Deploy Web Application to Microsoft Azure

Group: 12

I. INTRODUCTION

1. Overview

1.1. Microsoft Azure

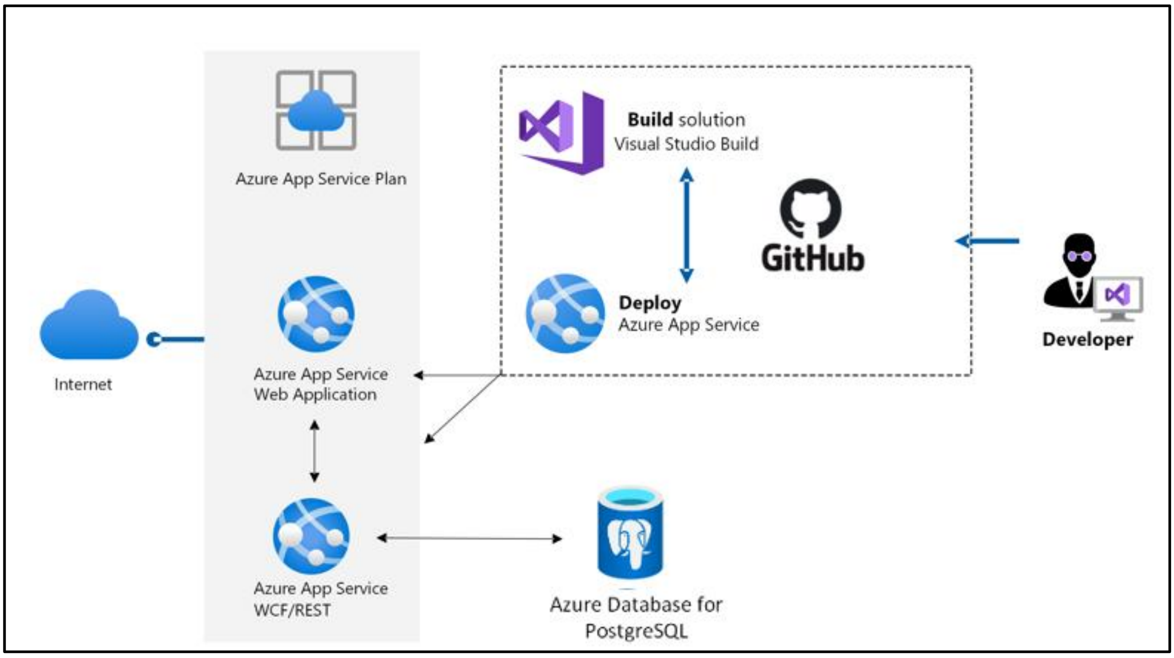
- Microsoft Azure is a cloud computing service for building, testing, deploying, and managing applications and services through Microsoft-managed data centers. It provides Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) and supports many different programming languages, tools, and frameworks. It also provides a broad range of cloud services, including computing, analytics, storage and networking.

1.2. Web application

- A Web application is an application program that is stored on a remote server and delivered over the Internet through a browser interface. Web services are Web applications by definition and many, although not all, websites contain Web apps.

2. Component

- Most web-based database applications have three primary components:
  - + A web browser (or client) - handle requests and responses
  - + A web application server - perform the requested tasks
  - + A database server - store data
- Web-based database applications rely on a database server, which provides the data for the application.
- The following structure will show the fundamental components of a basic Web Application.



- Some fundamental components are shown in above diagram:
  - **Azure App Service**: is a PaaS service for building and hosting apps in managed virtual machines. It provides monitoring of resource usage and app metrics, logging of diagnostic information, and alerts based on metrics.
  - **Visual Studio**
  - **Azure Database for PostgreSQL**
  - **Github Actions**

3. <u>Operation</u>

3.1. Operation of Web Application

Step 1: The user makes a request to the web server by connecting to the Internet through the application's user interface

Step 2: The web server sends this request to the Web Application Server

Step 3: The Web Application Server executes the requested task, then generates the requested data result

Step 4: The Web Application Server sends those results back to the web server (according to the processed data)

Step 5: The web server carries the requested information to the client (by network-connected devices)

Step 6: The requested information appears on the user screen

3.2. Operation of Web Application on Azure

Step 1: The user interacts with the browser and send requests to Web Application

Step 2: The browser and App service emits telemetry.

Step 3: The Web App Service collects and analyzes application health, performance, and usage data.

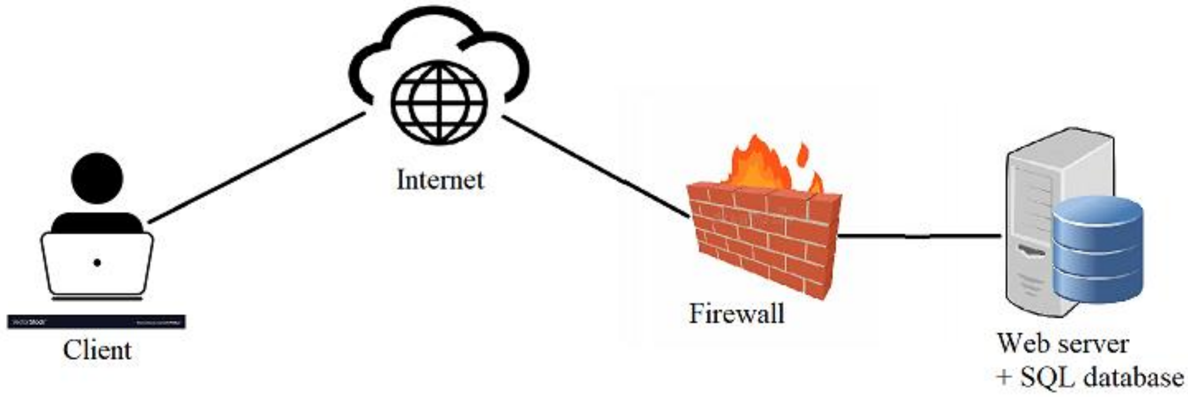
Step 4: The Web App connect to Azure SQL Database. (such as MySQL, PostgreSQL,...)

