presigned URL using a variation of this command:
 

```
aws s3 presign s3://MyBucketName/PrivateObject --expires-in 600
```
2. Copy the full URL from the command output, and from a browser that's not logged into your AWS account, try to open the file.
3. Wait for the URL to expire and try again. This time, it should not work.

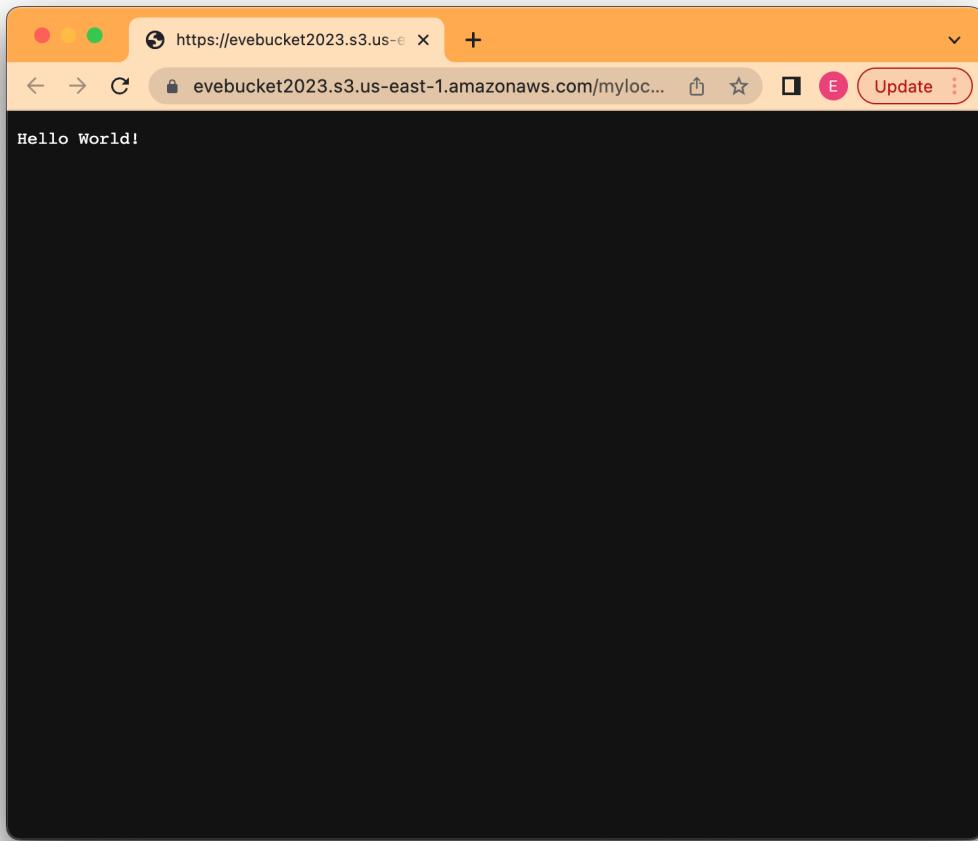
#### Solution:

1.

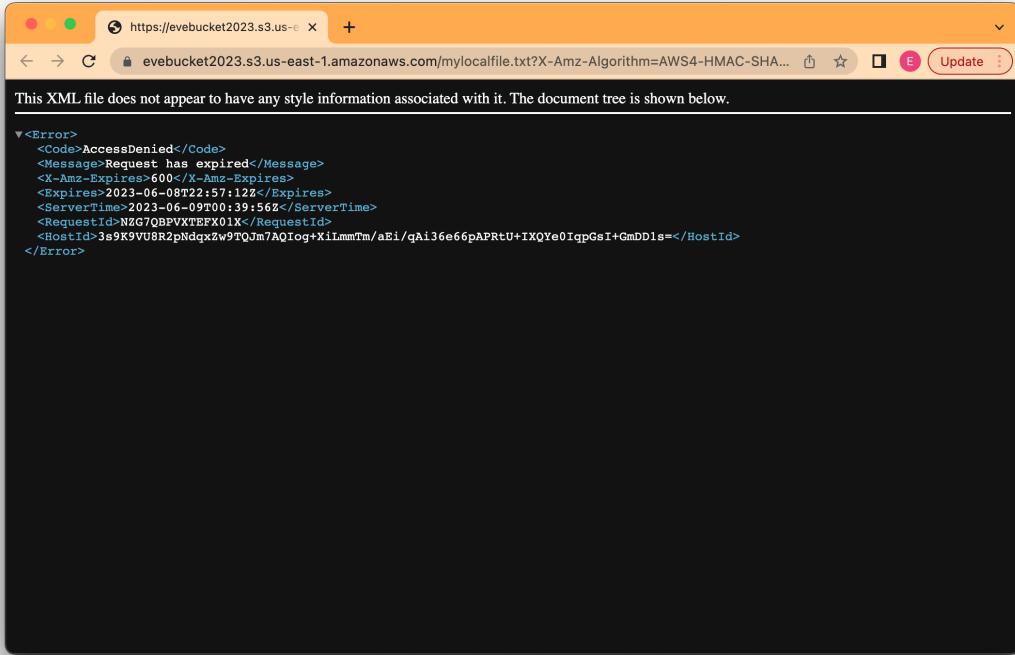


```
Last login: Thu Jun  8 15:23:02 on ttys003
[eve@Eves-Air ~ % aws s3 presign s3://evebucket2023/mylocalfile.txt --expires-in ]
600
https://evebucket2023.s3.us-east-1.amazonaws.com/mylocalfile.txt?X-Amz-Algorithm
=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAQUQJCMIO2GUUC4RW0%2F20230608%2Fus-east-1%2
Fs3%2Faws4_request&X-Amz-Date=20230608T224712Z&X-Amz-Expires=600&X-Amz-SignedHea
ders=host&X-Amz-Signature=5fe9f57baf2825f00f0320980637dec37c222302e87edd28d381db
86f7dd4179
eve@Eves-Air ~ %
```

2.



3.



## 3.4

### EXERCISE 3.4

#### Enable Static Website Hosting for an S3 Bucket

1. From the S3 dashboard, select (or create) an S3 bucket that contains at least one file with some simple text named `index.html`. Any files you want to be accessible should be readable by the public. You may need to change the Block Public Access settings for the bucket to allow access.
2. On the bucket's Properties tab, enable static website hosting and specify your `index.html` file as your index document.
3. Paste the static website endpoint into the URL field of a browser that's not logged into your AWS account and confirm that you can access the website.

Note that you can also enable static website hosting from the AWS CLI using a variation of these two commands:

```
aws s3api put-bucket-acl --bucket my-bucket --acl public-read
aws s3 website s3://my-bucket/ --index-document index.html \
--error-document error.html
```

---

#### Solution:

- 1.

```
[eve@Eves-Air ~ % aws s3 cp /Users/eve/Desktop/CS7346_Cloud_Computing/Labs/Labs\ 1/ index.html s3://evebucket2023/
upload: Desktop/CS7346_Cloud_Computing/Labs/Labs 1/index.html to s3://evebucket2023/index.html
eve@Eves-Air ~ %
```

The screenshot shows the AWS S3 console with the URL [s3.console.aws.amazon.com/s3/bucket/evebucket2023/property/bpa/edit?region=us-east-1](https://s3.console.aws.amazon.com/s3/bucket/evebucket2023/property/bpa/edit?region=us-east-1). The left sidebar shows 'Buckets' and other S3-related options like 'Block Public Access settings for this account'. The main content area is titled 'Edit Block public access (bucket settings)'. It contains a section titled 'Block public access (bucket settings)' with a detailed description of what it does. Below this are several checkboxes for different access control options:

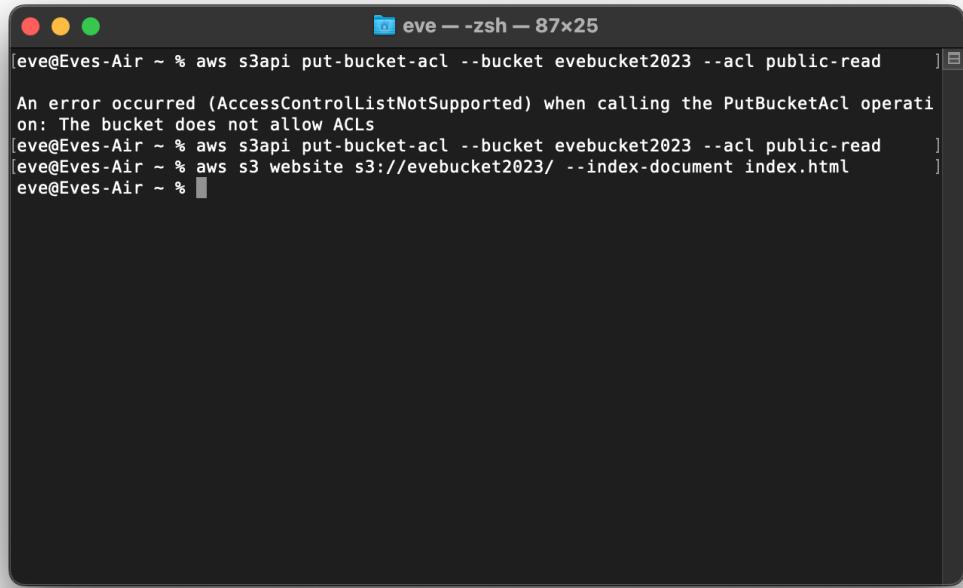
- Block all public access**: Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another.
- Block public access to buckets and objects granted through new access control lists (ACLs)**: S3 will block public access permissions applied to newly added buckets or objects, and prevent the creation of new public access ACLs for existing buckets and objects. This setting doesn't change any existing permissions that allow public access to S3 resources using ACLs.
- Block public access to buckets and objects granted through any access control lists (ACLs)**: S3 will ignore all ACLs that grant public access to buckets and objects.
- Block public access to buckets and objects granted through new public bucket or access point policies**: S3 will block new bucket and access point policies that grant public access to buckets and objects. This setting doesn't change any existing policies that allow public access to S3 resources.
- Block public and cross-account access to buckets and objects through any public bucket or access point policies**: S3 will ignore public and cross-account access for buckets or access points with policies that grant public access to buckets and objects.

