S3 Versioning, AWS Glacier and Static Website Deployment on AWS S3

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PUL074BEX007

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List of Abbreviations

AWS Amazon Web Services.

CSS Cascading Style Sheets.

HTML Hyper Text Markup Language.

JS Javascript.

S3 Simple Storage Service.

1 S3 Versioning

Amazon Simple Storage Service (Amazon S3) is the object storage service provided by AWS. Objects are stored in a S3 bucket, whose versioning is disabled by default. S3 versioning, or simply versioning is a method that allows users of S3 buckets to keep multiple versions of an object in the same S3 bucket. It is particularly useful for,

1. Avoiding accidental deletion of an object as it creates a delete marker on the latest version of the deleted object essentially making the delete marker object the current version.
2. Avoiding unintentional overwriting of an object as it creates a new version of the object with the same key rather than overwriting the existing object.

A note-worthy point is that, S3 versioning is disabled by default, so if an user wishes to have versioning enabled, they need to do it either during bucket creation or at a later time.

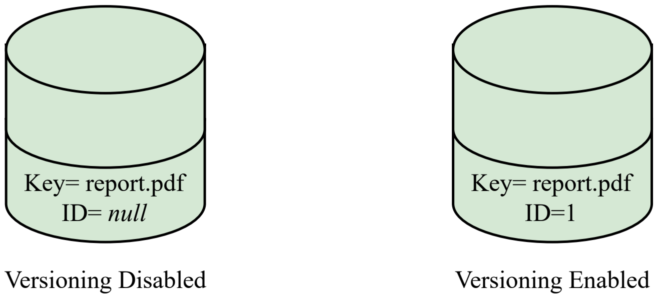


Figure 1: S3 versioning disabled versus enabled

Objects placed in buckets with versioning disabled have their ID set to *null*. If a bucket contains objects prior to the enabling of the versioning, the objects will still have their IDs marked as *null*. Any new objects that are PUT in the bucket will get an auto-generated version ID that are composed of various unicode, UTF-8 encoded, URL-ready, opaque strings. To explain S3 versioning, simpler IDs are used in this report. This ID distinguishes the different versions of

the same key.
S3 buckets can exist in one of the following states,

1. Versioning disabled (default)
2. Versioning enabled
3. Versioning suspended

Once a bucket's versioning is enabled, it can never be disabled, rather can only be set to a versioning suspended state by an user with the required permissions.

1.1 Different scenarios in versioned bucket

1.1.1 PUT an object in versioning enabled bucket

When an user PUTs an object in a versioning enabled bucket with the key of an existing object, rather than overwriting the object, the new object is stored with a new version ID and becomes the latest version of that object. This way accidental overwriting is prevented.

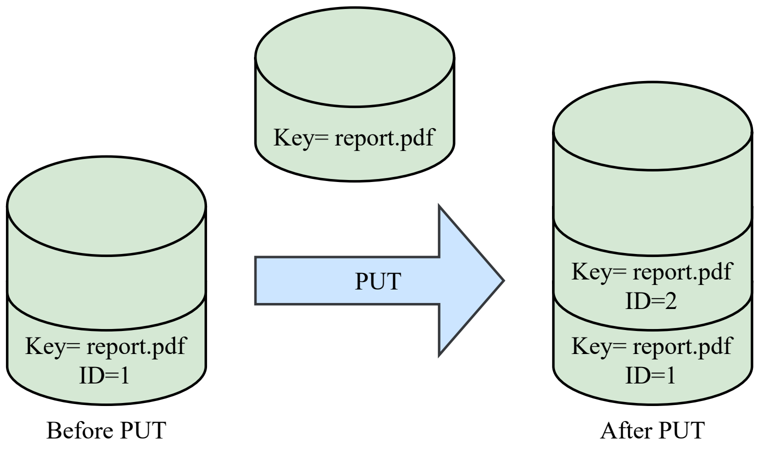


Figure 2: PUT an object in versioning enabled bucket

1.1.2 DELETE an object from versioning enabled bucket

When an user DELETEs an object from a versioning enabled bucket, rather than deleting the object, a delete marker is inserted with a new version ID and becomes the latest version of that object. This way accidental deletion is prevented as the older versions of the object are still stored in the same S3 bucket.

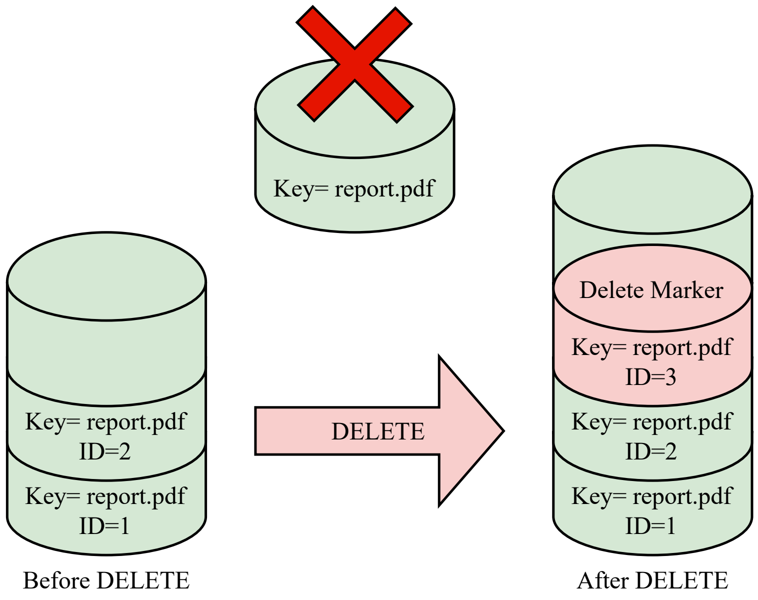


Figure 3: DELETE an object from versioning enabled bucket

1.1.3 GET an object from versioning enabled bucket

Since GET request returns the latest version of an object, a simple GET request to retrieve the report.pdf object in the current situation would return a '404 No Object Found' error since the latest version is a delete marker. This is because the delete marker identifies the object as deleted although there are older versions of the object existing in the same bucket. If the user wishes to retrieve an older version of the object that is not marked as deleted, then the GET request must be modified to point to the exact unique version ID that the user wants to get.

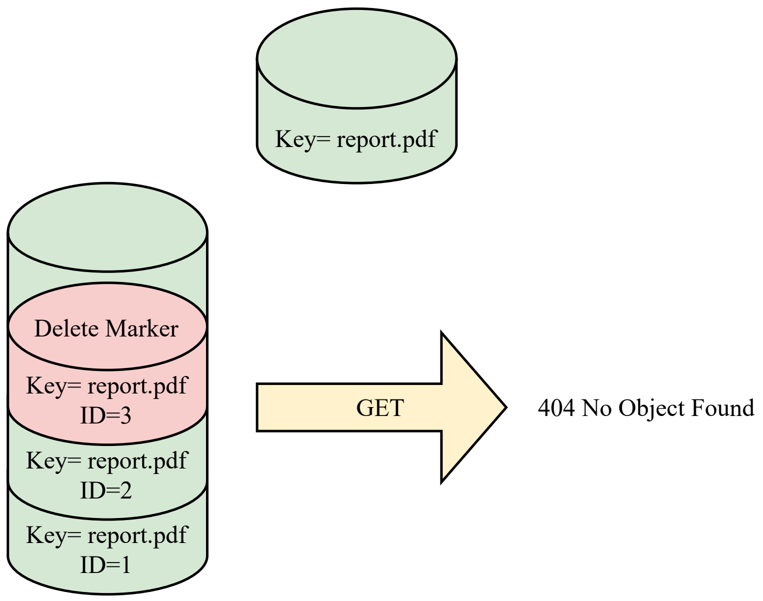


Figure 4: GET a delete marked object

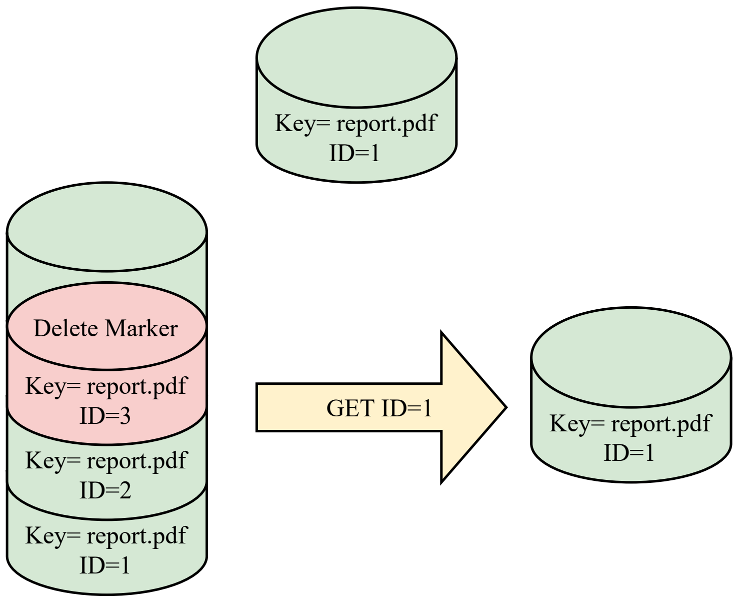


Figure 5: GET a specific version of object by using ID

This helps in explaining how the different versions of the object are separately accessible with their unique version ID.