Step 5: The Web App Service retrieves data from the SQL database and returns response to the user

Step 6: The requested demand appears on user's browser

II. IMPLEMENTATION

1. <u>Topology</u>



(Bài làm không đụng tới firewall nhưng PostgreSQL có 1 phần nhỏ về phần firewall rule)

Name	IP	Service/App
Web Server	Virtual IP address (Azure provides itself when creating a web app)	Web service on Azure
Client (Users)	IP of PC test	Use Internet

2. Installation

To publish a web application on the Internet, we need to install programs through 4 services:

- Visual Studio
- Azure Web App Service.
- GitHub Action
- PostgreSQL database

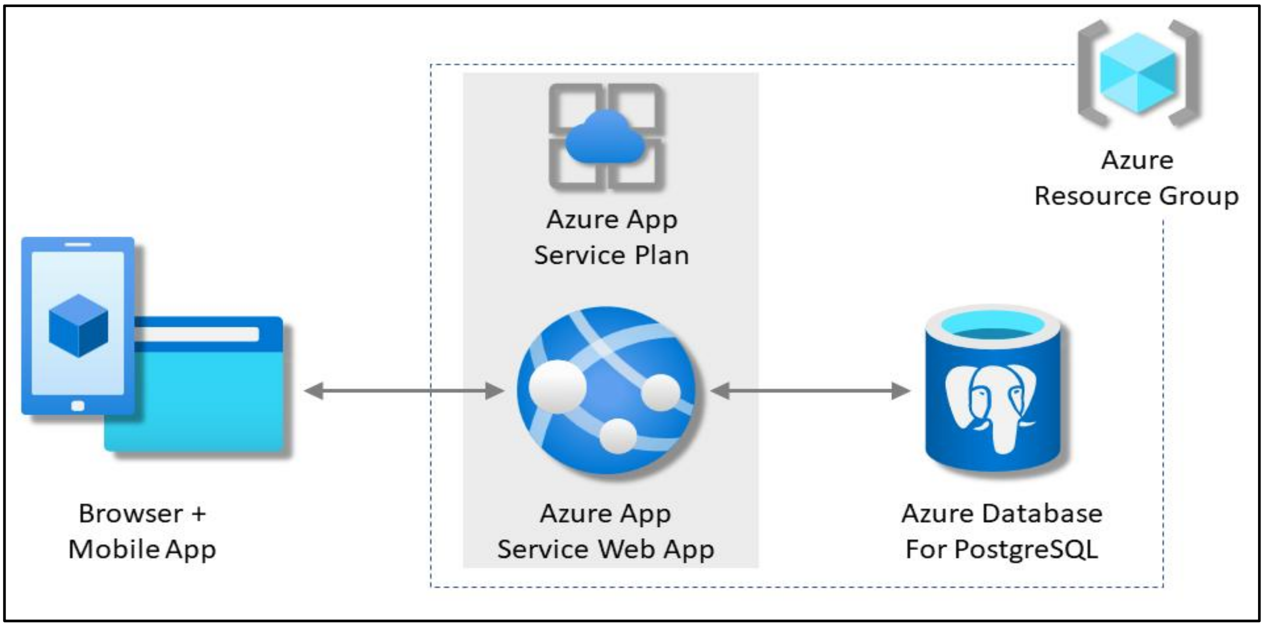
2.1. Visual Studio:

2.2. PostgreSQL

2.3. Web App Service

3. Configure

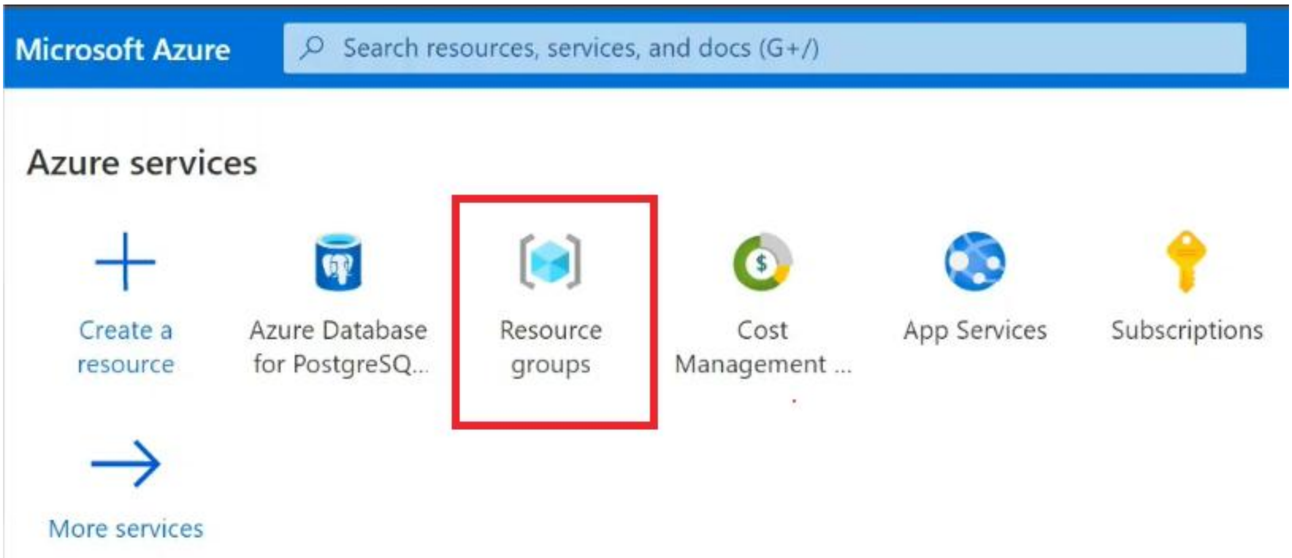
- Web application deploying to model network with PostgreSQL database connection



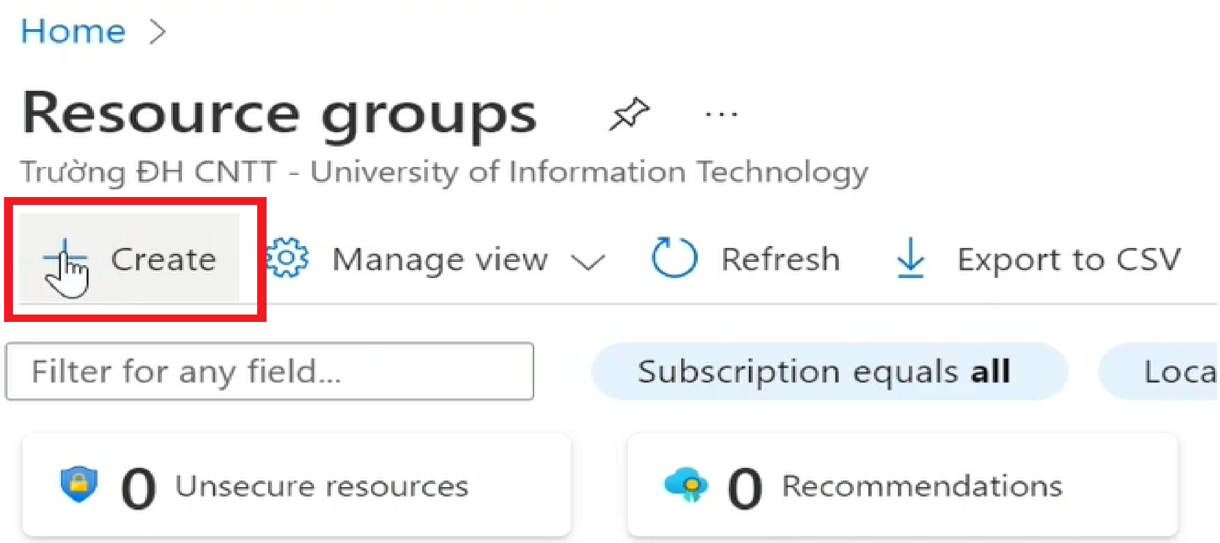
3.1. Create a web app on Azure with Azure portal