At the bottom right are 'Cancel' and 'Save changes' buttons.

The screenshot shows the AWS S3 console with the 'Permissions' tab selected for the 'evebucket2023' bucket. A success message at the top states: 'Successfully edited Block Public Access settings for this bucket.' The 'Permissions overview' section shows that 'Bucket and objects not public' is selected under 'Access'. Below this, the 'Block public access (bucket settings)' section indicates that 'Block all public access' is turned 'Off'. A note explains that public access is granted through ACLs, bucket policies, and access point policies. The 'Edit' button is visible. The 'Bucket policy' section shows a note about JSON policies and a 'Delete' button. The bottom of the page includes standard AWS navigation links like CloudShell, Feedback, Language, and copyright information.

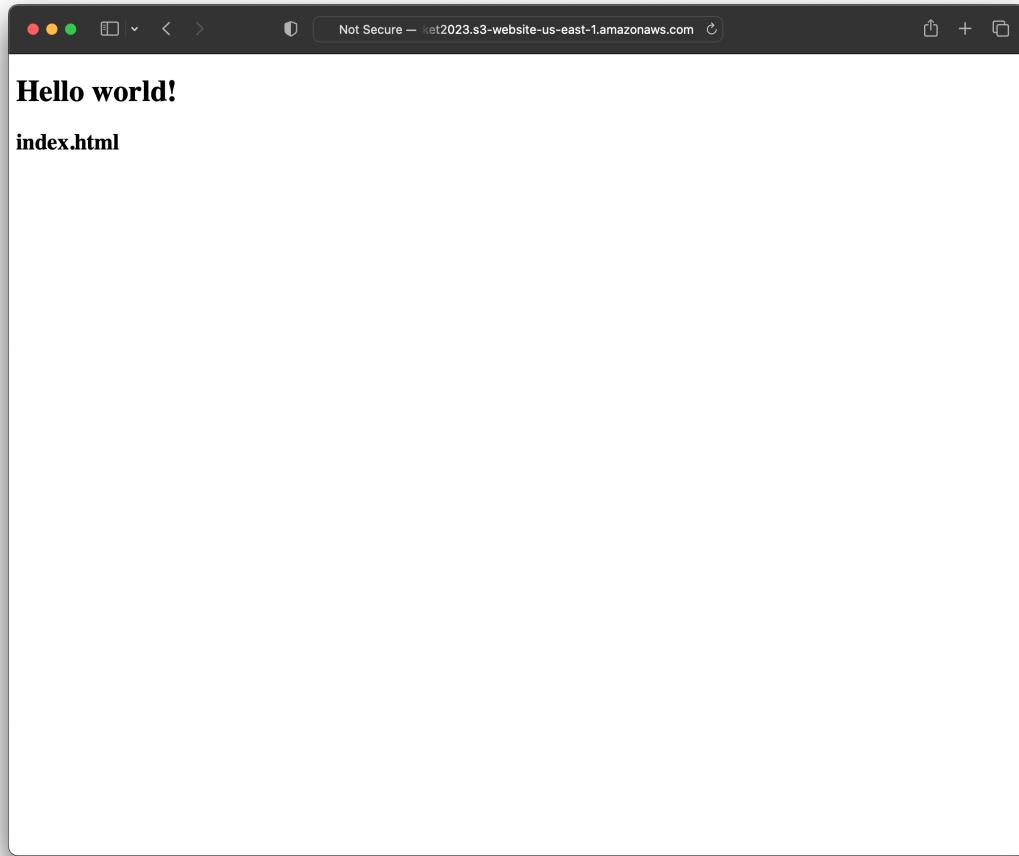
2.

The screenshot shows the 'Edit static website hosting' page for the 'evebucket2023' bucket. The 'Static website hosting' section has 'Enable' selected. Under 'Hosting type', 'Host a static website' is selected, with a note explaining it uses the bucket endpoint as the web address. The 'Index document' field contains 'index.html'. The 'Error document - optional' field contains 'error.html'. The 'Redirection rules - optional' section is currently empty. The bottom of the page includes standard AWS navigation links like CloudShell, Feedback, Language, and copyright information.



```
[eve@Eves-Air ~ % aws s3api put-bucket-acl --bucket evebucket2023 --acl public-read
An error occurred (AccessControlListNotSupported) when calling the PutBucketAcl operation: The bucket does not allow ACLs
[eve@Eves-Air ~ % aws s3api put-bucket-acl --bucket evebucket2023 --acl public-read
[eve@Eves-Air ~ % aws s3 website s3://evebucket2023/ --index-document index.html
eve@Eves-Air ~ %
```

3.



The screenshot shows the AWS S3 console interface for a bucket named 'evebucket2023'. The left sidebar lists various services like Buckets, Storage Lens, and Requester pays. The main content area displays several configuration sections:

- EventBridge notifications:** Send notifications to Amazon EventBridge for all events in this bucket. Status: Off.
- Transfer acceleration:** Use an accelerated endpoint for faster data transfers. Status: Disabled.
- Object Lock:** Store objects using a write-once-read-many (WORM) model to help prevent objects from being deleted or overwritten for a fixed amount of time or indefinitely. Status: Disabled. A note indicates that Object Lock is not supported after a bucket is created.
- Requester pays:** When enabled, the requester pays for requests and data transfer costs, and anonymous access to this bucket is disabled. Status: Disabled.
- Static website hosting:** Use this bucket to host a website or redirect requests. Status: Enabled. The hosting type is Bucket hosting. The bucket's website endpoint is listed as <http://evebucket2023.s3-website-us-east-1.amazonaws.com>.

At the bottom, there are links for CloudShell, Feedback, Language, and a footer with copyright information and links to Privacy, Terms, and Cookie preferences.

## 3.5

### EXERCISE 3.5

#### Calculate the Total Life Cycle Costs for Your Data

Use the AWS Simple Monthly Calculator (<http://calculator.s3.amazonaws.com/index.html>) to estimate the total monthly costs of the scenario described at the beginning of this section. Even better, use a scenario that fits your own business. Try to include a full usage scenario, including requests, scans, and data retrieval. Note that you access the S3 part of the calculator by clicking the Amazon S3 tab on the left, and you can keep track of your itemized estimate using the Estimate Of Your Monthly Bill tab along the top.

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Other Storage-Related Services      81

Note that AWS has been trying to deprecate the Simple Monthly Calculator for some time in favor of their new AWS Pricing Calculator (<https://calculator.aws/#>). However, since so many customers have communicated their preference for the old tool, AWS continues to extend its life. Nevertheless, be aware that the move will likely happen eventually.

---

**Solution:**

The screenshot shows the AWS Pricing Calculator interface. The top navigation bar includes links for 'Feedback', 'Language: English', and 'Contact Sales'. The main title is 'Select service' with an 'Info' link. On the left, there are two steps: 'Step 1 Select service' and 'Step 2 Configure service'. A search bar at the top right contains the placeholder 'Search all services' and 'Choose a service or workload to configure an estimate.' Below the search bar, there are two sections: 'Search by location type' (selected) and 'Search all services'. Under 'Search by location type', there is a dropdown for 'Region' set to 'US East (Ohio)'. A search input field shows the query 's3'. Below these sections, there are four service cards:

- Amazon Simple Storage Service (S3)**: Described as storage for the internet. It can store and retrieve any amount of data at any time from anywhere on the web. Buttons for 'Product page' and 'Configure'.
- Amazon Athena**: A serverless, interactive analytics service built on open-source frameworks. It provides a simplified, flexible way to analyze petabytes of data where it lives. Buttons for 'Product page' and 'Configure'.
- Amazon Inspector**: An automated and continual vulnerability scanning service that assesses Amazon Elastic Compute Cloud (EC2) instances and container images to improve security and compliance of infrastructure workloads. Buttons for 'Product page' and 'Configure'.
- AWS Transfer Family**: A fully managed SFTP, FTPS, FTP, and AS2 service. Buttons for 'Product page' and 'Configure'.
- Amazon Macie**: A fully managed data security and data privacy service that uses machine learning and pattern matching to discover and protect sensitive data in AWS. Buttons for 'Product page' and 'Configure'.
- AWS Backup**: A centralized and fully-managed service with an end-to-end solution for business and regulatory compliance requirements. It automates data protection across AWS. Buttons for 'Product page' and 'Configure'.

At the bottom of the page, there are cost summary details: 'Upfront cost: 0.00 USD', 'Monthly cost: 0.00 USD', 'Total 12 months cost 0.00 USD (Includes upfront cost)', and a 'View summary' button. The footer includes links for 'Privacy', 'Site terms', 'Cookie preferences', and a copyright notice: '© 2023, Amazon Web Services, Inc. or its affiliates. All rights reserved.'