1.1.4 Restoring a previous version of an object

To restore previous versions of an object, one of two methods can be used,

1. Copy a pervious version of the object into the bucket.
2. Permanently delete the current version of the object.

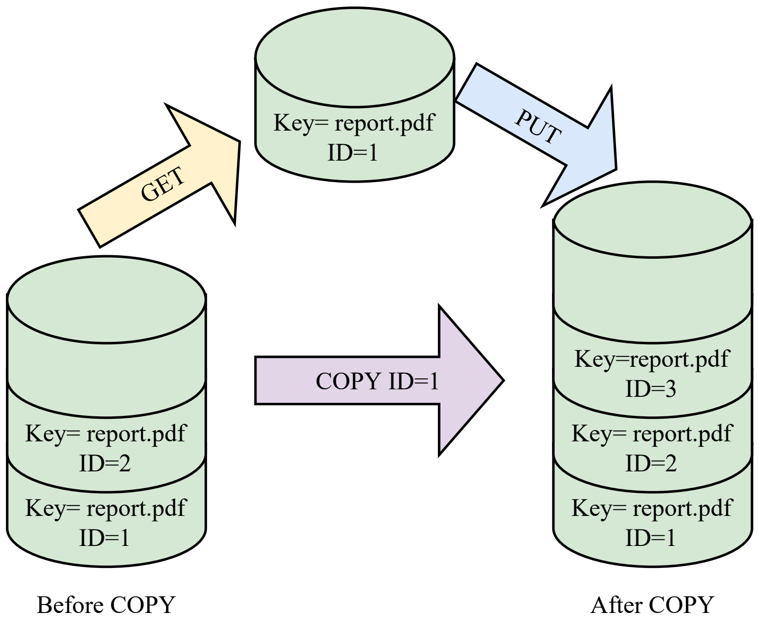


Figure 6: COPY a previous version of an object

A copy of a previous version can be made into the same S3 bucket by first using GET request to retrieve the required ID followed by a PUT request. A note-worthy point during this method is that, the old version isn't moved and made the current version, rather a new object with a new unique ID is PUT into the bucket that is a copy of the requested version.

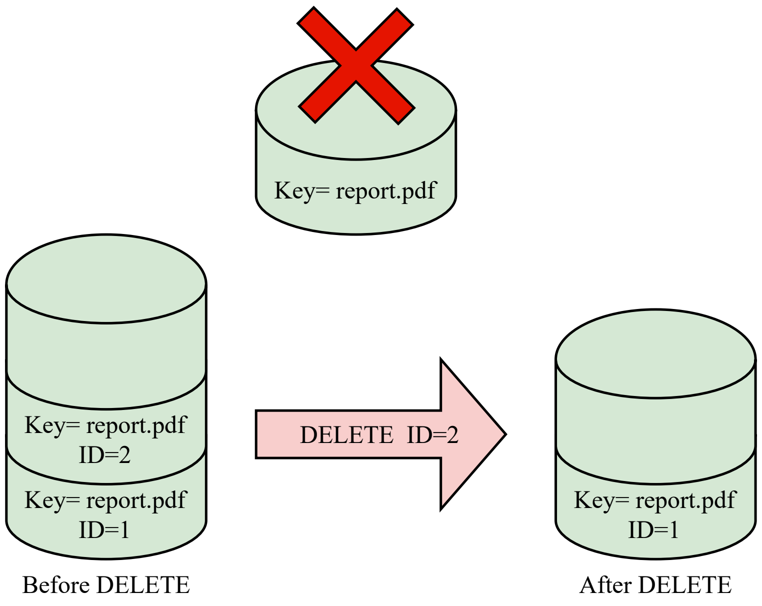


Figure 7: Permanently DELETE the current version of an object

Unlike Figure 3, where a general DELETE request inserts a delete marker as the current version, if the user specify the ID of the version that they wish to delete, it is deleted permanently. This can be used to some extent restore the immediately previous version of the object, but if there are multiple versions existing, and the need is to restore a version that is quite old, multiple versions of the object would need to be deleted, which might not be what the user wants.

2 AWS Glacier

AWS Glacier is a low-cost, secure and durable storage class under AWS S3 storage classes, mostly used for data archiving purpose. As the name suggests, S3 Glacier is used to store cold data, a term commonly used for data that is archived or infrequently accessed but preserved for future access. Many organizations have the need of storing cold data but surely won't want high-cost storage services to do so. To keep the cost of AWS Glacier as low as possible, AWS provides data retrieval in one of three ways,

1. **Bulk retrieval:** To recover large among of data in 5 to 12 hours.
2. **Standard retrieval:** To recover data in 3 to 5 hours.
3. **Expedited retrieval:** To recover data within 5 minutes.

Some use cases of AWS Glacier are,

1. **Digital preservation:** Many governmental firms and offices utilize Glacier service for digital preservation of the important data.
2. **Regulatory and compliance archiving:** Since health and financial firms require large amount of regulatory and compliance archives, they use Glacier services.
3. **Tape replacement:** With large upfront investment and maintenance needs, tape archiving can be replace by Glacier archiving.
4. **Media assets storage:** Large media files that require a lot of space are stored in affordable Glacier buckets.

Some of the benefits of AWS Glacier are,

1. **Durability and scalability:** Since AWS Glacier is distributed across at lease three availability zones, the durability of the storage is unquestioned. Similarly, organizations can scale their cloud archives as per their requirements.
2. **Lower cost:** AWS Glacier is one of the lowest-cost storage classes and also employs pay-as-you go, hence reducing the cost tremendously.
3. **Security:** Glacier has support of various compliance standards and encryption that allow secure storage at low cost.

4. **Retrieval options:** As mentioned above, there are different options that a client can choose from while retrieving their data hence giving them choice based on retrieval time and cost.

3 Static Website Deployment on AWS S3

To deploy static websites on AWS S3, users need to create a storage bucket where the static code (HTML, CSS, JS) files are kept as objects. Necessary policies are then created for the public access of these static files and a S3 url for the HTML object makes the website accessible over the internet.
For this report, a simple HTML file is used.

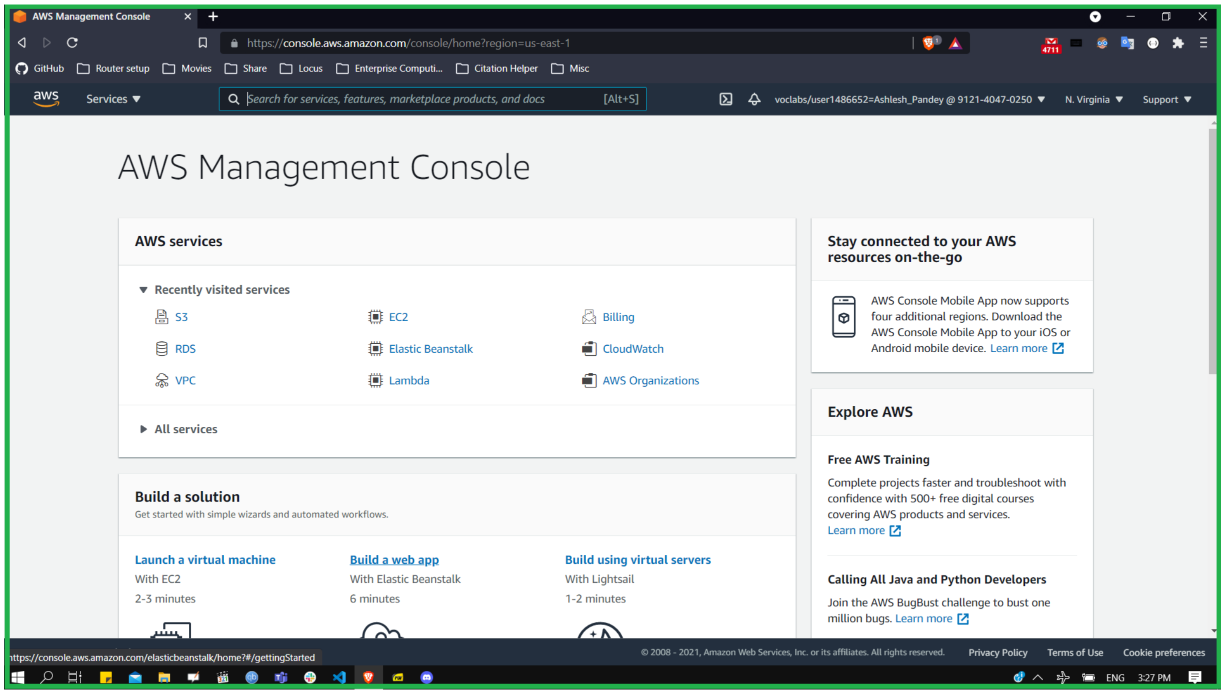
```html
<html>
    <head>
    </head>
    <body>
        <h1>Static website hosted on S3 by Ashlesh Pandey</h1>
    </body>
</html>
```

Listing 1: HTML code for the static website

Hosting a static website isn't however limited to a single HTML file, rather different styling codes in CSS and functional codes in JS codes are necessary. It should be noted that the entire project must be made public so that the static website functions properly. Similarly, if there are any media assets that are used in the website, they too need to be accessible publicly. The steps to host a static website on AWS S3 include,

1. Create a bucket and make sure the bucket can have public objects.
2. Upload code files to the bucket and make the files public.
3. Access the website using the S3 object url.