- Step 0: Sign in to the Azure portal
- Step 1: Create a **Resource groups**

+ Step 1.1: Select **Resource groups**



+ Step 1.2: Select **Create**



+ Step 1.3: Enter the following values:

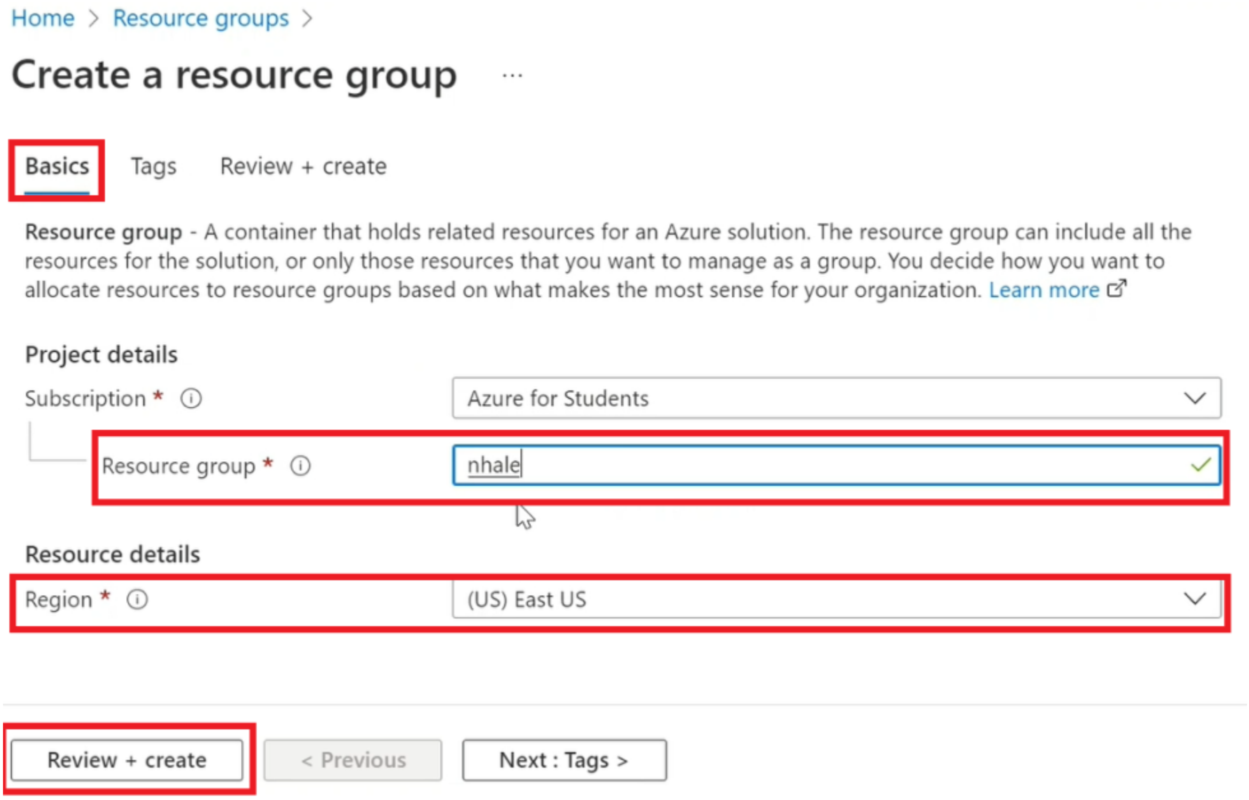
* Subscription: Select your **Azure subscription.**

* Resource group: Enter a new **resource group name**.

* Region: Select an **Azure location**, such as Central US or East US .v.v

-> Select **Review + Create**

-> Select **Create** (It takes a few seconds to create a resource group.)



Resource group - A container that holds related resources for an Azure solution. The resource group can include all the resources for the solution, or only those resources that you want to manage as a group. You decide how you want to allocate resources to resource groups based on what makes the most sense for your organization. Learn more

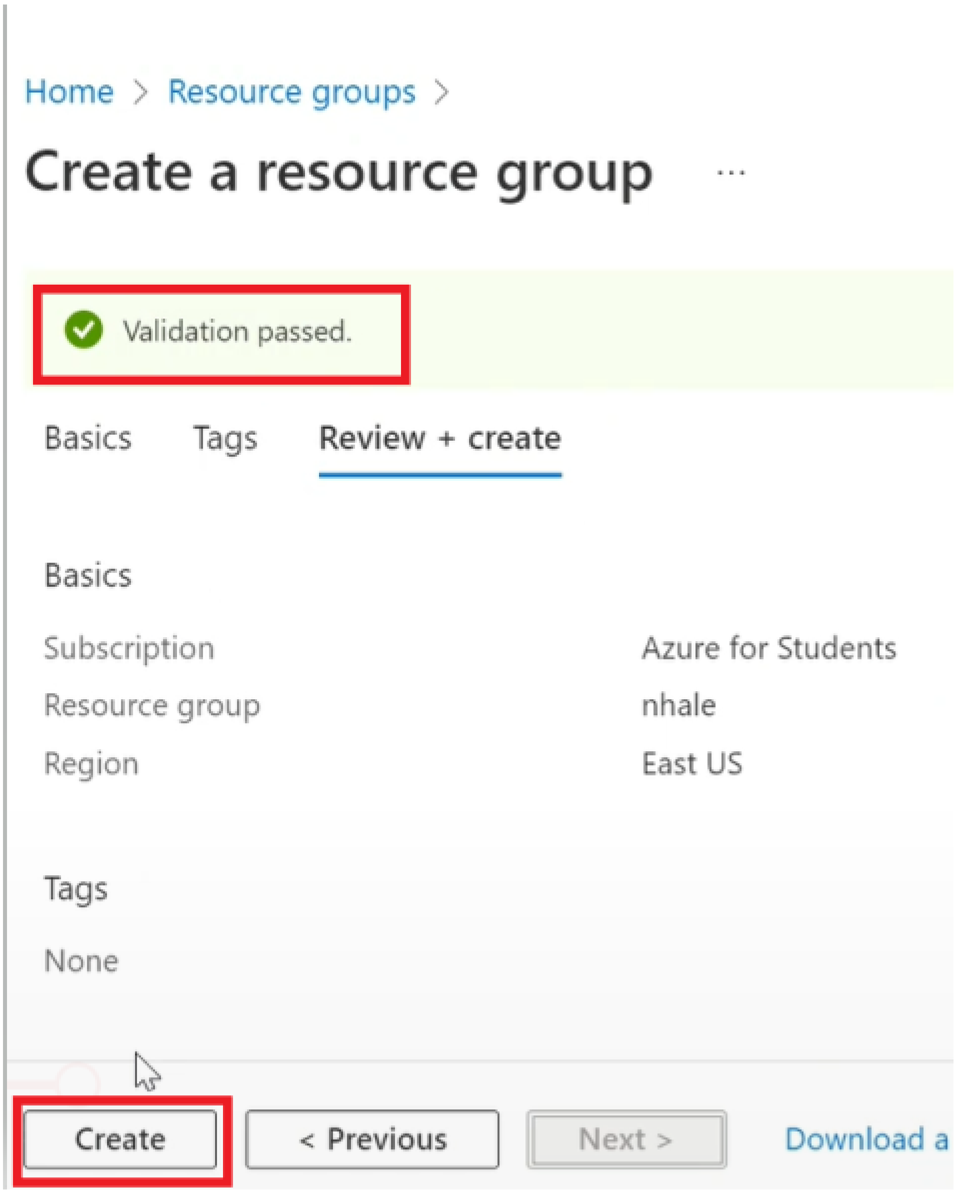
Project details

Subscription * : Azure for Students

Resource group * : nhale

Resource details

Region * : (US) East US



Validation passed.