The screenshot shows the AWS Pricing Calculator interface for configuring an S3 bucket. The bucket name is set to "S3-Calculator". The region is chosen as "US East (Ohio)". Under "Select S3 Storage classes and other features", "S3 Standard" is selected. In the "S3 Standard feature" section, "S3 Standard" is expanded, showing a monthly storage cost of 20 GB per month. The total monthly cost is listed as 0.46 USD.

**Configure Amazon Simple Storage Service (S3)**

Description: S3-Calculator

Choose a location type: Region: US East (Ohio)

Select S3 Storage classes and other features:

- S3 Standard
- S3 One Zone - Infrequent Access
- S3 Management and Analytics
- Data Transfer
- S3 Intelligent - Tiering
- S3 Glacier Flexible Retrieval
- S3 Object Lambda
- S3 Standard - Infrequent Access
- S3 Glacier Deep Archive
- S3 Glacier Instant Retrieval

**S3 Standard feature**

**S3 Standard**

The calculations below exclude Free Tier discounts.

S3 Standard storage: 20 GB per month

**Total Upfront cost: 0.00 USD**   **Total Monthly cost: 0.46 USD**

**Save and view summary**   **Save and add service**

My Estimate - AWS Pricing Calculator

calculator.aws/#/estimate?key=new

Feedback Language: English Contact Sales

Successfully added Amazon Simple Storage Service (S3) estimate.

AWS Pricing Calculator > My Estimate

## My Estimate

Estimate summary [Info](#)

Upfront cost	Monthly cost	Total 12 months cost
0.00 USD	0.46 USD	<b>5.52 USD</b> Includes upfront cost

Getting Started with AWS

[Get started for free](#)

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### My Estimate

	Service Name	Status	Upfront cost	Monthly cost	Description	Region	Config Summary
<input type="checkbox"/>	Amazon Simple St...	-	0.00 USD	0.46 USD	S3-Calculator	US East (Ohio)	S3 Standard stora...

Acknowledgement

AWS Pricing Calculator provides only an estimate of your AWS fees and doesn't include any taxes that might apply. Your actual fees depend on a variety of factors, including your actual usage of AWS services. [Learn more](#)

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# Chapter 5

## 5.1

### EXERCISE 5.1

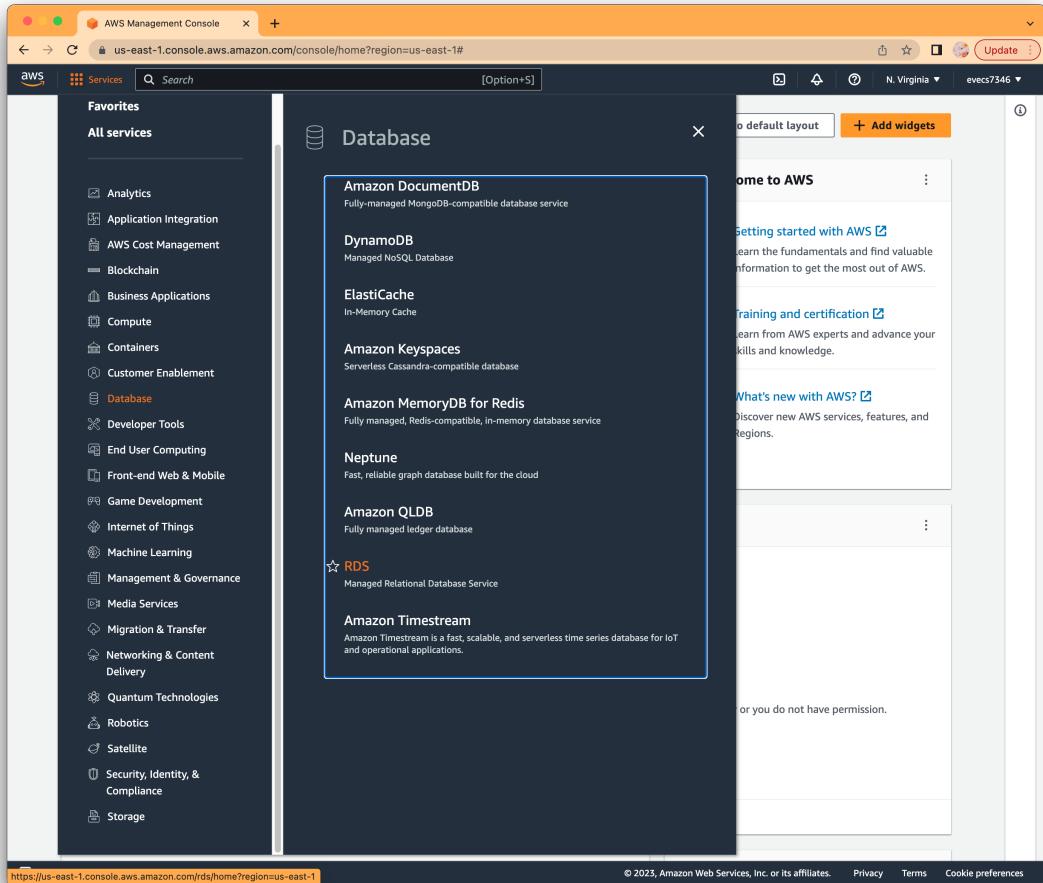
#### Create an RDS Database Instance

In this exercise, you'll create an RDS database instance using MariaDB as the database engine. Free Tier accounts won't incur any charges.

1. Click the RDS Dashboard link in the RDS service console.
  2. Click Create Database.
  3. Under Choose A Database Creation Method, select Standard Create.
  4. Under Engine Options, select MariaDB. Keep the default version.
  5. Under Templates, select FreeTier.
  6. Enter a master username and master password of your choice.
  7. Scroll down to the Additional Configuration section and expand it.
  8. For Initial Database Name, enter a database name of your choice.
  9. Click Create Database.
- 

#### Solution:

- 1.



2.

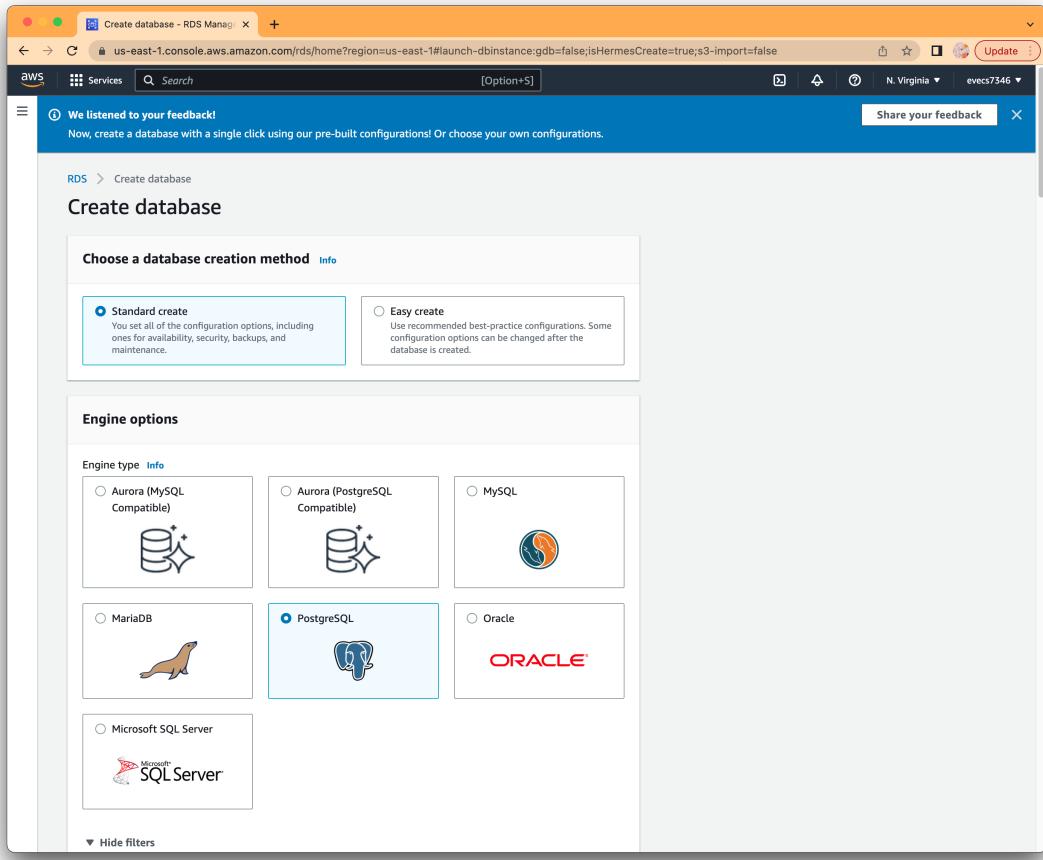
The screenshot shows the Amazon RDS Management Dashboard. On the left, there's a sidebar with links like 'Databases', 'Query Editor', 'Performance insights', 'Snapshots', 'Exports in Amazon S3', 'Automated backups', 'Reserved instances', 'Proxies', 'Subnet groups', 'Parameter groups', 'Option groups', and 'Custom engine versions'. Below that are 'Events' and 'Event subscriptions'. At the bottom of the sidebar, there are 'Recommendations' (0) and 'Certificate update'.