Step 1: *Log in to AWS console*



AWS Management Console

https://console.aws.amazon.com/console/home?region=us-east-1

GitHub Router setup Movies Share Locus Enterprise Computi... Citation Helper Misc

Services ▼ Search for services, features, marketplace products, and docs [Alt+S] voclabs/user1486652=Ashlesh_Pandey @ 9121-4047-0250 ▼ N. Virginia ▼ Support ▼

AWS Management Console

AWS services

▼ Recently visited services

S3	EC2	Billing
RDS	Elastic Beanstalk	CloudWatch
VPC	Lambda	AWS Organizations

▶ All services

Build a solution

Get started with simple wizards and automated workflows.

Launch a virtual machine	Build a web app	Build using virtual servers
With EC2	With Elastic Beanstalk	With Lightsail
2-3 minutes	6 minutes	1-2 minutes

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https://console.aws.amazon.com/elasticbeanstalk/home?#/gettingStarted

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ENG 3:27 PM

Figure 8: Log in to AWS console

Firstly, log in to the AWS console using a valid user with access to S3 services. In this report, the log in was done using the sandbox account from AWS Academy.

Step 2: *Open S3 service from the AWS services list*

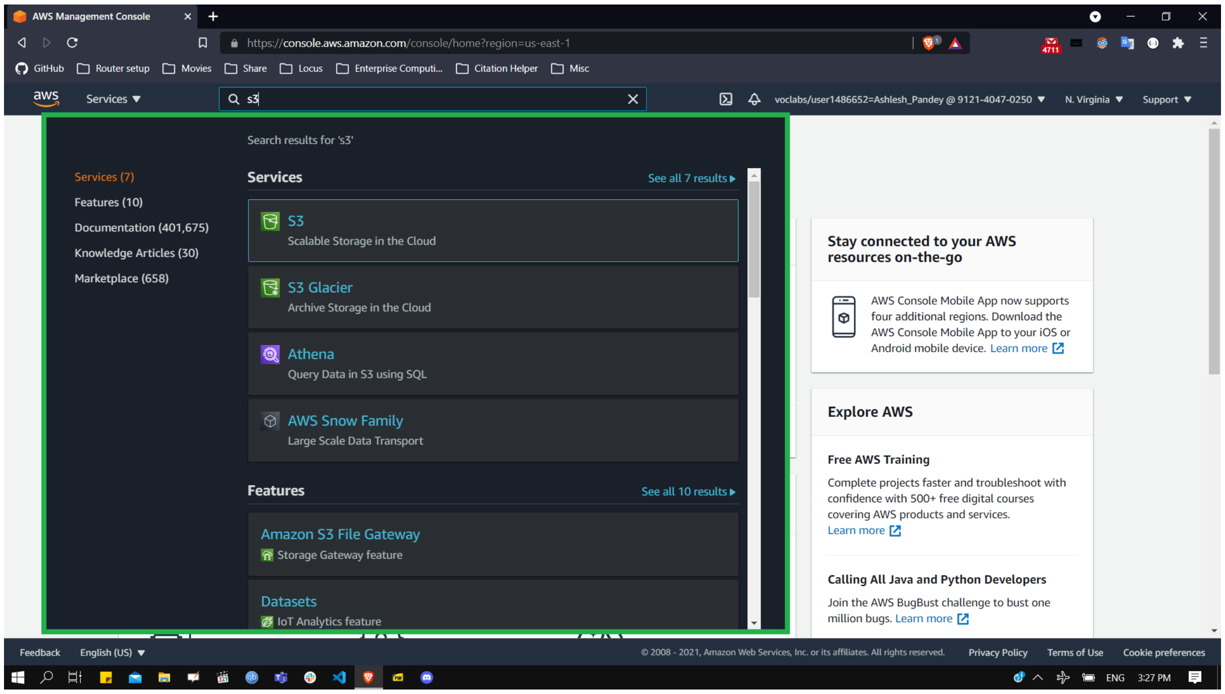


Figure 9: Open S3 service from the AWS services list

Search for S3 service in the search box and select S3 service to proceed.

Step 3: *Create a S3 bucket*

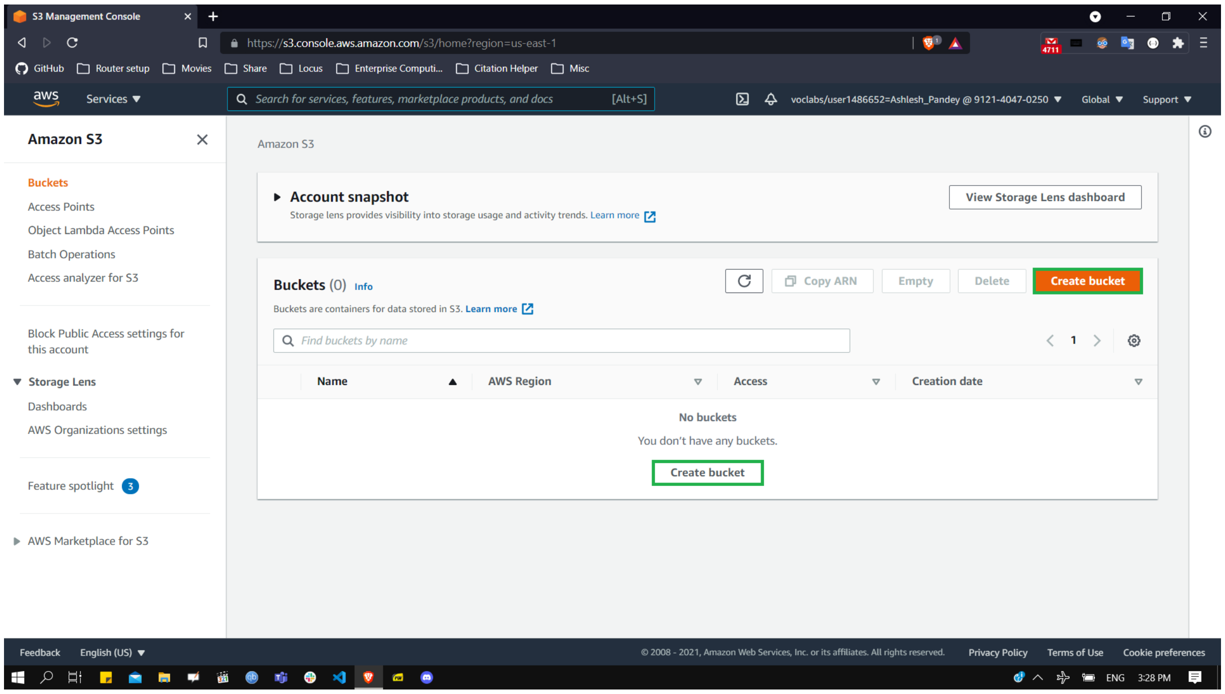
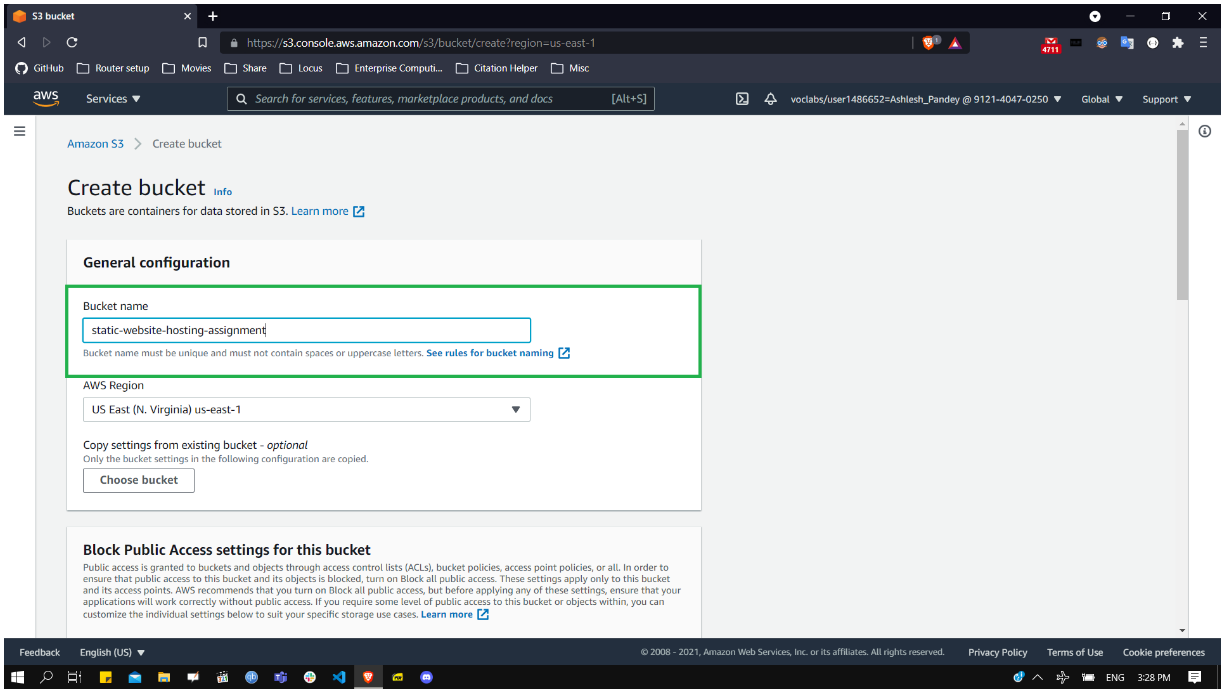

S3 Management Console
https://s3.console.aws.amazon.com/s3/home?region=us-east-1
Services
Search for services, features, marketplace products, and docs [Alt+S]
voclabs/user1486652=Ashlesh_Pandey @ 9121-4047-0250
Global
Support
Amazon S3
Buckets
Access Points
Object Lambda Access Points
Batch Operations
Access analyzer for S3
Block Public Access settings for this account
Storage Lens
Dashboards
AWS Organizations settings
Feature spotlight 3
AWS Marketplace for S3
Account snapshot
Storage lens provides visibility into storage usage and activity trends. Learn more
View Storage Lens dashboard
Buckets (0) Info
Copy ARN
Empty
Delete
Create bucket
Buckets are containers for data stored in S3. Learn more
Find buckets by name
Name
AWS Region
Access
Creation date
No buckets
You don't have any buckets.
Create bucket

Figure 10: Create a S3 bucket

To create a S3 bucket select any one of the *Create bucket* buttons.