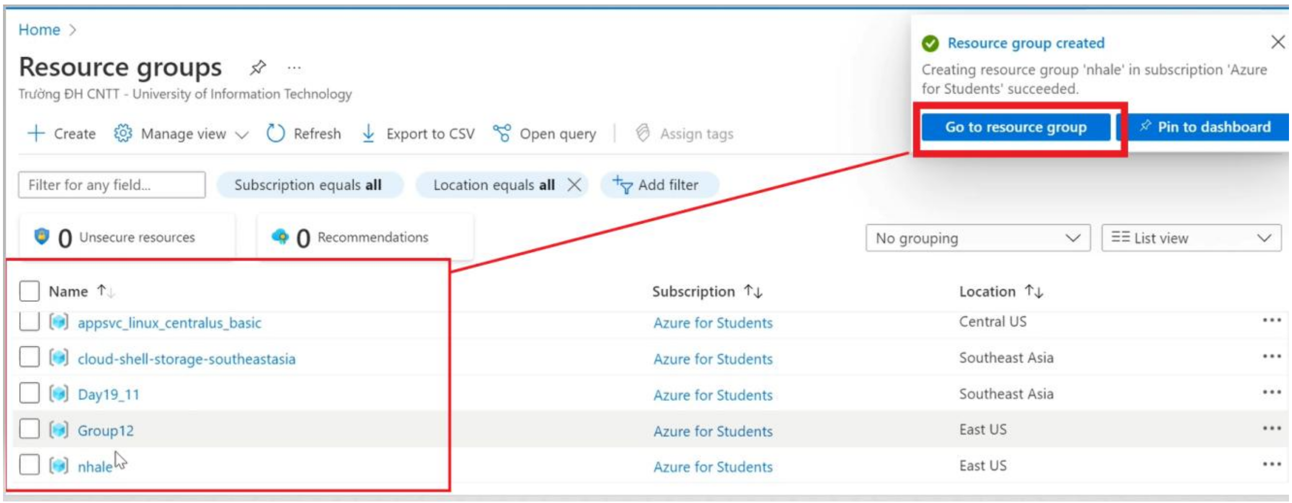
Basics

Subscription	Azure for Students
Resource group	nhale
Region	East US

Tags

None

+ Step 1.4: Select **Go to resource groups** to open the newly created resource group



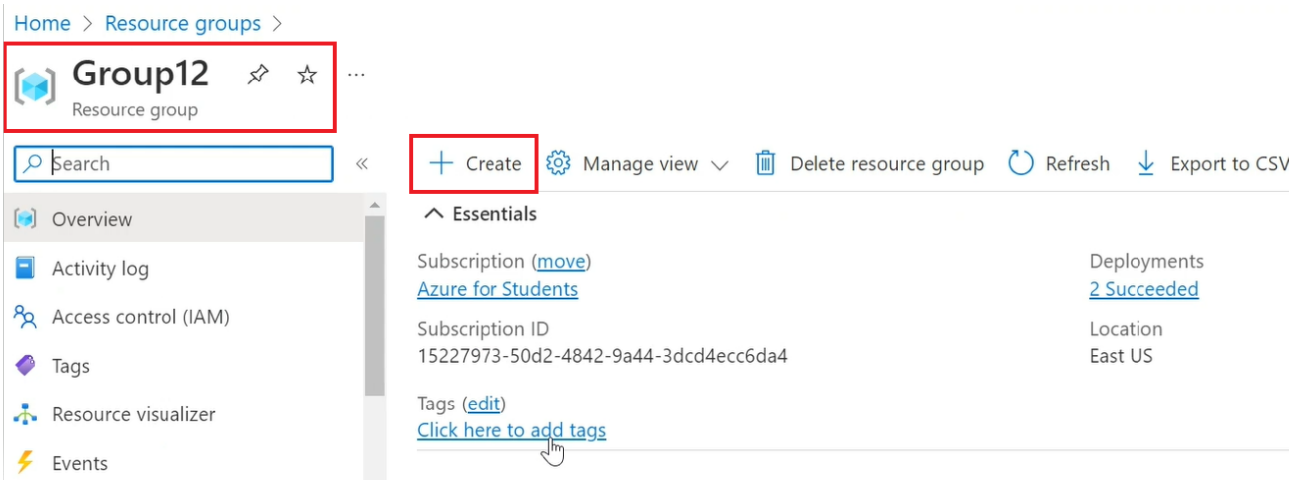
Resource group created

Creating resource group 'nhale' in subscription 'Azure for Students' succeeded.

Name	Subscription	Location
appsvc_linux_centralus_basic	Azure for Students	Central US
cloud-shell-storage-southeastasia	Azure for Students	Southeast Asia
Day19_11	Azure for Students	Southeast Asia
Group12	Azure for Students	East US
nhale	Azure for Students	East US