The main content area has a blue header bar with the text 'Introducing Aurora I/O-Optimized' and a message about it being a new cluster storage configuration. Below this, there's a callout box with the text 'Try the new Amazon RDS Multi-AZ deployment option for MySQL and PostgreSQL' and a 'Create database' button. It also mentions 'Or, Restore Multi-AZ DB Cluster from Snapshot'.

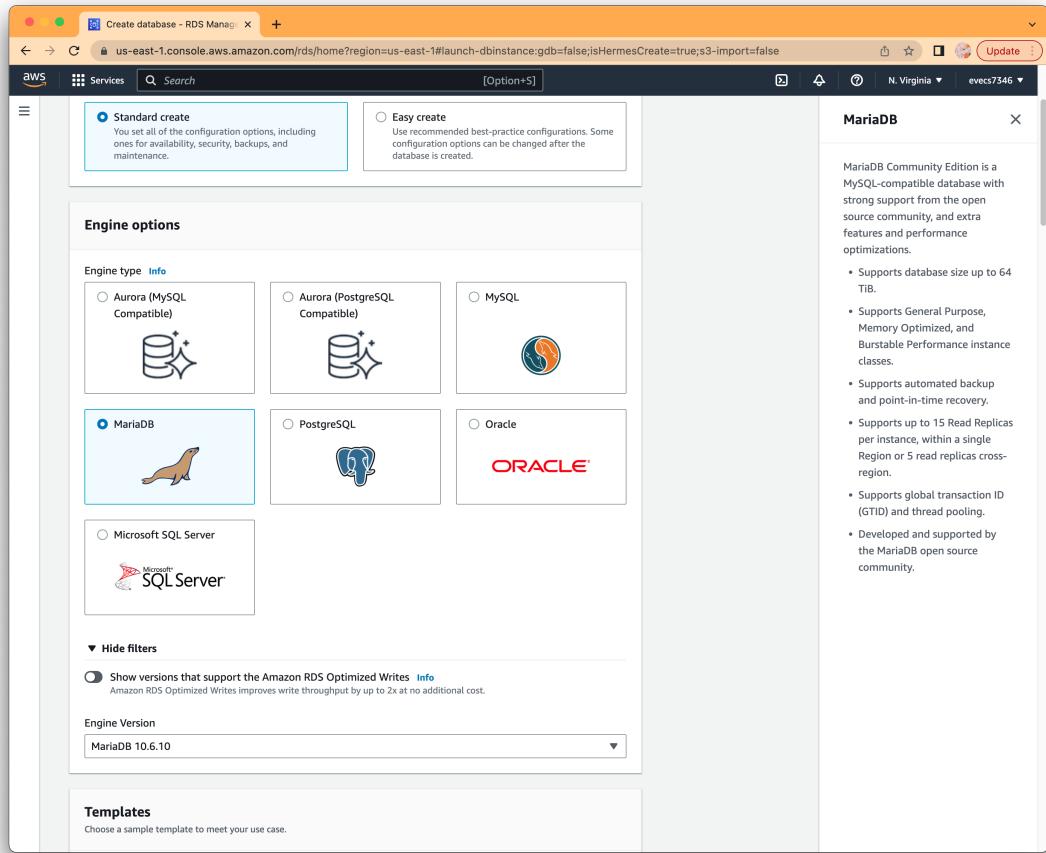
The central part of the dashboard is divided into sections:

- Resources**: Shows usage details: DB Instances (0/40), Allocated storage (0 TB/100 TB), DB Clusters (0/40), Reserved instances (0/40), Snapshots (0), and Automated (DB Cluster (0/100), DB Instance (0/100)).
- Recommended for you**: Includes links to 'Build RDS Operational Tasks', 'Implementing Cross-Region DR', 'Time-Series Tables in PostgreSQL', 'Amazon RDS Backup and Restore using AWS Backup', and 'Additional information'.
- Create database**: A section with the text 'Amazon Relational Database Service (RDS) makes it easy to set up, operate, and scale a relational database in the cloud.'

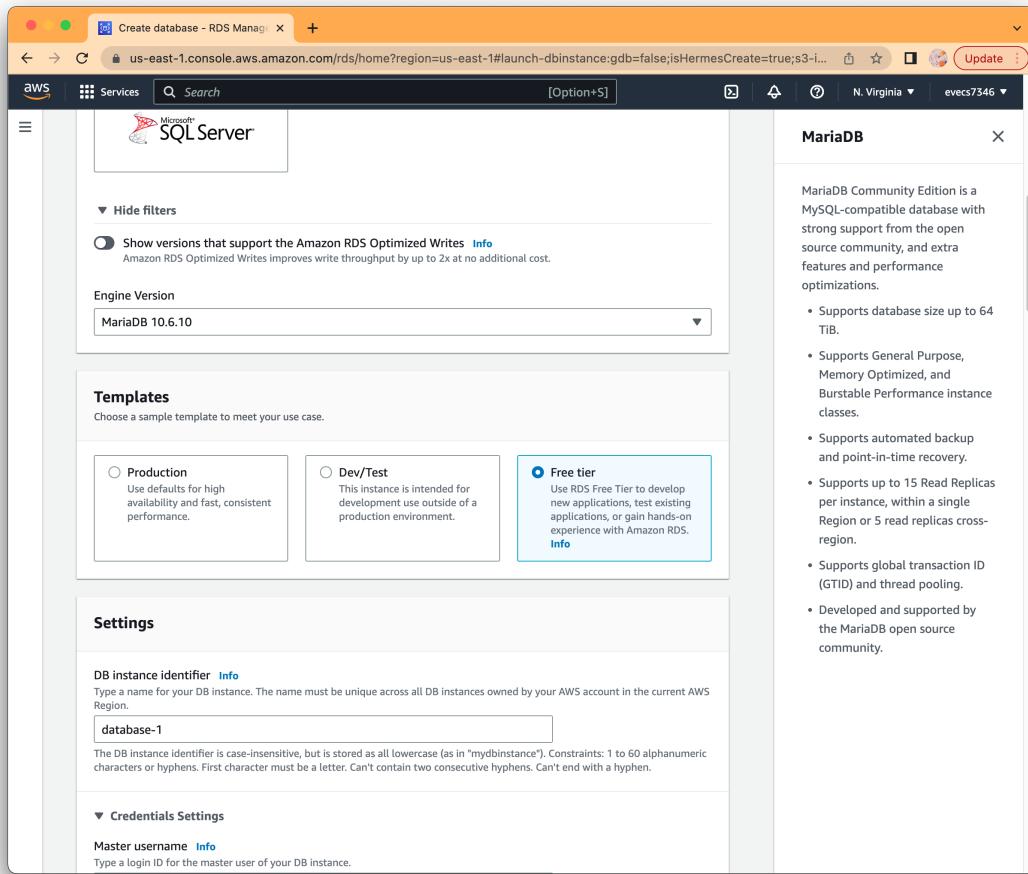
3.



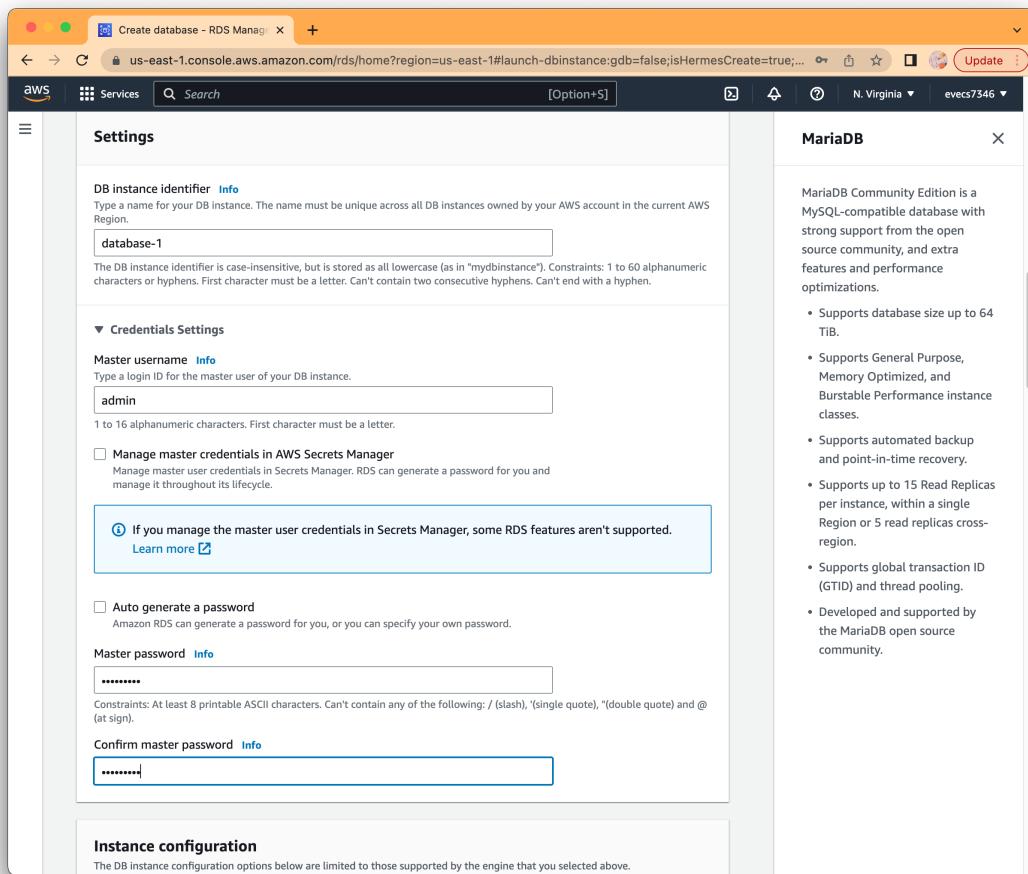
4.