Step 4: *Set an unique bucket name*



Amazon S3 > Create bucket

Create bucket Info

Buckets are containers for data stored in S3. Learn more

General configuration

Bucket name: static-website-hosting-assignment

Bucket name must be unique and must not contain spaces or uppercase letters. See rules for bucket naming

AWS Region: US East (N. Virginia) us-east-1

Copy settings from existing bucket - *optional*

Only the bucket settings in the following configuration are copied.

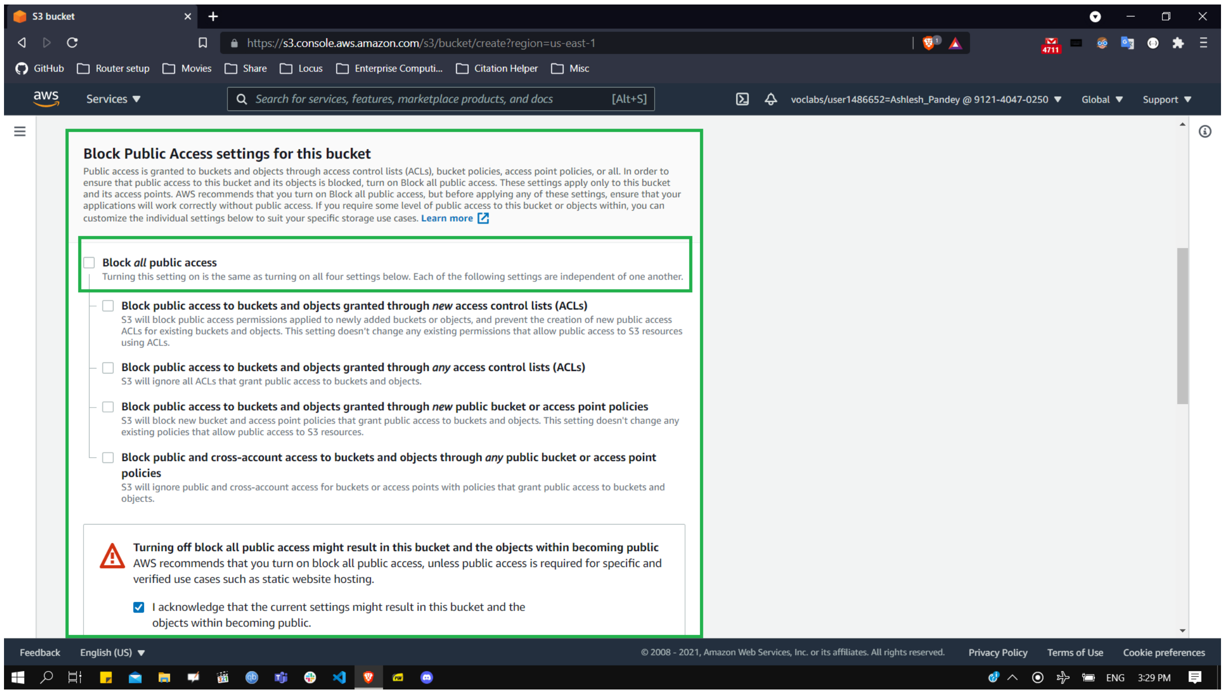
Block Public Access settings for this bucket

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to this bucket and its objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to this bucket or objects within, you can customize the individual settings below to suit your specific storage use cases. Learn more

Figure 11: Set an unique bucket name

Bucket names must be unique without using any spaces or uppercase letters. Choose an appropriate name that will be easy to remember. For this example, the name chosen is *static-website-hosting-assignment*.

Step 5: *Grant public access to bucket*


S3 bucket
https://s3.console.aws.amazon.com/s3/bucket/create?region=us-east-1
GitHub
Router setup
Movies
Share
Locus
Enterprise Computi...
Citation Helper
Misc
Services
Search for services, features, marketplace products, and docs [Alt+S]
voclabs/user1486652=Ashlesh_Pandey @ 9121-4047-0250
Global
Support
Feedback
English (US)
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Privacy Policy
Terms of Use
Cookie preferences
ENG
3:29 PM

Block Public Access settings for this bucket

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to this bucket and its objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to this bucket or objects within, you can customize the individual settings below to suit your specific storage use cases. Learn more

- [ ] **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.

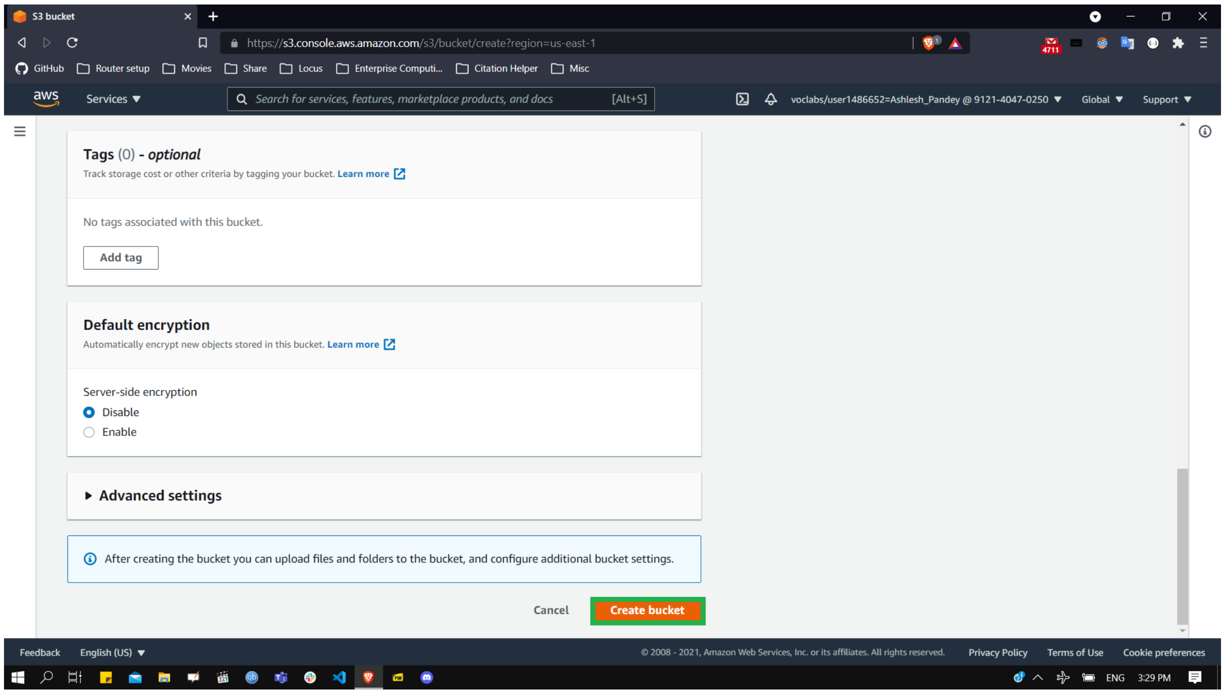
Turning off block all public access might result in this bucket and the objects within becoming public
AWS recommends that you turn on block all public access, unless public access is required for specific and verified use cases such as static website hosting.

- [✓] I acknowledge that the current settings might result in this bucket and the objects within becoming public.

Figure 12: Grant public access to bucket

Unselect the *Block all public access* option. Also select the *I acknowledge that the current settings might result in this bucket and the objects within becoming public* option.

Step 6: *Complete bucket creation*


S3 bucket
https://s3.console.aws.amazon.com/s3/bucket/create?region=us-east-1
GitHub
Router setup
Movies
Share
Locus
Enterprise Computi...
Citation Helper
Misc
aws
Services
Search for services, features, marketplace products, and docs
[Alt+S]
voclabs/user1486652=Ashlesh_Pandey @ 9121-4047-0250
Global
Support

Tags (0) - *optional*

Track storage cost or other criteria by tagging your bucket. Learn more

No tags associated with this bucket.