- Step 2: Create a web app

+ Step 2.1: Select **Resource groups** created -> Select **Create**



Subscription (move)
Azure for Students

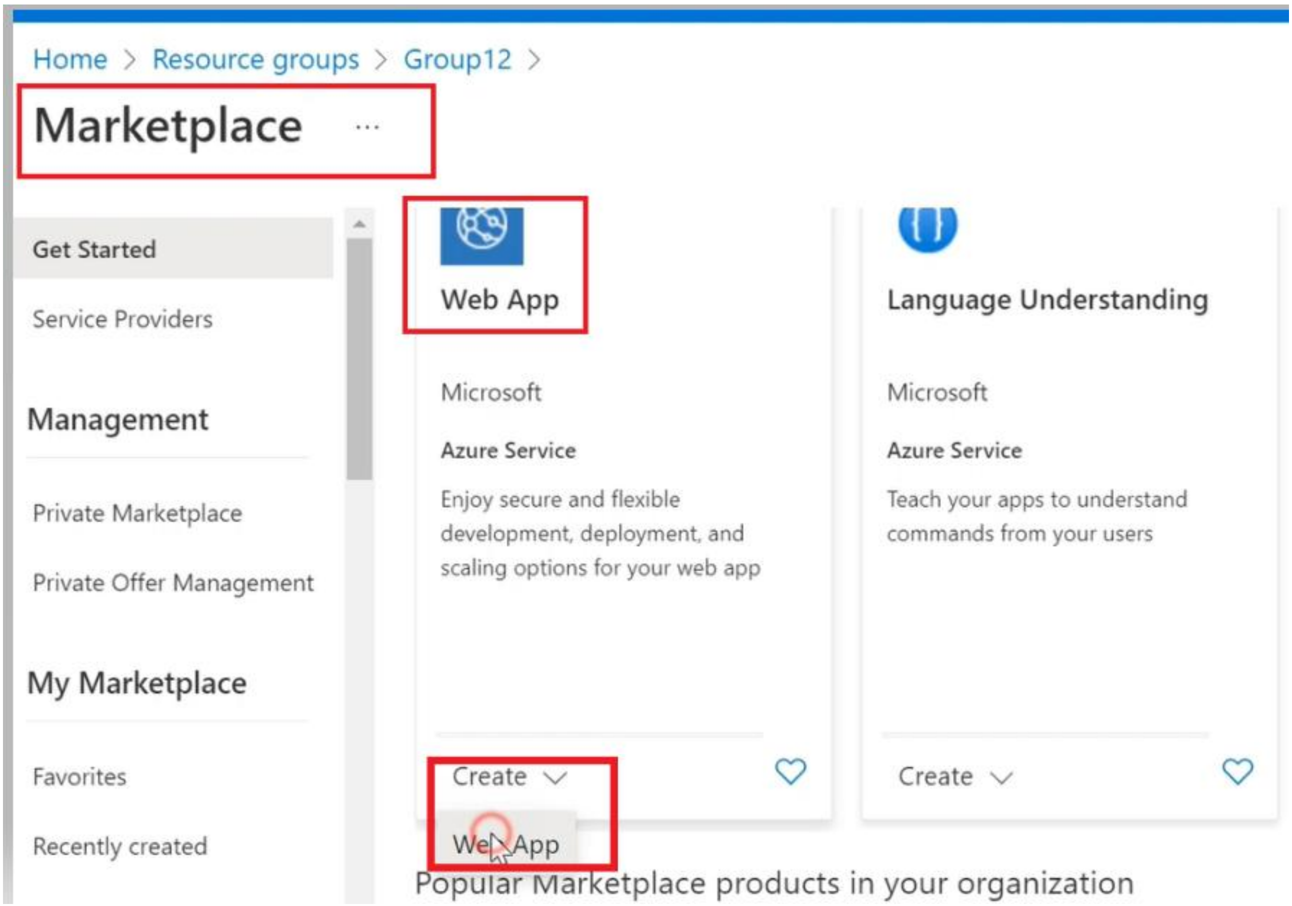
Subscription ID
15227973-50d2-4842-9a44-3dcd4ecc6da4

Tags (edit)
Click here to add tags

Deployments
2 Succeeded

Location
East US

+ Step 2.2: Find at Marketplace -> Select Web App -> Create -> Web App



Enjoy secure and flexible development, deployment, and scaling options for your web app

Teach your apps to understand commands from your users

+ Step 2.3: On the Create Web App page, fill out the form as follows.

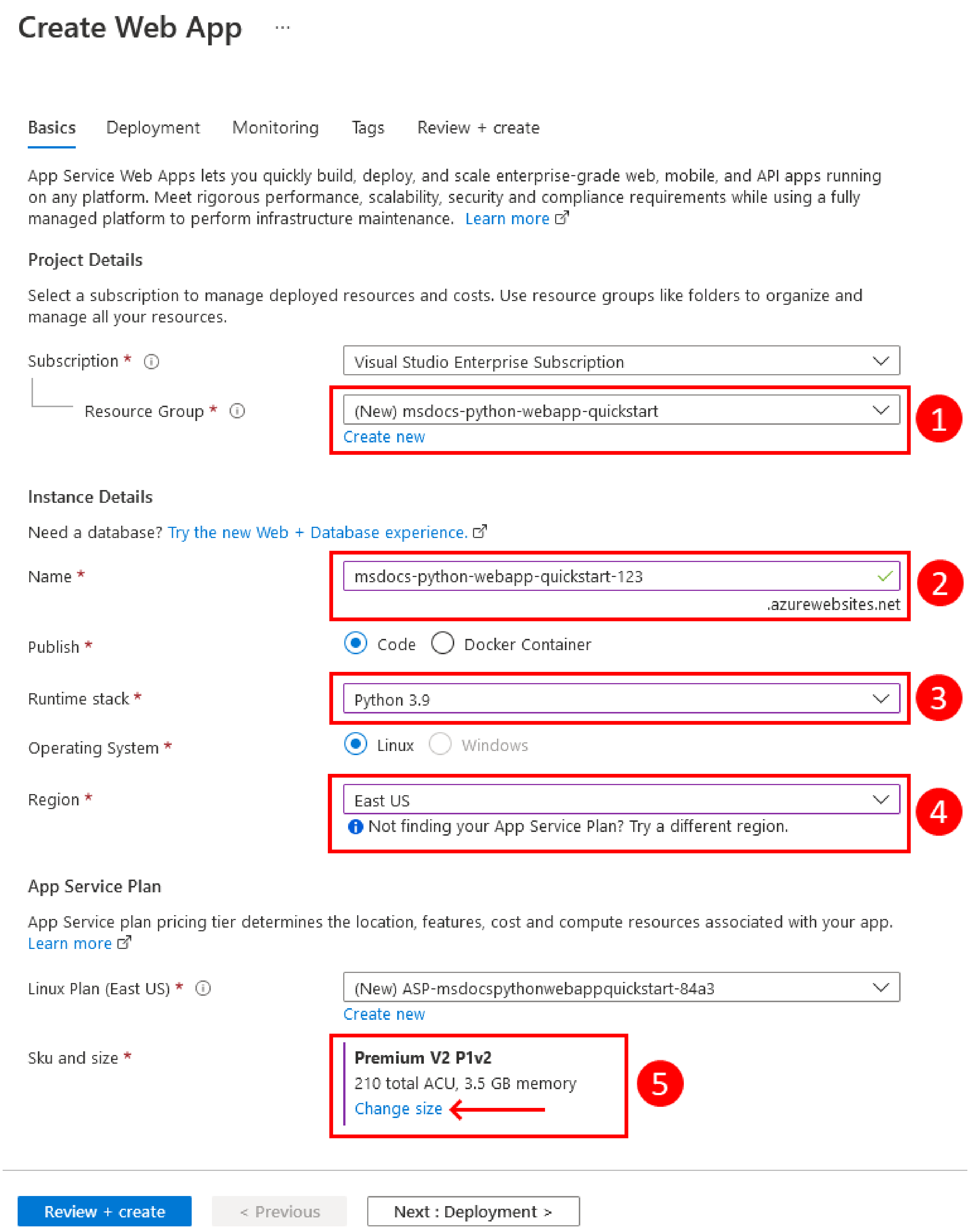
* Resource Group → Select groups created or select Create new

* Name → Enter name (This name must be unique across Azure.)