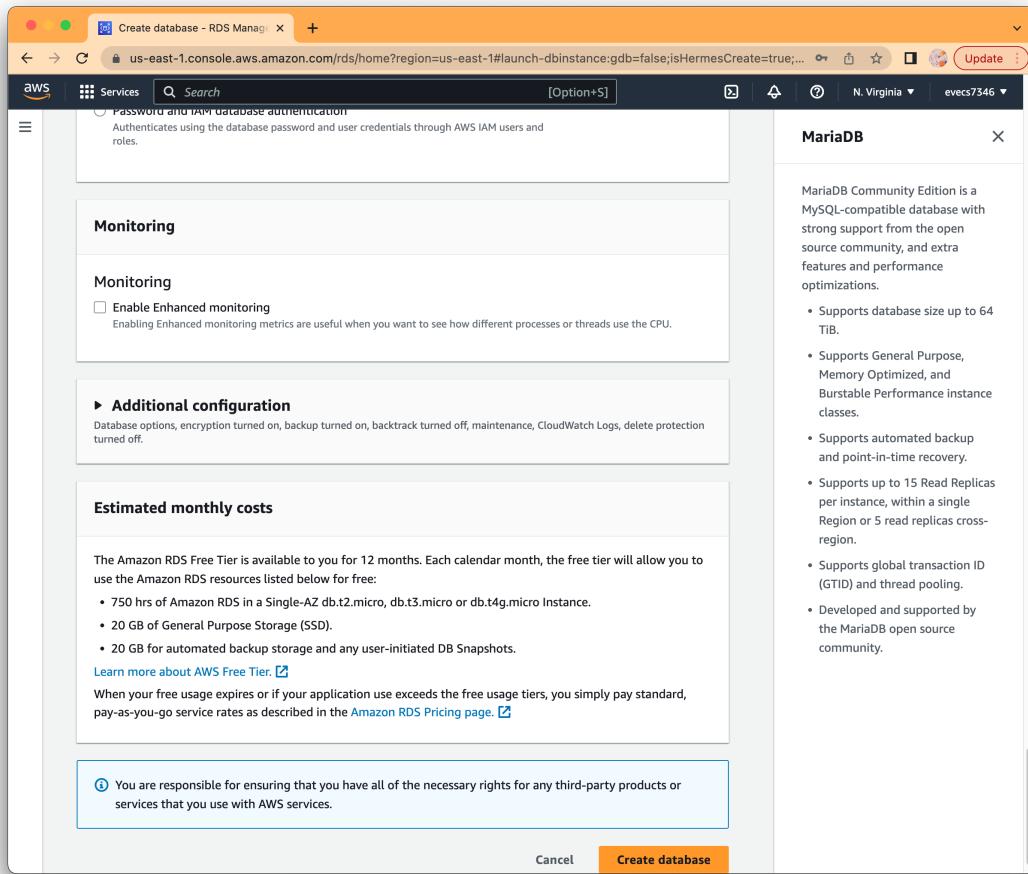
5.



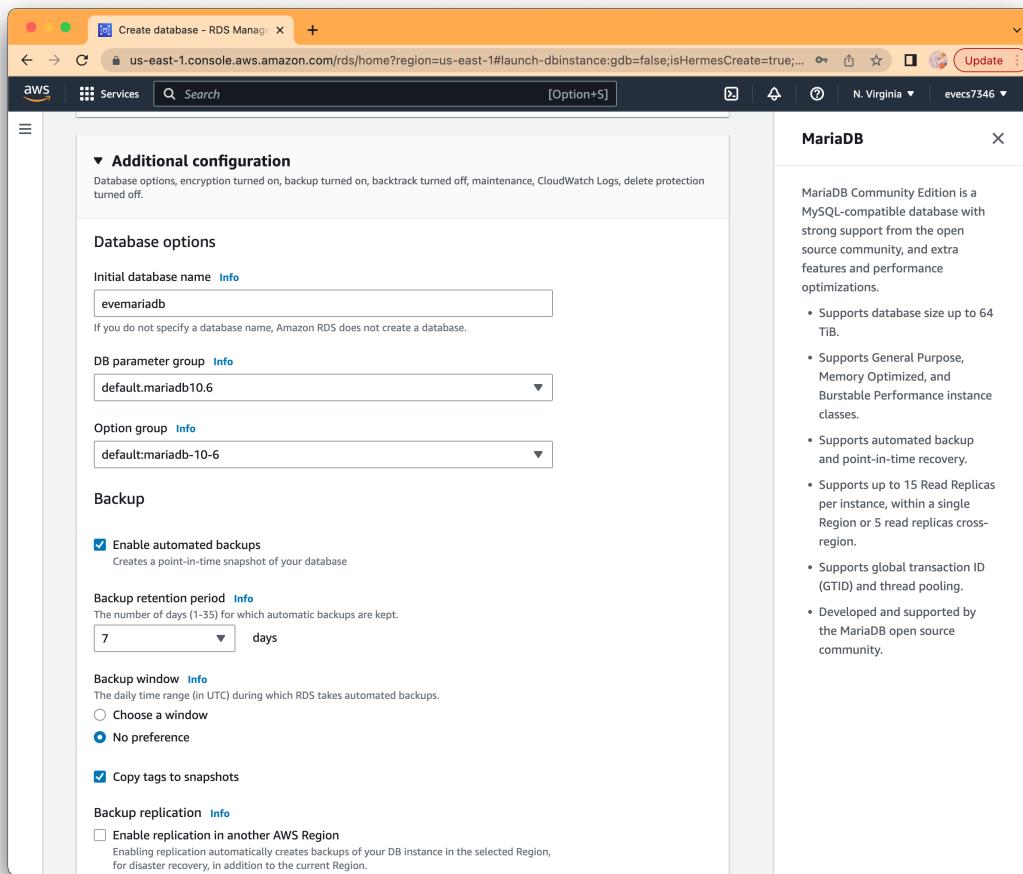
6.



7.



8.

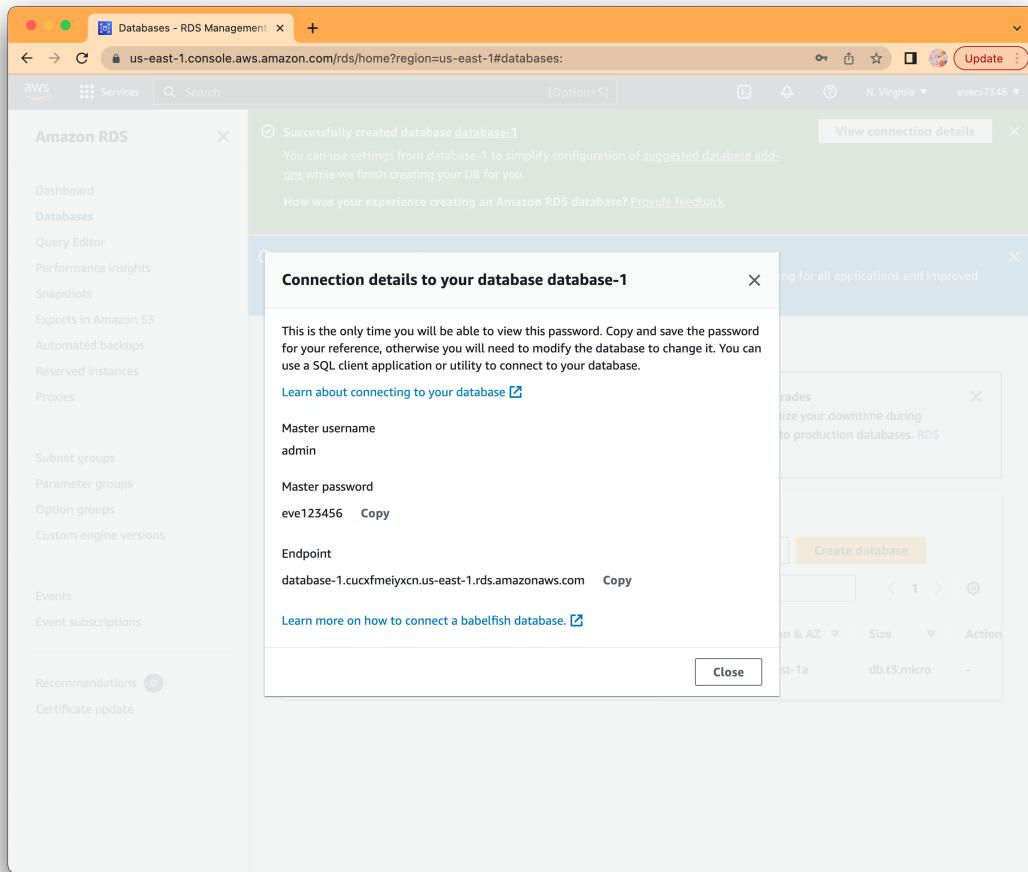


9.