Default encryption

Automatically encrypt new objects stored in this bucket. Learn more

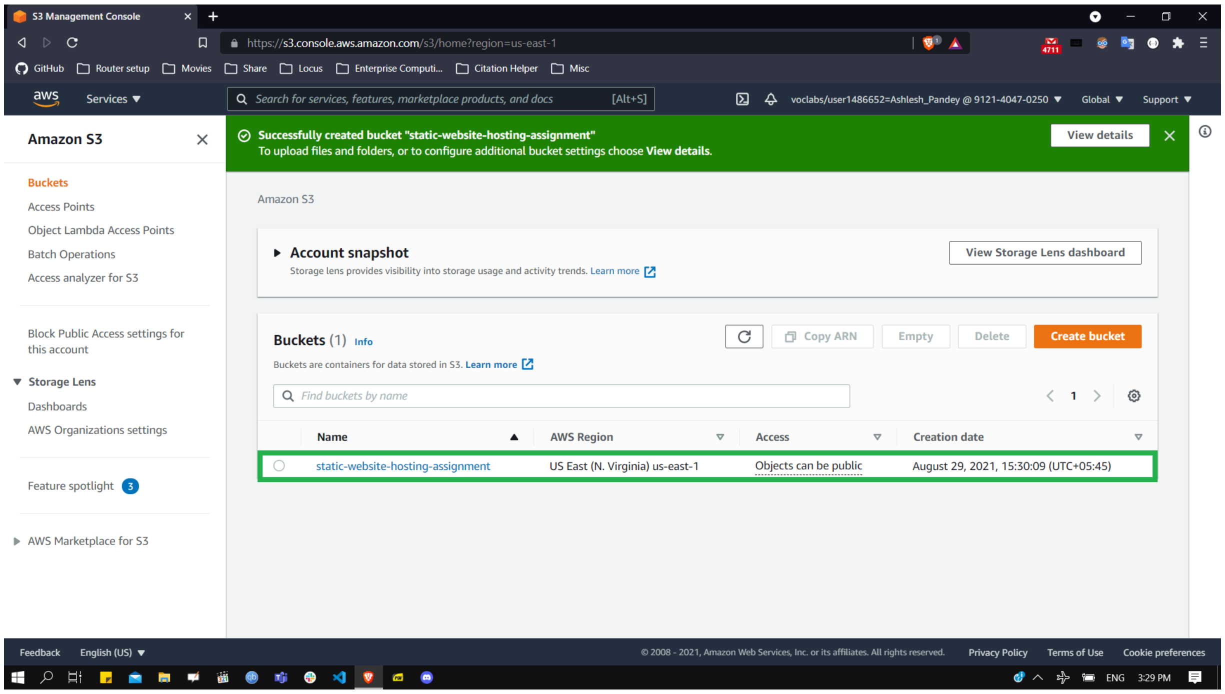
Server-side encryption
[✓ Disable] Enable

After creating the bucket you can upload files and folders to the bucket, and configure additional bucket settings.

Figure 13: Complete bucket creation

Click on the *Create bucket* button to complete the bucket creation process.

Step 7: *Select the created bucket*


Successfully created bucket "static-website-hosting-assignment"
To upload files and folders, or to configure additional bucket settings choose **View details**.

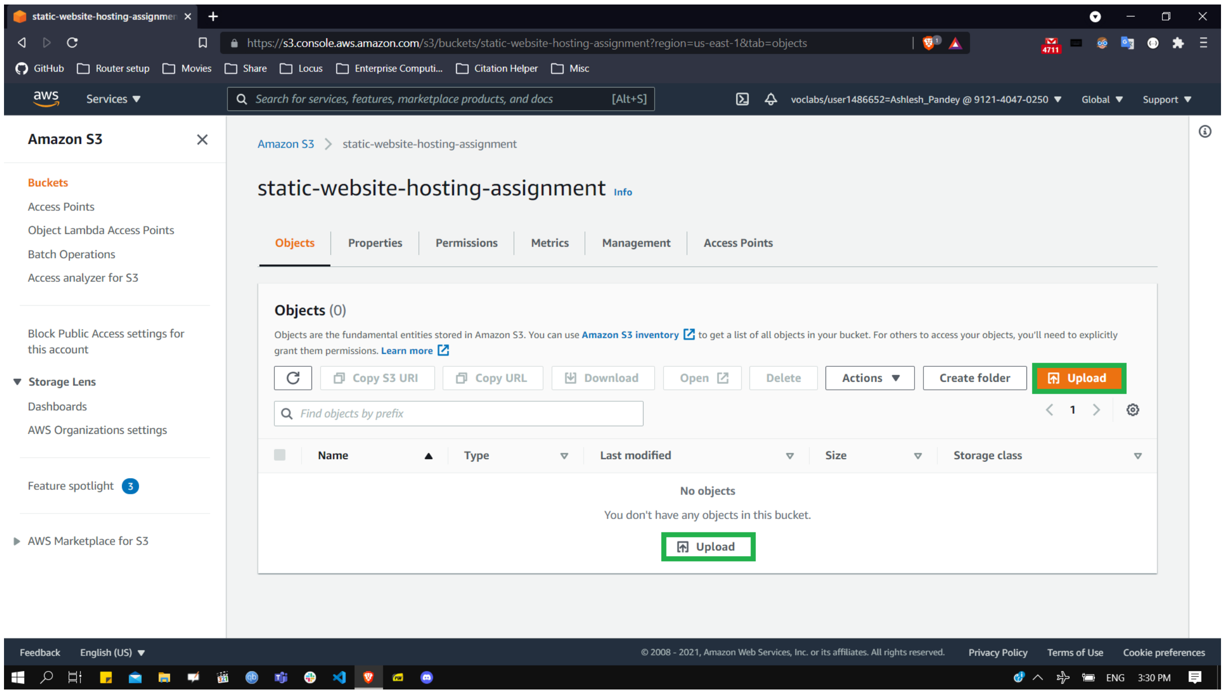
	Name	AWS Region	Access	Creation date
○	static-website-hosting-assignment	US East (N. Virginia) us-east-1	Objects can be public	August 29, 2021, 15:30:09 (UTC+05:45)

Amazon S3
Buckets
Access Points
Object Lambda Access Points
Batch Operations
Access analyzer for S3
Block Public Access settings for this account
Storage Lens
Dashboards
AWS Organizations settings
Feature spotlight
AWS Marketplace for S3
View details
Account snapshot
Storage lens provides visibility into storage usage and activity trends. Learn more
View Storage Lens dashboard
Buckets (1) Info
Buckets are containers for data stored in S3. Learn more
Copy ARN
Empty
Delete
Create bucket
Find buckets by name

Figure 14: Select the created bucket

Confirm that the bucket is created and then select the bucket to proceed.

Step 8: *Upload objects to the bucket*



Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

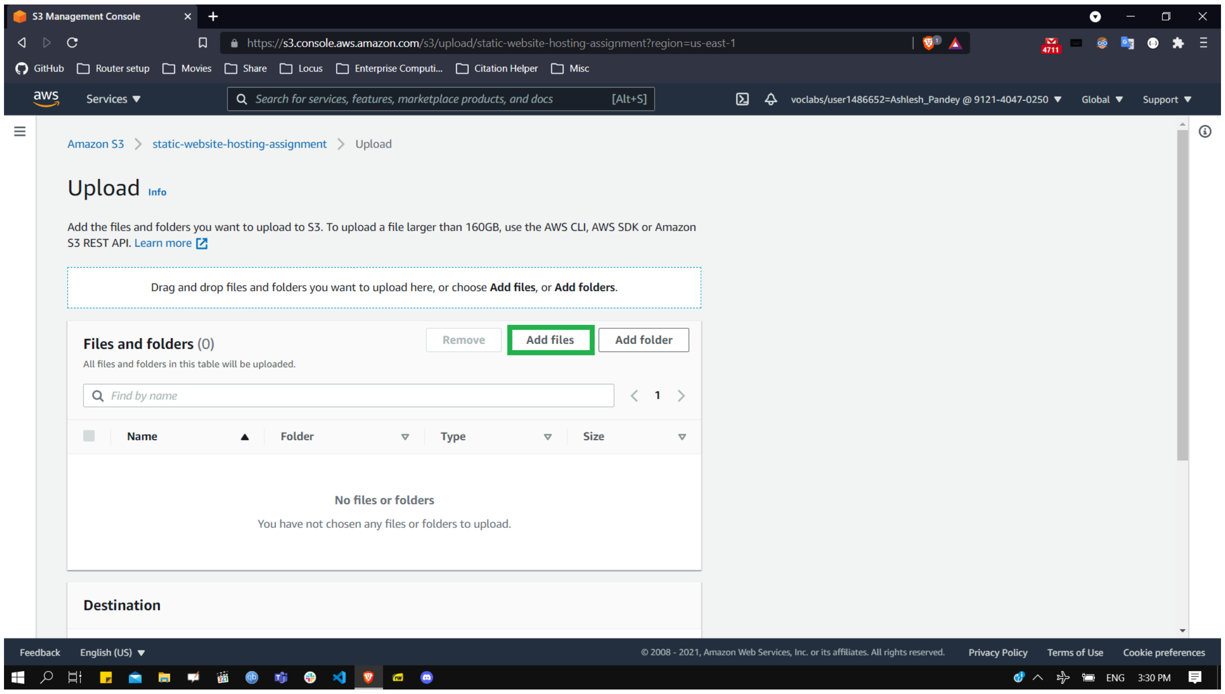
No objects

You don't have any objects in this bucket.

Figure 15: Upload objects to the bucket

Click on the *Upload button* to start the upload process.