* Runtime stack → Python 3.9.

* Region → Any Azure region near you.

* App Service Plan → Under Sku and size, select Change size to select a different App Service plan.



Create Web App ···

Basics | Deployment | Monitoring | Tags | Review + create

App Service Web Apps lets you quickly build, deploy, and scale enterprise-grade web, mobile, and API apps running on any platform. Meet rigorous performance, scalability, security and compliance requirements while using a fully managed platform to perform infrastructure maintenance. Learn more

Project Details

Select a subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription * : Visual Studio Enterprise Subscription

Resource Group * : (New) msdocs-python-webapp-quickstart
Create new

Instance Details

Need a database? Try the new Web + Database experience.

Name * : msdocs-python-webapp-quickstart-123 .azurewebsites.net

Publish * : ● Code ○ Docker Container

Runtime stack * : Python 3.9

Operating System * : ● Linux ○ Windows

Region * : East US
Not finding your App Service Plan? Try a different region.

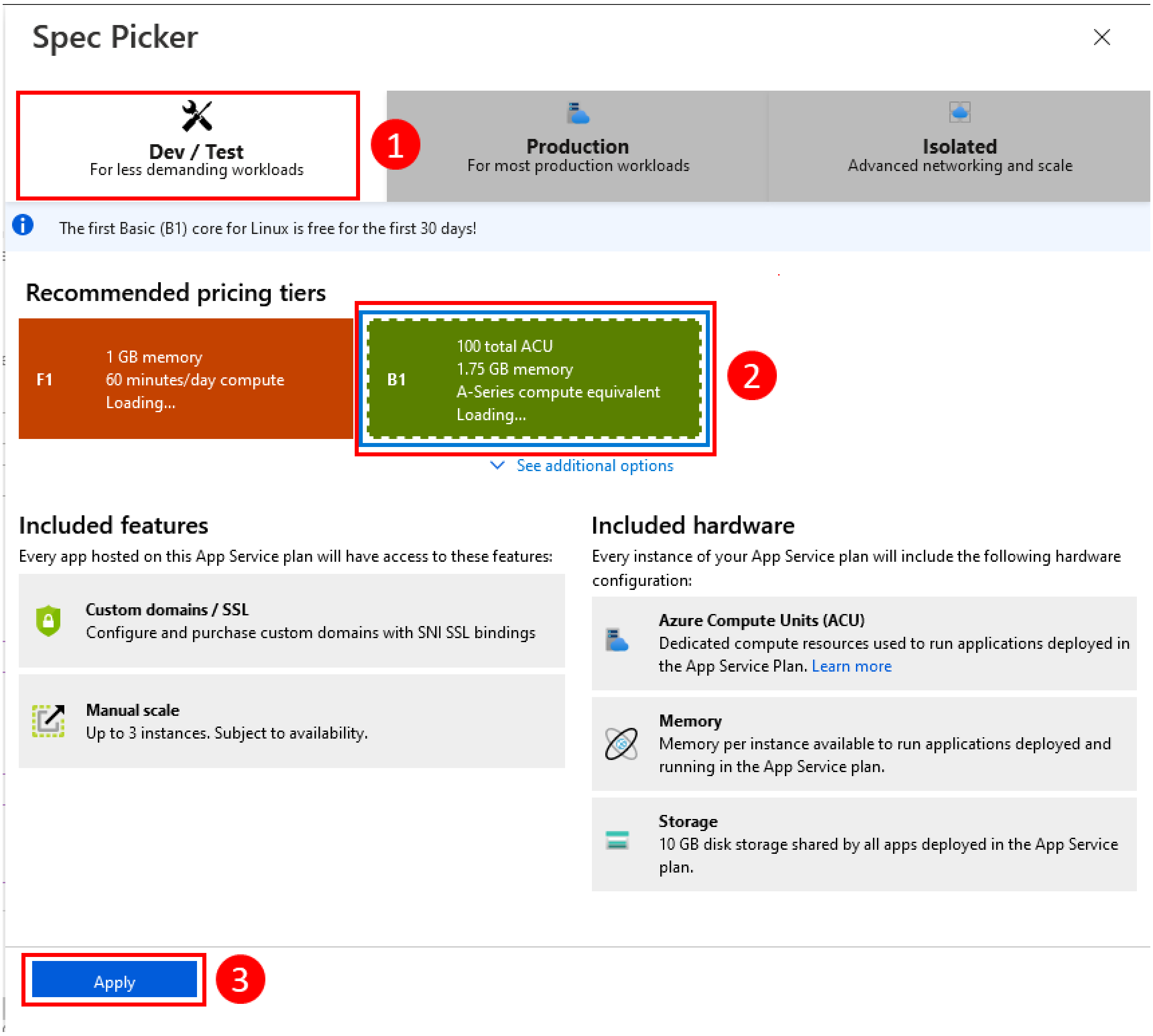
App Service Plan

App Service plan pricing tier determines the location, features, cost and compute resources associated with your app. Learn more

Linux Plan (East US) * : (New) ASP-msdocspythonwebappquickstart-84a3
Create new

Sku and size * : **Premium V2 P1v2**
210 total ACU, 3.5 GB memory
Change size

(The App Service plan controls how many resources (CPU/memory) are available to your app and the cost of those resources.)



Spec Picker

Dev / Test
For less demanding workloads

Production
For most production workloads

Isolated
Advanced networking and scale

The first Basic (B1) core for Linux is free for the first 30 days!

Recommended pricing tiers

F1 1 GB memory
60 minutes/day compute
Loading...

B1 100 total ACU
1.75 GB memory
A-Series compute equivalent
Loading...

See additional options

Included features

Every app hosted on this App Service plan will have access to these features:

Custom domains / SSL
Configure and purchase custom domains with SNI SSL bindings

Manual scale
Up to 3 instances. Subject to availability.

Included hardware

Every instance of your App Service plan will include the following hardware configuration:

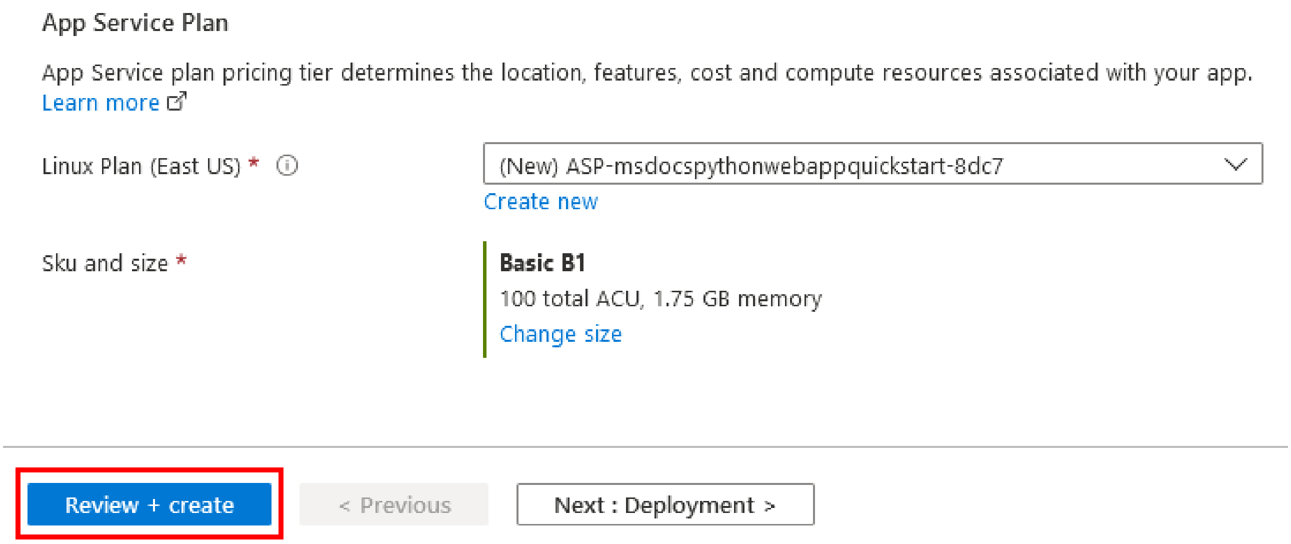
Azure Compute Units (ACU)
Dedicated compute resources used to run applications deployed in the App Service Plan. Learn more

Memory
Memory per instance available to run applications deployed and running in the App Service plan.

Storage
10 GB disk storage shared by all apps deployed in the App Service plan.

Apply

-> Select **Review + Create** (This will take you to the Review page. Select Create to create your App Service.)



App Service Plan

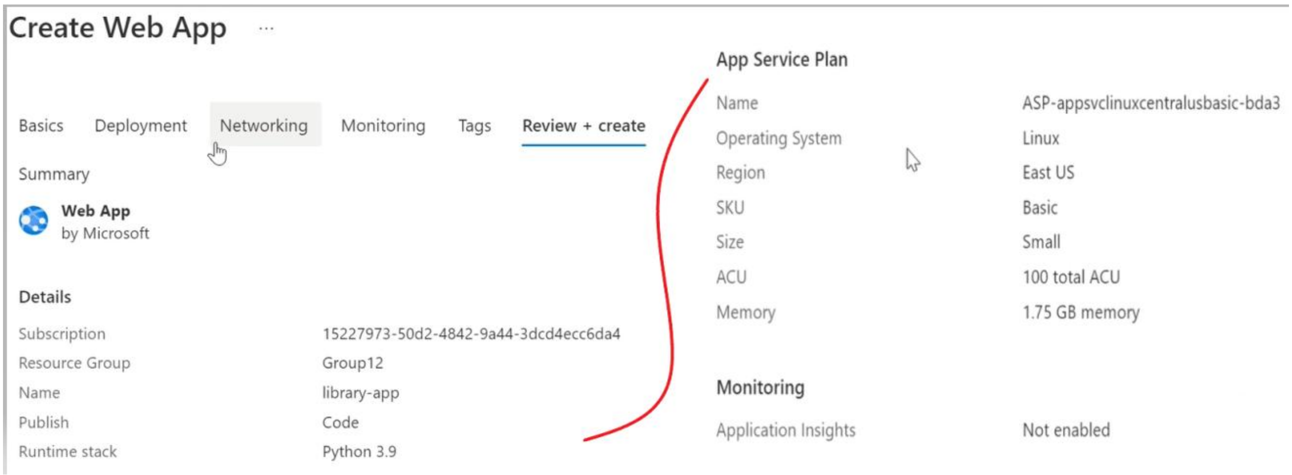
App Service plan pricing tier determines the location, features, cost and compute resources associated with your app. Learn more

Linux Plan (East US) * : (New) ASP-msdocspythonwebappquickstart-8dc7
Create new

Sku and size * : **Basic B1**
100 total ACU, 1.75 GB memory
Change size

Review + create | < Previous | Next : Deployment >

-> Initialization group information for web app



Summary

Web App
by Microsoft

Details

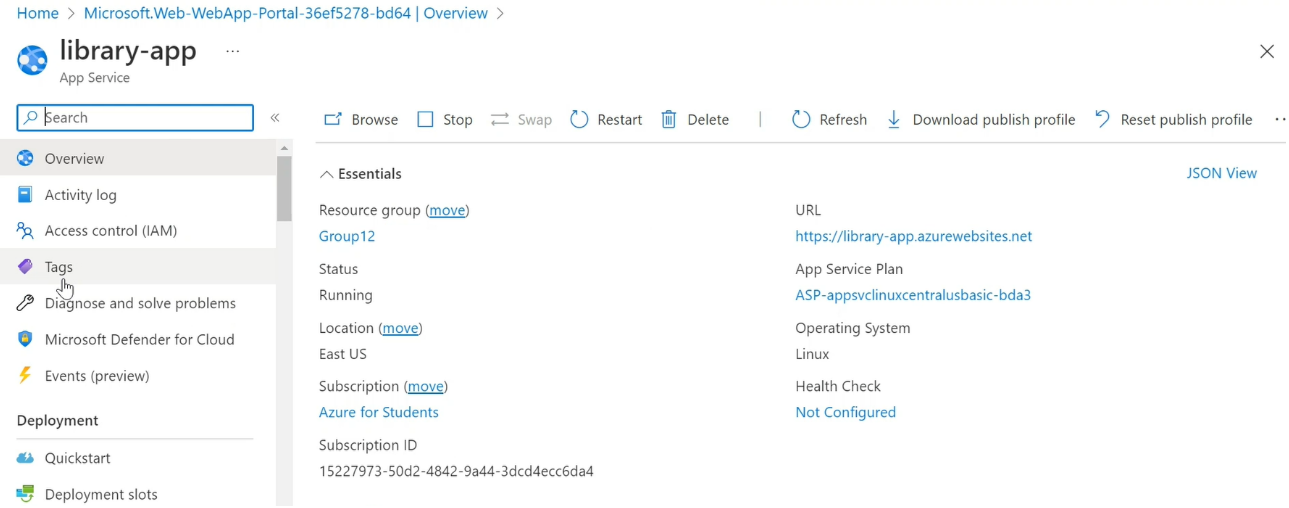
Subscription	15227973-50d2-4842-9a44-3dcd4ecc6da4
Resource Group	Group12
Name	library-app
Publish	Code
Runtime stack	Python 3.9

App Service Plan

Name	ASP-appsvclinuxcentralusbasic-bda3
Operating System	Linux
Region	East US
SKU	Basic
Size	Small
ACU	100 total ACU
Memory	1.75 GB memory

Monitoring

Application Insights	Not enabled



Essentials

Resource group (move) Group12	URL https://library-app.azurewebsites.net
Status Running	App Service Plan ASP-appsvclinuxcentralusbasic-bda3
Location (move) East US	Operating System Linux
Subscription (move) Azure for Students	Health Check Not Configured
Subscription ID 15227973-50d2-4842-9a44-3dcd4ecc6da4	