The screenshot shows the Amazon RDS Management console with the following details:

- Left Sidebar:** Shows navigation links for Dashboard, Databases (selected), Query Editor, Performance insights, Snapshots, Exports in Amazon S3, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom engine versions, Events, Event subscriptions, Recommendations (0), and Certificate update.
- Top Center:** A modal window titled "Creating database database-1" with the message: "Your database might take a few minutes to launch. You can use settings from database-1 to simplify configuration of suggested database add-ons while we finish creating your DB for you." It also includes a link to "View credential details".
- Top Right:** Includes AWS logo, Services dropdown, Search bar, [Option+S] button, Update button, N. Virginia region, and user evecs7346.
- Middle Center:** A modal window titled "Introducing Aurora I/O-Optimized" with the message: "Aurora's I/O-Optimized [?] is a new cluster storage configuration that offers predictable pricing for all applications and improved price-performance, with up to 40% costs savings for I/O-intensive applications." It includes a "Close" button.
- Bottom Center:** The main RDS Databases page showing one database entry:

DB identifier	Status	Role	Engine	Region & AZ	Size	Actions
database-1	Creating	Instance	MariaDB	-	db.t3.micro	-



## 5.2

### EXERCISE 5.2

#### Create a Read Replica

1. In the navigation pane of the RDS service console, click Databases.
2. Select the instance you created earlier, click Actions, and then click Create Read Replica.
3. Under the Settings section, in the DB Instance Identifier field, enter a name for your read replica.
4. Click the Create Read Replicas button.

---

#### Solution:

1.

The screenshot shows the AWS RDS Management console. On the left, a sidebar menu includes options like Dashboard, Databases (which is selected), Query Editor, Performance insights, Snapshots, Exports in Amazon S3, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom engine versions, Events, Event subscriptions, Recommendations (with a notification count of 1), and Certificate update.

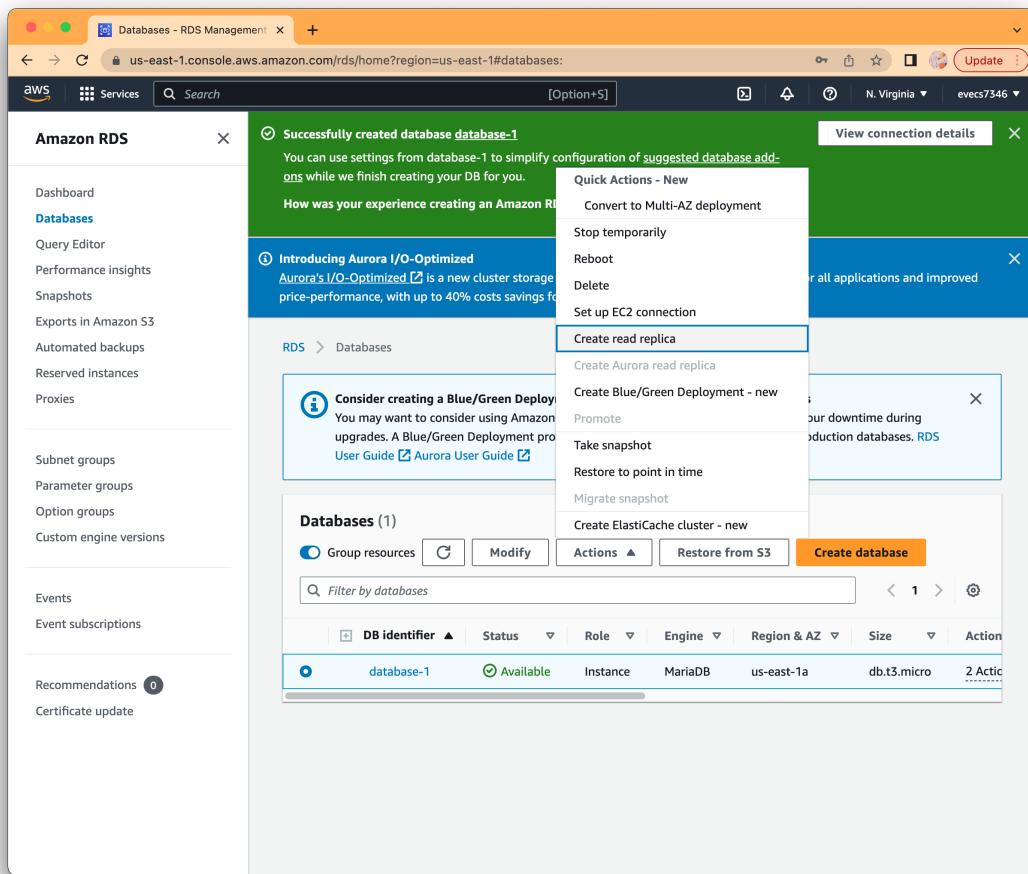
The main content area displays a green success message: "Successfully created database database-1". It says, "You can use settings from database-1 to simplify configuration of suggested database add-ons while we finish creating your DB for you." Below this is a link to "Provide feedback".

There is also a blue informational message about "Introducing Aurora I/O-Optimized". It describes it as a new cluster storage configuration offering predictable pricing and improved price-performance, with up to 40% cost savings for I/O-intensive applications. It includes links to "User Guide" and "Aurora User Guide".

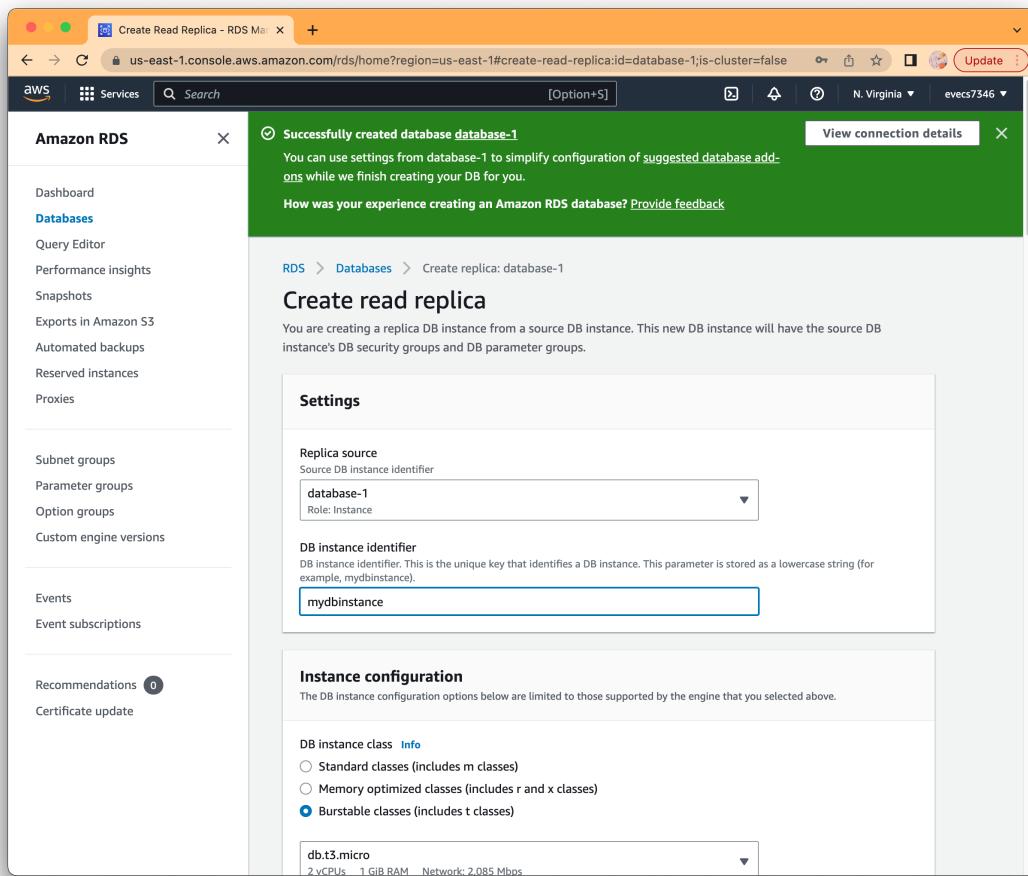
The "Databases" section shows one entry:

DB identifier	Status	Role	Engine	Region & AZ	Size	Action
database-1	Available	Instance	MariaDB	us-east-1a	db.t3.micro	2 Actions