Step 9: *Upload a file or a folder as needed*


Amazon S3 > static-website-hosting-assignment > Upload

Upload Info

Add the files and folders you want to upload to S3. To upload a file larger than 160GB, use the AWS CLI, AWS SDK or Amazon S3 REST API. Learn more

Drag and drop files and folders you want to upload here, or choose **Add files**, or **Add folders**.

Files and folders (0)

All files and folders in this table will be uploaded.

Name	Folder	Type	Size

No files or folders

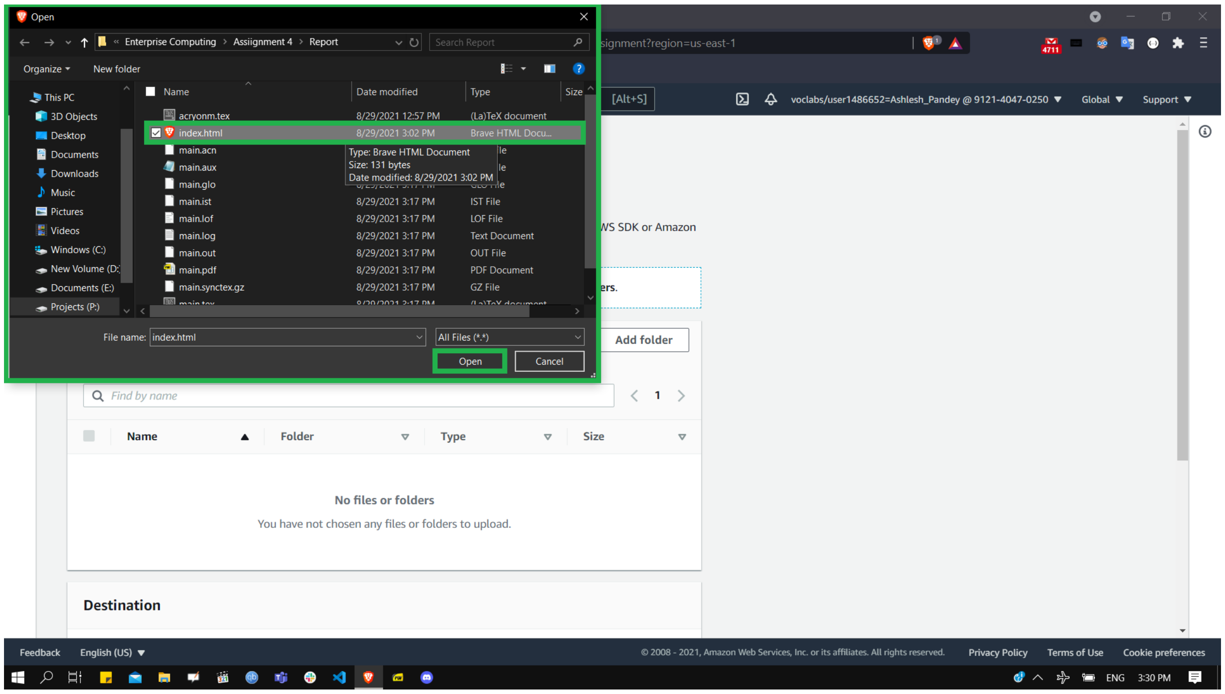
You have not chosen any files or folders to upload.

Destination

Figure 16: Upload a file or a folder as needed

Click on the *Add files* or *Add folder* button as necessary. Since there is only one file for this example, *Add files* is selected.

Step 10: *Select the file to upload*



Enterprise Computing › Assiignment 4 › Report

Name	Date modified	Type
acryonm.tex	8/29/2021 12:57 PM	(La)TeX document
index.html	8/29/2021 3:02 PM	Brave HTML Docu...
main.acn		
main.aux		
main.glo		
main.ist	8/29/2021 3:17 PM	IST File
main.lof	8/29/2021 3:17 PM	LOF File
main.log	8/29/2021 3:17 PM	Text Document
main.out	8/29/2021 3:17 PM	OUT File
main.pdf	8/29/2021 3:17 PM	PDF Document
main.synctex.gz	8/29/2021 3:17 PM	GZ File

Type: Brave HTML Document
Size: 131 bytes
Date modified: 8/29/2021 3:02 PM

File name: index.html
All Files (*.*)

No files or folders

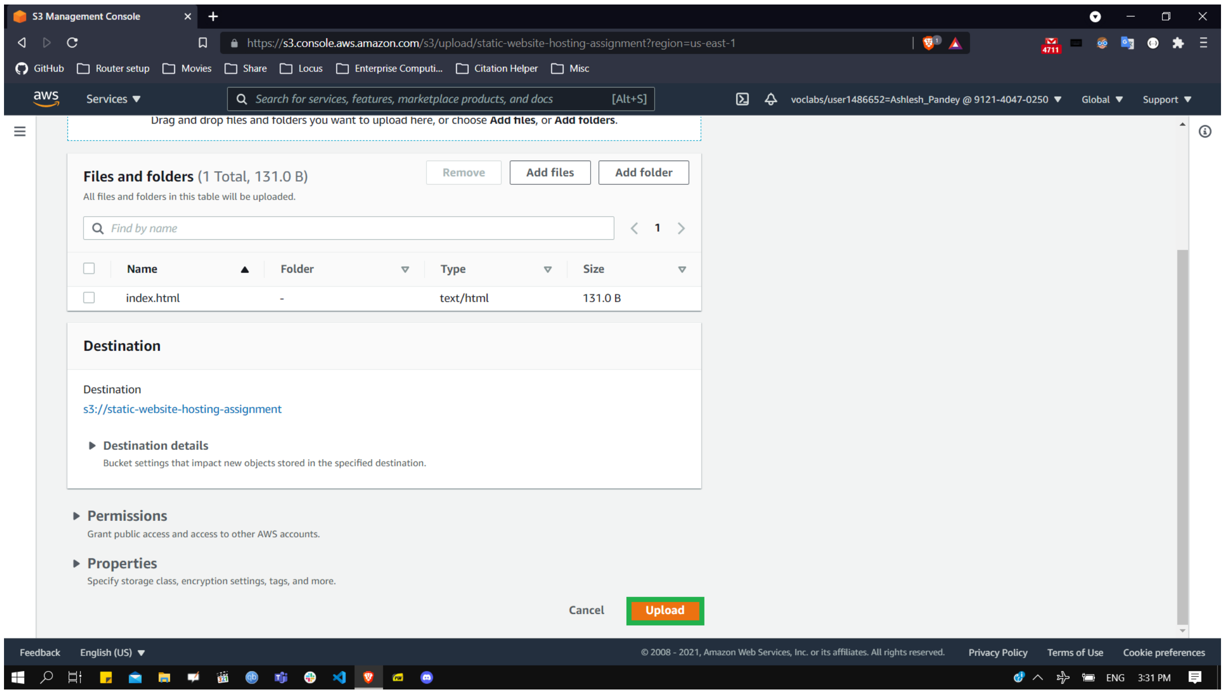
You have not chosen any files or folders to upload.

Destination

Figure 17: Select the file to upload

Using the prompt that pops up, browser the local directory and select the required file to upload.

Step 11: *Upload selected file*



Drag and drop files and folders you want to upload here, or choose **Add files**, or **Add folders**.

Files and folders (1 Total, 131.0 B)

All files and folders in this table will be uploaded.

Name	Folder	Type	Size
index.html	-	text/html	131.0 B

Destination

Destination
s3://static-website-hosting-assignment

Destination details
Bucket settings that impact new objects stored in the specified destination.

Permissions
Grant public access and access to other AWS accounts.

Properties
Specify storage class, encryption settings, tags, and more.

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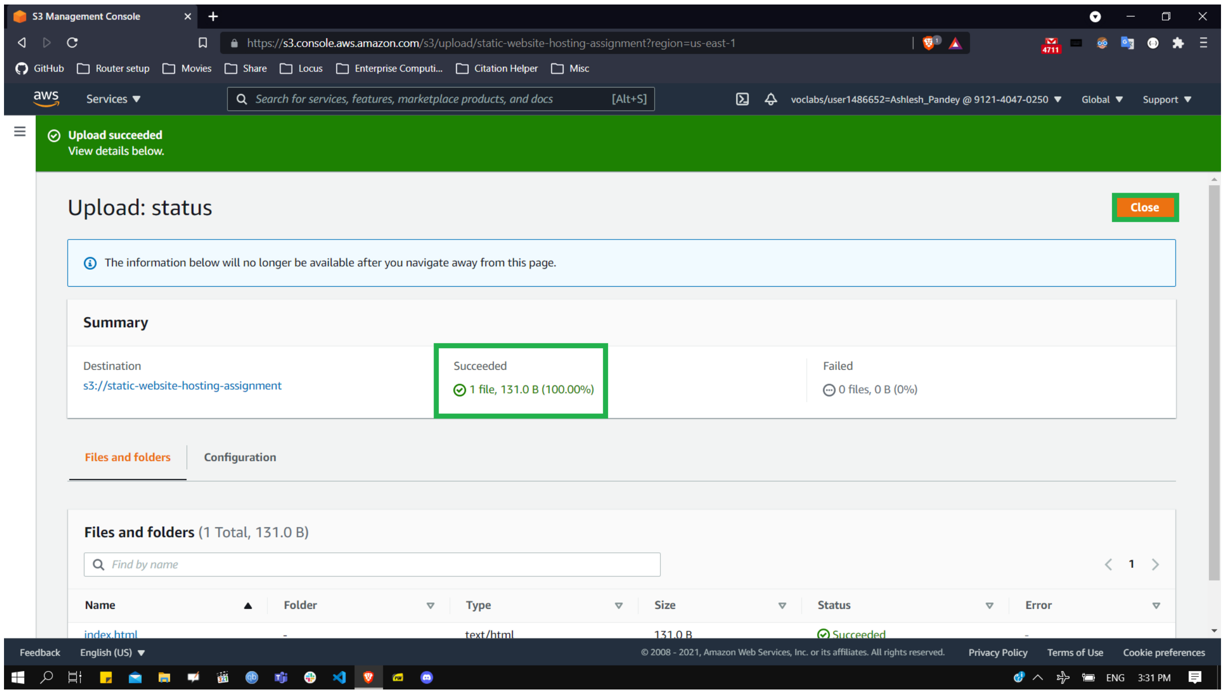
Figure 18: Upload selected file

Click *Upload* button to start uploading the selected file.