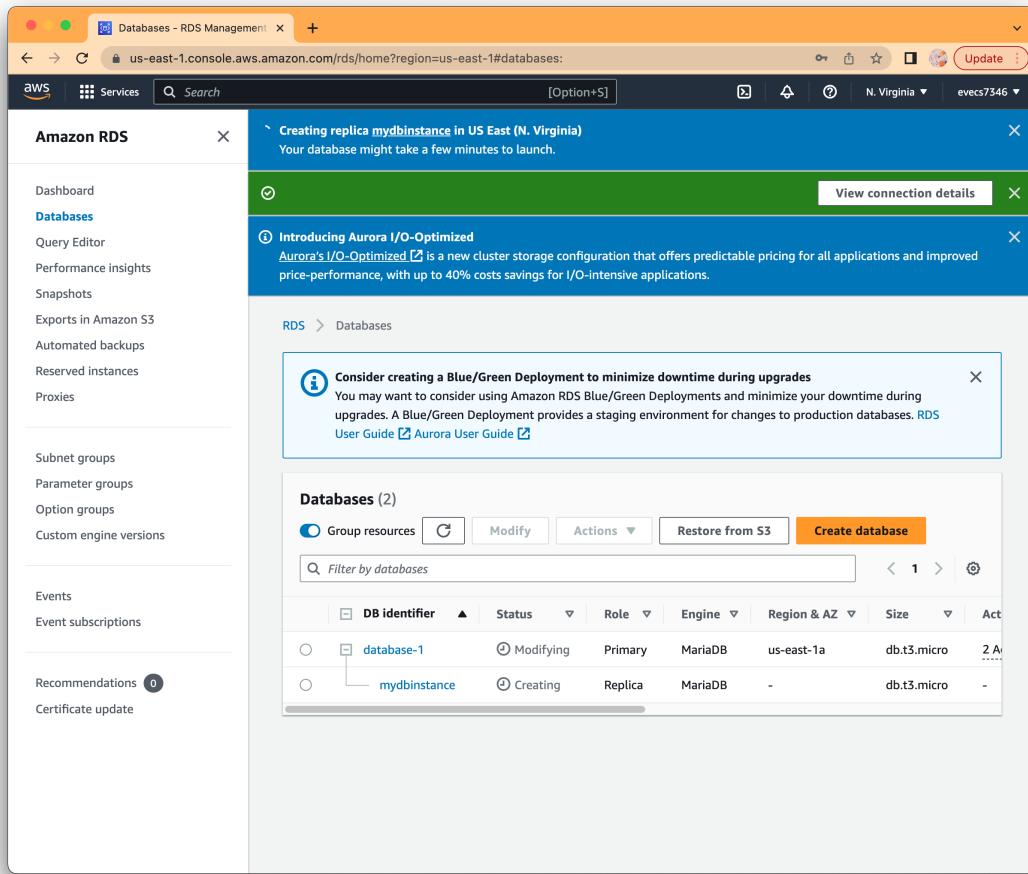
2.



3.



4.



## 5.3

### EXERCISE 5.3

#### Promote the Read Replica to a Master

In this exercise, you'll promote the read replica you just created to master. Before beginning, wait for the replica to enter the Available state.

1. In the RDS service console, click Databases.
2. Select the read replica you created.
3. Click Actions and then select Promote.
4. Click Continue.
5. Click Promote Read Replica.

#### Solution:

1.

The screenshot shows the Amazon RDS Management console with the URL [us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#databases](https://us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#databases). The left sidebar is titled "Amazon RDS" and includes links for Dashboard, Databases (which is selected), Query Editor, Performance insights, Snapshots, Exports in Amazon S3, Automated backups, Reserved instances, Proxies, Subnet groups, Parameter groups, Option groups, Custom engine versions, Events, Event subscriptions, Recommendations (2), and Certificate update. The main content area has a blue header bar with the text "Introducing Aurora I/O-Optimized" and a sub-header "Consider creating a Blue/Green Deployment to minimize downtime during upgrades". Below this is a table titled "Databases (2)" with two rows:

DB identifier	Status	Role	Engine	Region & AZ	Size	Action
database-1	Available	Primary	MariaDB	us-east-1a	db.t3.micro	2 Actions
mydbinstance	Available	Replica	MariaDB	us-east-1d	db.t3.micro	-

At the bottom of the page are links for CloudShell, Feedback, Language, © 2023, Amazon Web Services, Inc. or its affiliates., Privacy, Terms, and Cookie preferences.

2.

The screenshot shows the Amazon RDS Management console with the following details:

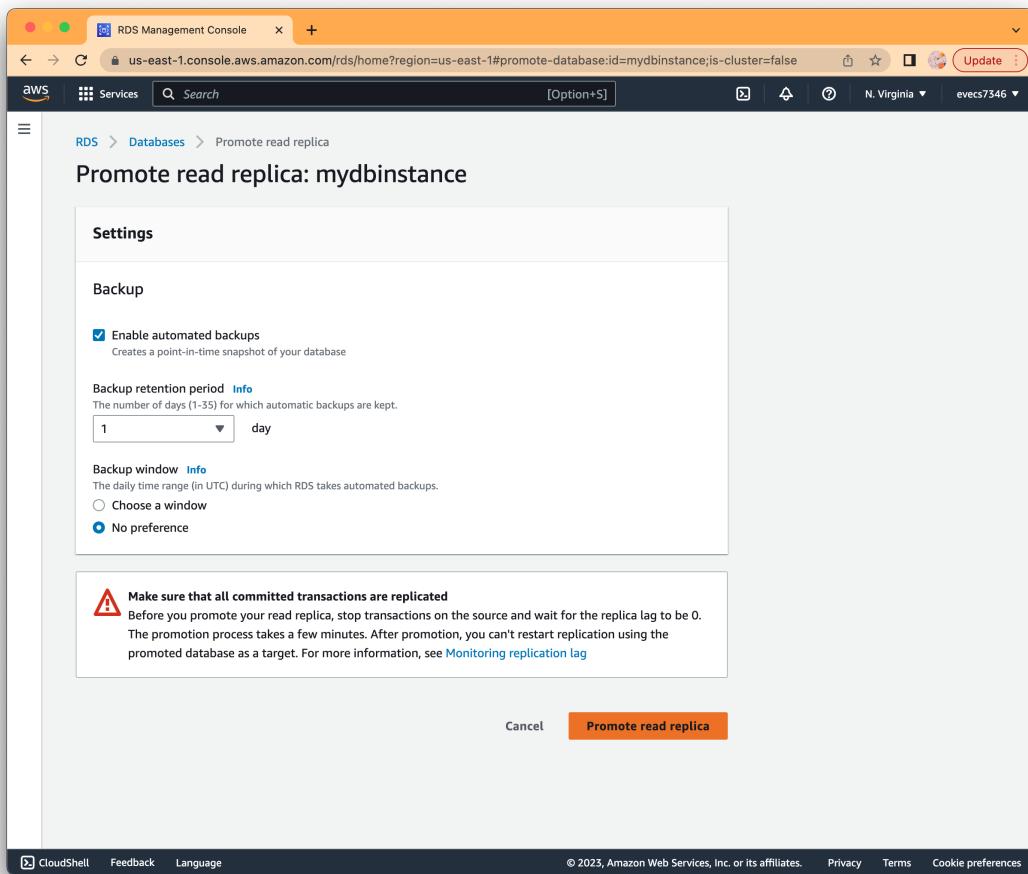
- Header:** Databases - RDS Management
- Top Bar:** AWS Services Search [Option+S] Update N. Virginia evecs7346
- Left Sidebar:**
  - Dashboard
  - Databases**
  - Query Editor
  - Performance insights
  - Snapshots
  - Exports in Amazon S3
  - Automated backups
  - Reserved instances
  - Proxies
  - Subnet groups
  - Parameter groups
  - Option groups
  - Custom engine versions
  - Events
  - Event subscriptions
  - Recommendations (2)
  - Certificate update
- Central Content:**
  - Introducing Aurora I/O-Optimized:** Aurora's I/O-Optimized is a new cluster storage configuration that offers predictable pricing for all applications and improved price-performance, with up to 40% costs savings for I/O-intensive applications.
  - Consider creating a Blue/Green Deployment to minimize downtime during upgrades:** You may want to consider using Amazon RDS Blue/Green Deployments and minimize your downtime during upgrades. A Blue/Green Deployment provides a staging environment for changes to production databases. [RDS User Guide](#) [Aurora User Guide](#)
  - Databases (2)**

DB identifier	Status	Role	Engine	Region & AZ	Size	Action
database-1	Available	Primary	MariaDB	us-east-1a	db.t3.micro	<a href="#">Actions</a>
mydbinstance	Available	Replica	MariaDB	us-east-1d	db.t3.micro	<a href="#">Actions</a>
- Footer:** CloudShell Feedback Language © 2023, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

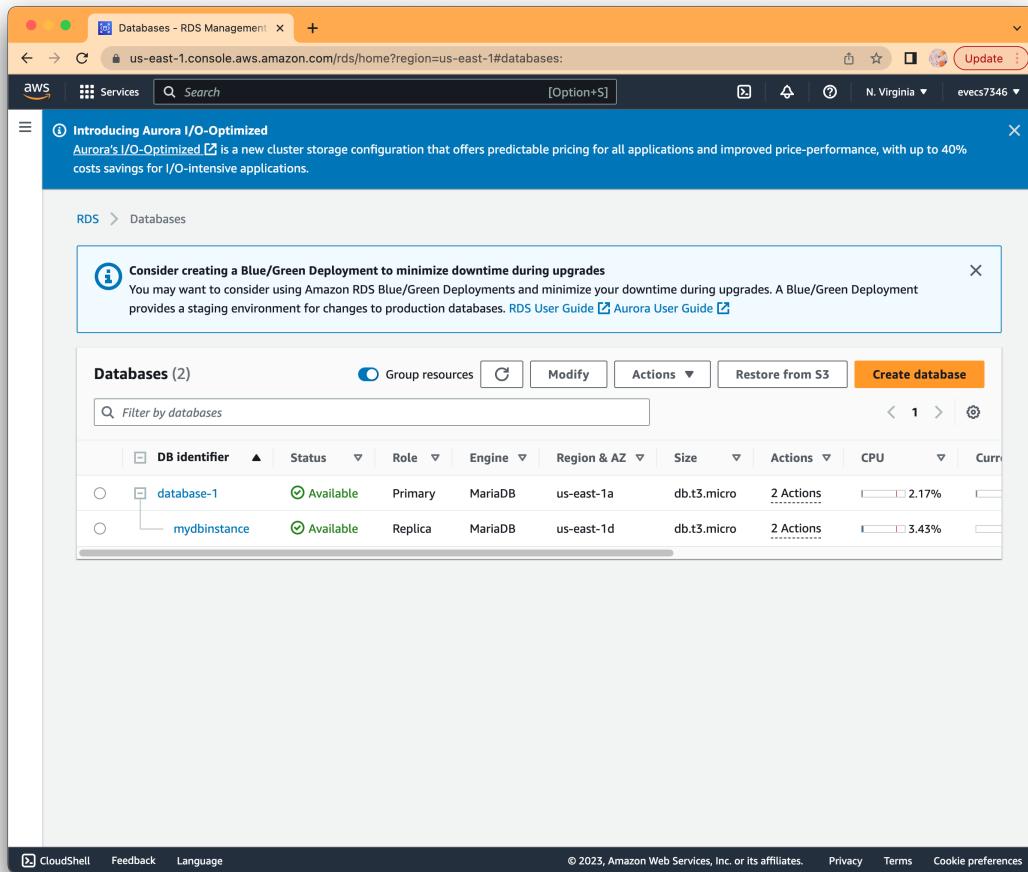
3.