Step 12: *Confirm the file upload*


Upload succeeded
View details below.

Upload: status

The information below will no longer be available after you navigate away from this page.

Summary

Destination	Succeeded	Failed
s3://static-website-hosting-assignment	1 file, 131.0 B (100.00%)	0 files, 0 B (0%)

Files and folders (1 Total, 131.0 B)

Name	Folder	Type	Size	Status	Error
index.html	-	text/html	131.0 B	Succeeded	-

S3 Management Console
https://s3.console.aws.amazon.com/s3/upload/static-website-hosting-assignment?region=us-east-1
Services
Search for services, features, marketplace products, and docs [Alt+S]
voclabs/user1486652=Ashlesh_Pandey @ 9121-4047-0250
Global
Support
Close
Files and folders
Configuration
Find by name
Feedback
English (US)
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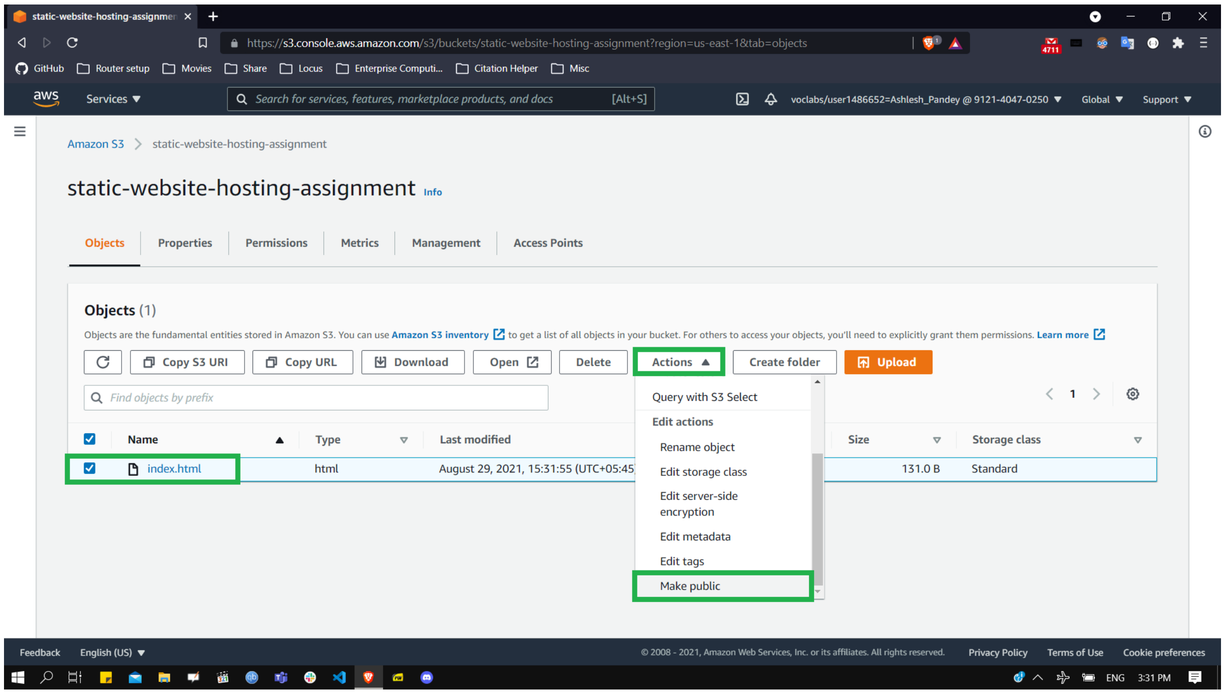
Privacy Policy
Terms of Use
Cookie preferences

Figure 19: Confirm the file upload

Confirm that the file upload succeeded and then click *Close* button.

Step 13: *Make the object public*


static-website-hosting-assignment
https://s3.console.aws.amazon.com/s3/buckets/static-website-hosting-assignment?region=us-east-1&tab=objects
Services
Search for services, features, marketplace products, and docs [Alt+S]
voclabs/user1486652=Ashlesh_Pandey @ 9121-4047-0250
Global
Support
Amazon S3 > static-website-hosting-assignment
static-website-hosting-assignment Info
Objects
Properties
Permissions
Metrics
Management
Access Points
Objects (1)
Copy S3 URI
Copy URL
Download
Open
Delete
Actions
Create folder
Upload
Find objects by prefix
Query with S3 Select
Edit actions
Rename object
Edit storage class
Edit server-side encryption
Edit metadata
Edit tags
Make public
Feedback
English (US)
Privacy Policy
Terms of Use
Cookie preferences

Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

Name	Type	Last modified	Size	Storage class
index.html	html	August 29, 2021, 15:31:55 (UTC+05:45	131.0 B	Standard

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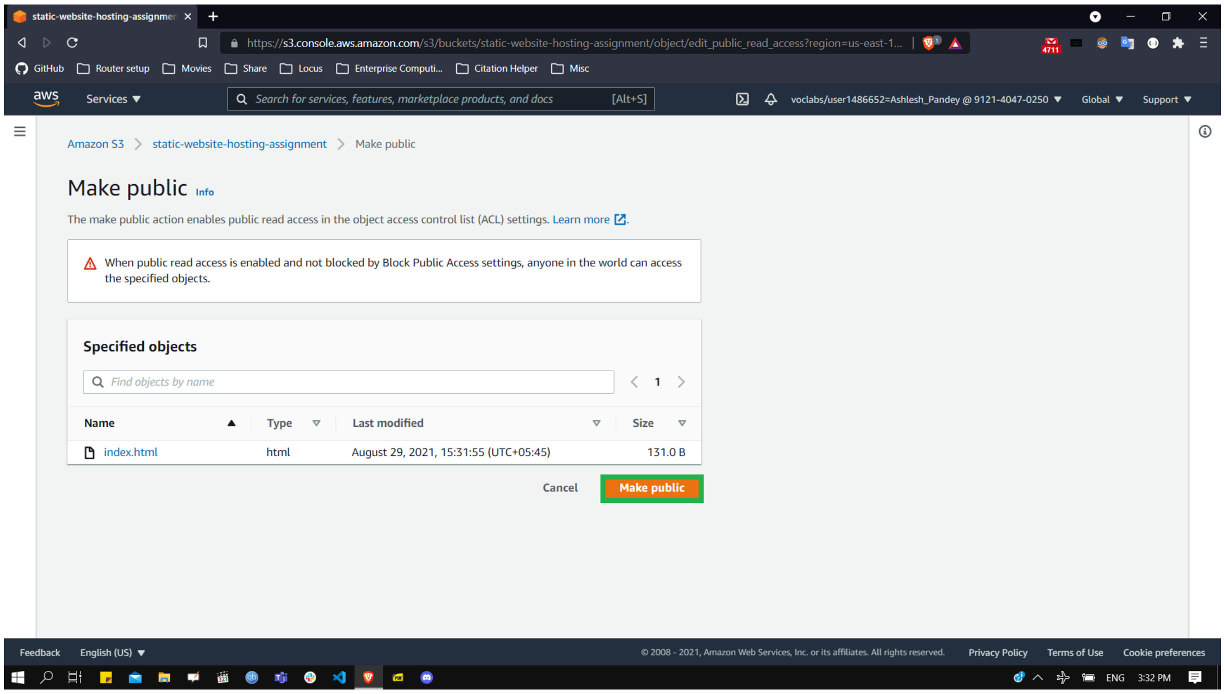
Figure 20: Make the object public

Select the uploaded file, and click *Actions* to open a drop-down menu. Scroll to the bottom of the menu and select *Make public* option.

Step 14: *Review the selected object*


Amazon S3 > static-website-hosting-assignment > Make public

Make public Info

The make public action enables public read access in the object access control list (ACL) settings. Learn more

When public read access is enabled and not blocked by Block Public Access settings, anyone in the world can access the specified objects.

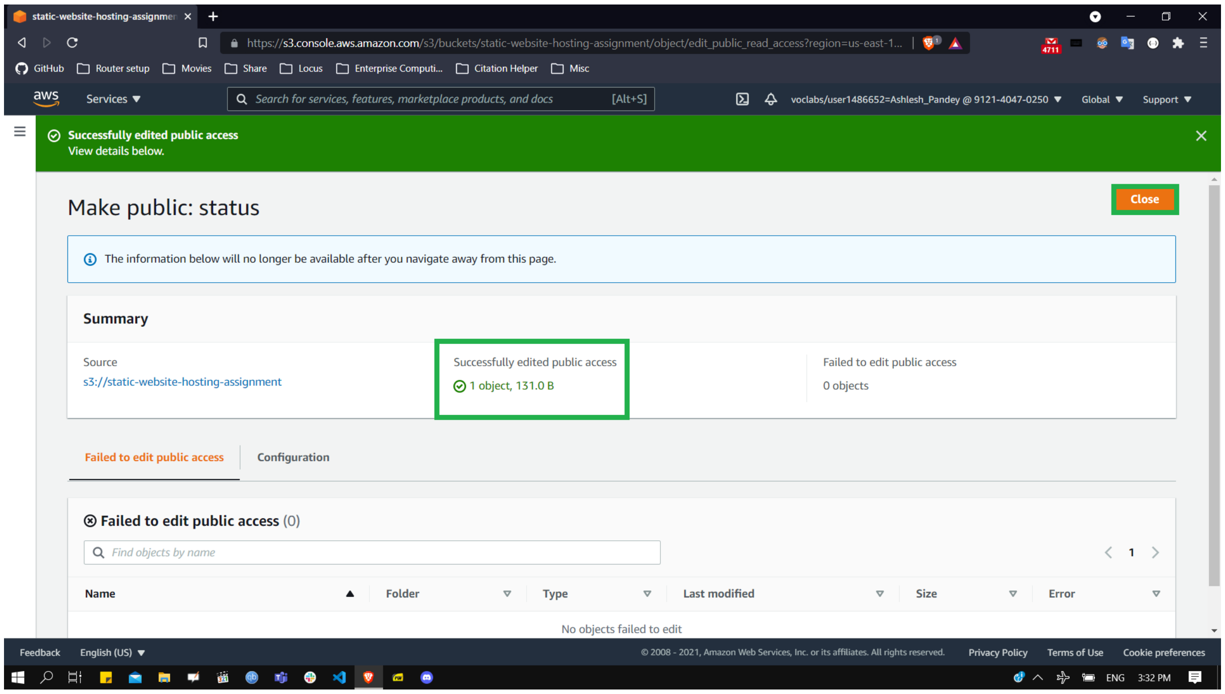
Specified objects

Name	Type	Last modified	Size
index.html	html	August 29, 2021, 15:31:55 (UTC+05:45)	131.0 B

Figure 21: Review the selected object

Review the selected object, and click *Make public* button to proceed.

Step 15: *Confirm public access*


Successfully edited public access
View details below.
Close

Make public: status

The information below will no longer be available after you navigate away from this page.

Summary

Source
s3://static-website-hosting-assignment

Successfully edited public access
1 object, 131.0 B

Failed to edit public access
0 objects

Failed to edit public access
Configuration

Failed to edit public access (0)

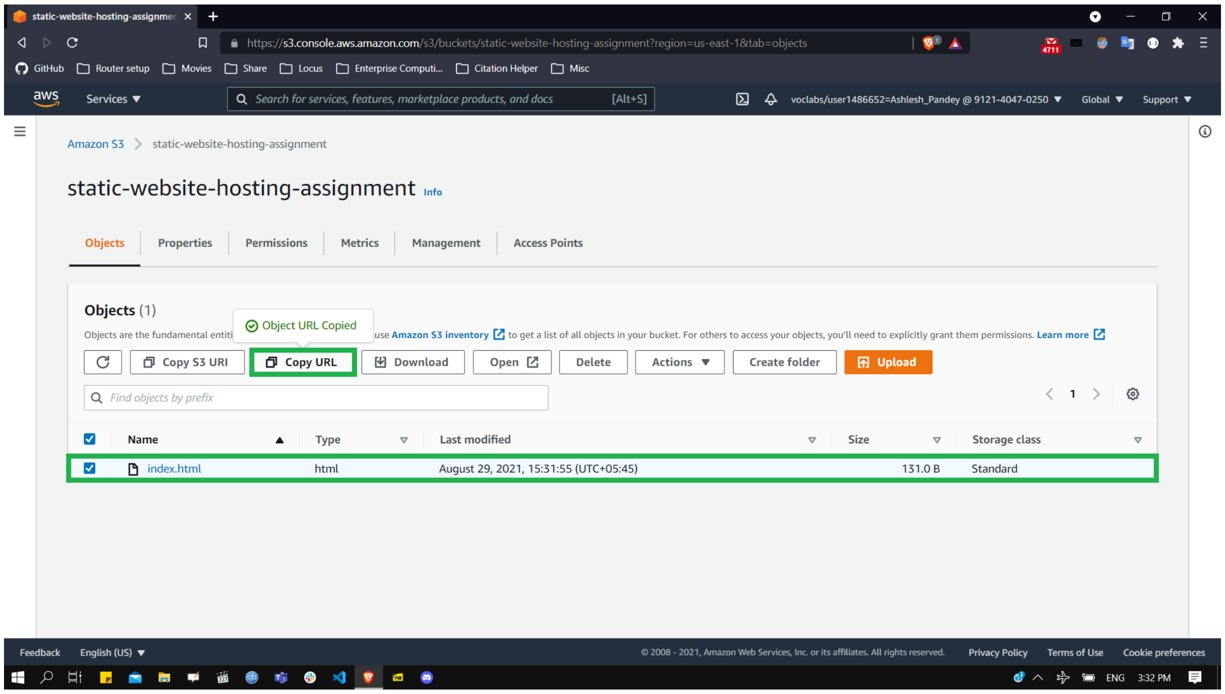
Name	Folder	Type	Last modified	Size	Error

No objects failed to edit

Figure 22: Confirm public access

Confirm that the public access status is edited correctly and then click *Close* button.

Step 16: *Copy the object url*

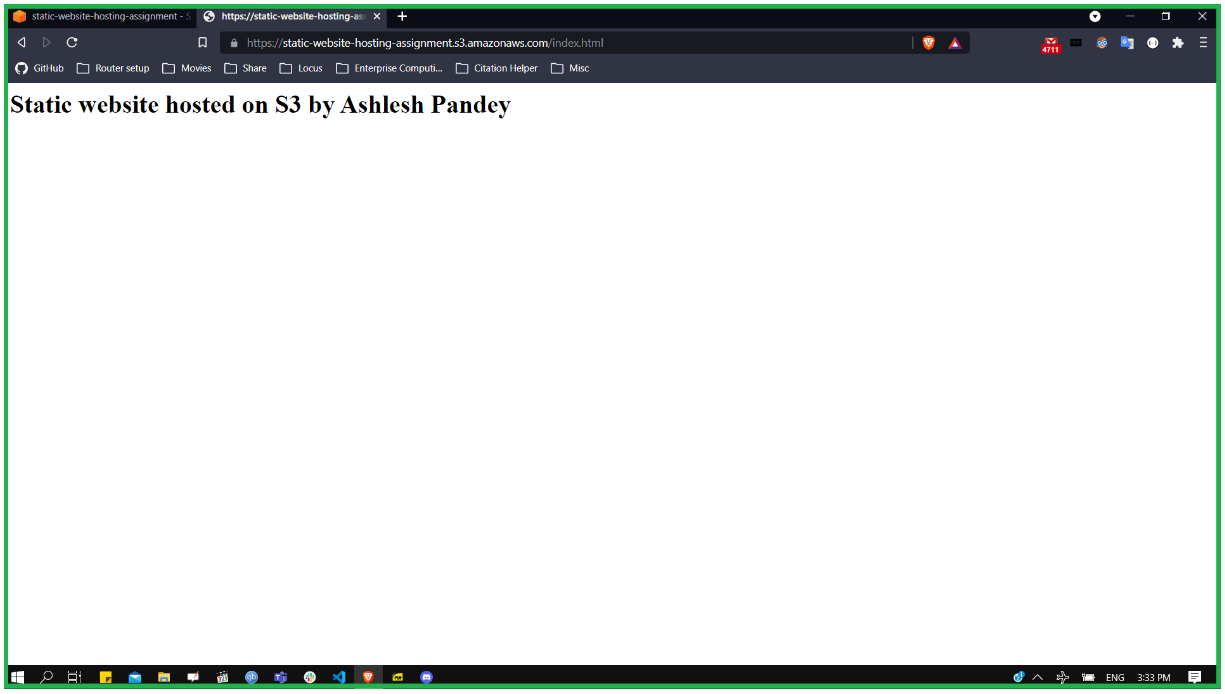

Amazon S3 > static-website-hosting-assignment
static-website-hosting-assignment
Objects | Properties | Permissions | Metrics | Management | Access Points
Objects (1)
Object URL Copied
Copy S3 URI | Copy URL | Download | Open | Delete | Actions | Create folder | Upload

Name	Type	Last modified	Size	Storage class
index.html	html	August 29, 2021, 15:31:55 (UTC+05:45)	131.0 B	Standard

Figure 23: Copy the object url

Select the object and click *Copy URL* button.

Step 17: *Visit the url and access the website*


static-website-hosting-assignment - S
https://static-website-hosting-as
https://static-website-hosting-assignment.s3.amazonaws.com/index.html
GitHub
Router setup
Movies
Share
Locus
Enterprise Computi...
Citation Helper
Misc
ENG
3:33 PM

Static website hosted on S3 by Ashlesh Pandey

Figure 24: Visit the url and access the website

Paste the copied url in the browser search bar and go to the url. The static website is accessible using this url over the internet.