The screenshot shows the AWS RDS Management console with the URL [us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#databases](https://us-east-1.console.aws.amazon.com/rds/home?region=us-east-1#databases). The page displays two databases: 'database-1' (Primary, MariaDB, us-east-1a) and 'mydbinstance' (Replica, MariaDB, us-east-1d). A context menu is open for 'mydbinstance', with the 'Promote' option highlighted. Other options in the menu include 'Quick Actions - New', 'Convert to Multi-AZ deployment', 'Turn on backups', 'Stop temporarily', 'Reboot', 'Delete', 'Set up EC2 connection', 'Create read replica', 'Create Aurora read replica', 'Take snapshot', 'Restore to point in time', 'Migrate snapshot', and 'Create ElastiCache cluster - new'. The top of the page features an 'Introducing Aurora I/O-Optimized' banner and a 'Consider creating a Blue/Green Deployment to minimize downtime during upgrades' message.

4.



5.



## 5.4

### EXERCISE 5.4

#### Create a Table in DynamoDB Using Provisioned Mode

1. Use the following command to create a table named Authors with a partition key named LastName and sort key named FirstName. Both keys should use the string data type. Provision the table with a WCU and an RCU of 1.

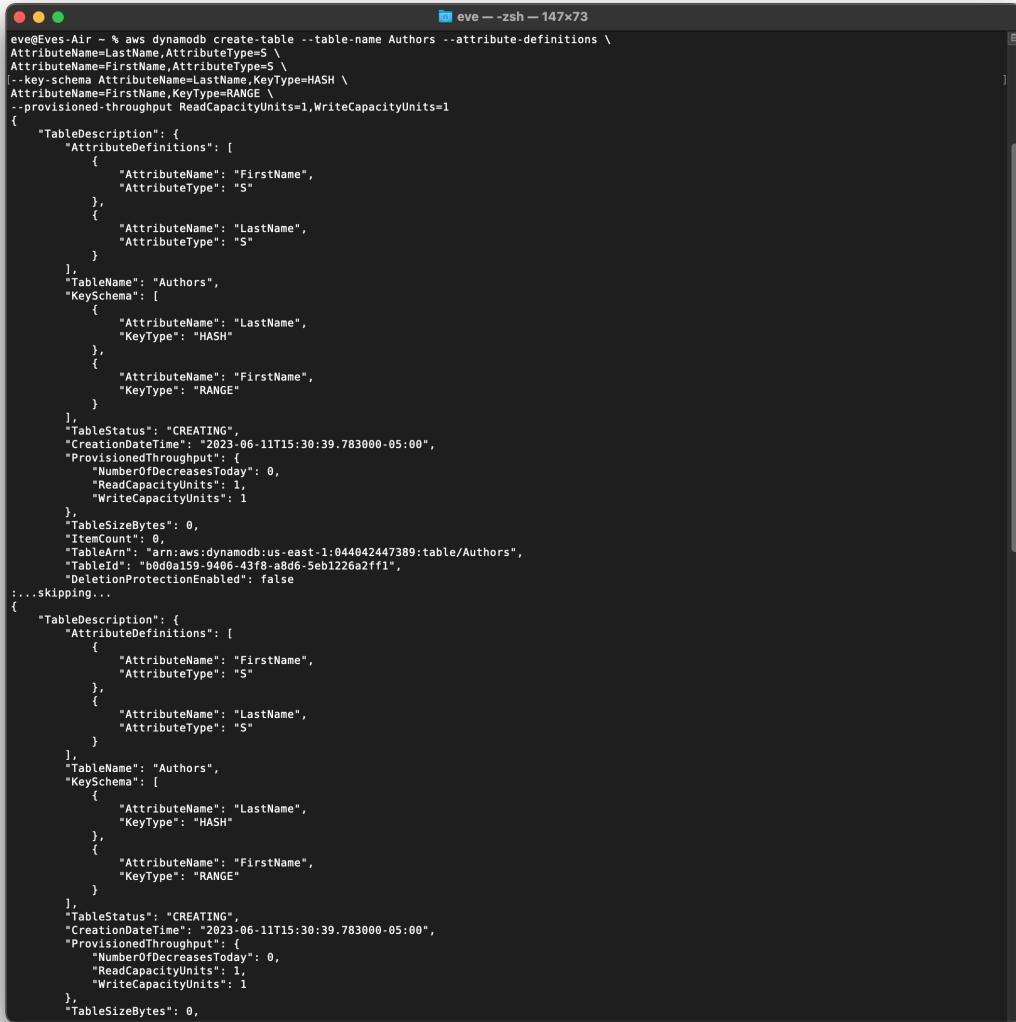
```
aws dynamodb create-table --table-name Authors --attribute-definitions
AttributeType=S
AttributeName=LastName,AttributeType=S
AttributeName=FirstName,AttributeType=S
--keyschema AttributeName=LastName,KeyType=HASH
AttributeName=FirstName,KeyType=RANGE
--provisioned-throughput ReadCapacityUnits=1,WriteCapacityUnits=1
```

2. Go to the DynamoDB service console to view the table you just created.

---

#### Solution:

1.



```
eve@Eves-Air ~ % aws dynamodb create-table --table-name Authors --attribute-definitions \
AttributeType=S \
AttributeName=LastName,AttributeType=S \
AttributeName=FirstName,AttributeType=S \
--key-schema AttributeName=LastName,KeyType=HASH \
AttributeName=FirstName,KeyType=RANGE \
--provisioned-throughput ReadCapacityUnits=1,WriteCapacityUnits=1

{
    "TableDescription": {
        "AttributeDefinitions": [
            {
                "AttributeName": "FirstName",
                "AttributeType": "S"
            },
            {
                "AttributeName": "LastName",
                "AttributeType": "S"
            }
        ],
        "TableName": "Authors",
        "KeySchema": [
            {
                "AttributeName": "LastName",
                "KeyType": "HASH"
            },
            {
                "AttributeName": "FirstName",
                "KeyType": "RANGE"
            }
        ],
        "TableStatus": "CREATING",
        "CreationDateTime": "2023-06-11T15:30:39.783000-05:00",
        "ProvisionedThroughput": {
            "NumberOfDecreasesToday": 0,
            "ReadCapacityUnits": 1,
            "WriteCapacityUnits": 1
        },
        "TableSizeBytes": 0,
        "ItemCount": 0,
        "TableArn": "arn:aws:dynamodb:us-east-1:044042447389:table/Authors",
        "TableId": "b6d0a159-9406-43f8-a8d6-5eb1226a2ff1",
        "DeletionProtectionEnabled": false
    },
    "...skipping...
    {
        "TableDescription": {
            "AttributeDefinitions": [
                {
                    "AttributeName": "FirstName",
                    "AttributeType": "S"
                },
                {
                    "AttributeName": "LastName",
                    "AttributeType": "S"
                }
            ],
            "TableName": "Authors",
            "KeySchema": [
                {
                    "AttributeName": "LastName",
                    "KeyType": "HASH"
                },
                {
                    "AttributeName": "FirstName",
                    "KeyType": "RANGE"
                }
            ],
            "TableStatus": "CREATING",
            "CreationDateTime": "2023-06-11T15:30:39.783000-05:00",
            "ProvisionedThroughput": {
                "NumberOfDecreasesToday": 0,
                "ReadCapacityUnits": 1,
                "WriteCapacityUnits": 1
            },
            "TableSizeBytes": 0,

```

2.

The screenshot shows the Amazon DynamoDB console interface. At the top, there is a survey bar asking "How would you rate your experience with this service console?" with five star icons. Below the survey, the navigation bar includes the AWS logo, Services, a search bar, and account information for "N. Virginia" and user "evecs7346".

The main left sidebar menu for "DynamoDB" includes the following options:

- Dashboard
- Tables** (selected)
- Update settings
- Explore items
- PartQL editor
- Backups
- Exports to S3
- Imports from S3
- Reserved capacity
- Settings

Below the sidebar, under the "Tables" section, is a "DAX" section with options: Clusters, Subnet groups, Parameter groups, and Events.

The central content area displays the "Tables" list with one entry:

Name	Status	Partition key	Sort key	Indexes	Deletion protection	Read capacity mode	Write capacity mode
Authors	Active	LastName (S)	FirstName (S)	0	Off	Provisioned (1)	Provisioned

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