+ Step 2.4: Connect source code via github

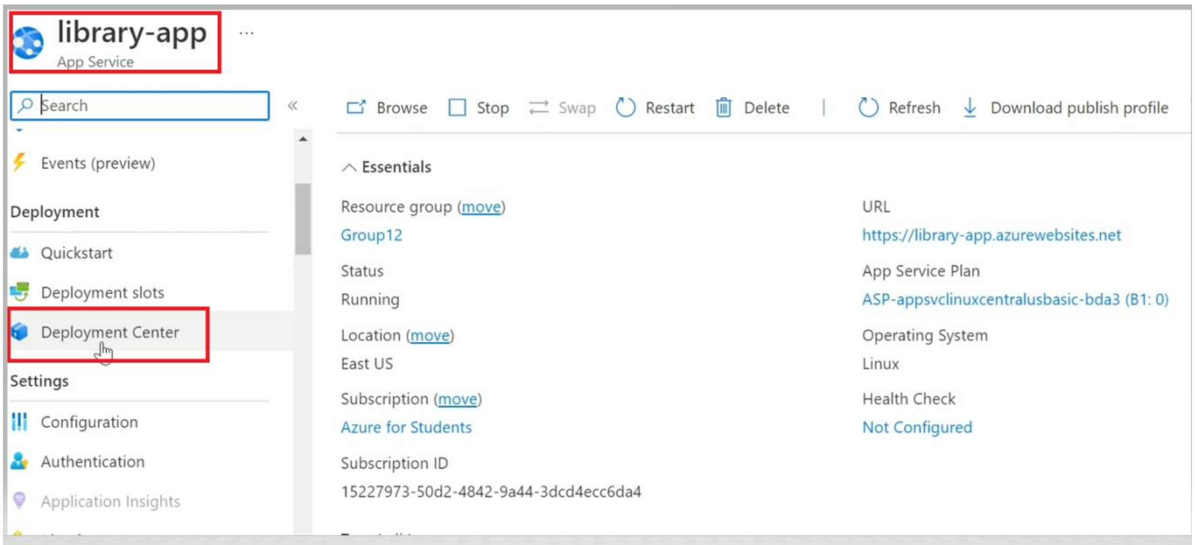
On the page for the App Service:

* Select Deployment Center from the menu on the left side of the screen.

* Select Github in the dropdown list labeled Source.

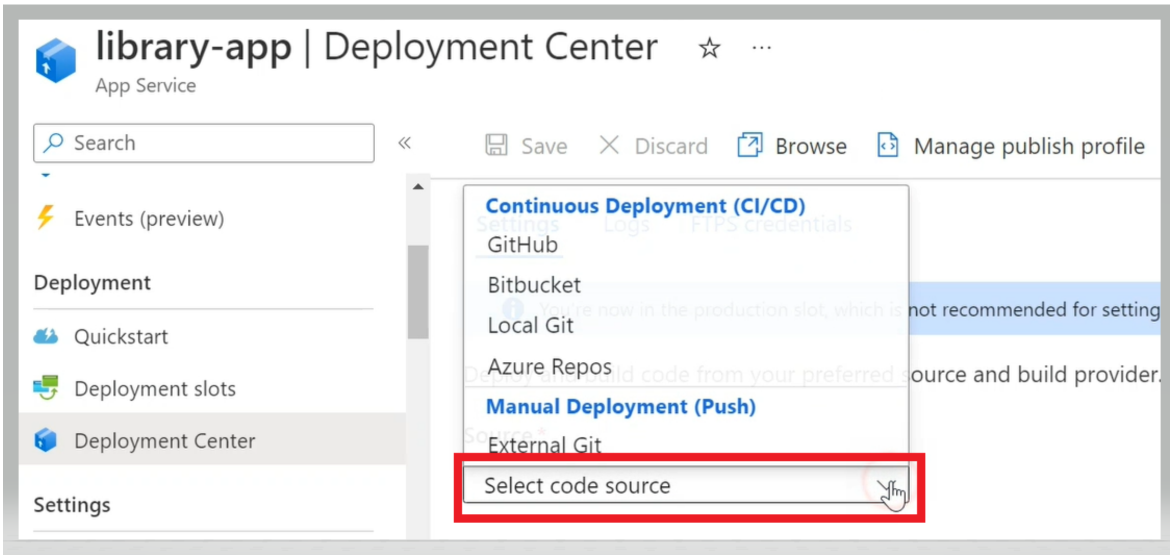
* Enter the following values

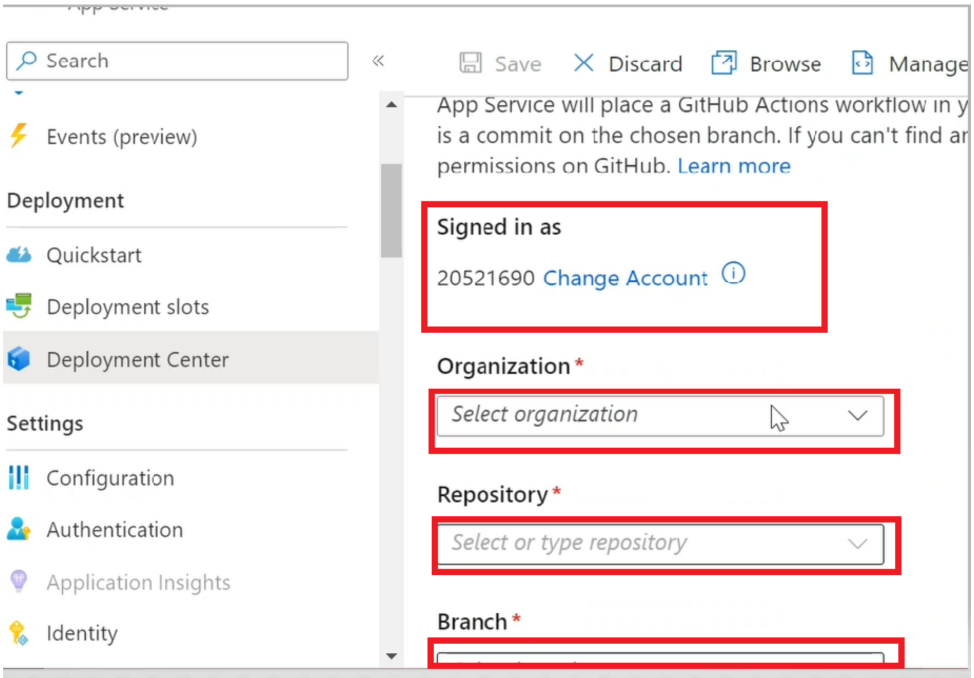
* Select Save.



Essentials

Resource group (move) Group12	URL https://library-app.azurewebsites.net
Status Running	App Service Plan ASP-appsvclinuxcentralusbasic-bda3 (B1: 0)
Location (move) East US	Operating System Linux
Subscription (move) Azure for Students	Health Check Not Configured
Subscription ID 15227973-50d2-4842-9a44-3dcd4ecc6da4	





App Service will place a GitHub Actions workflow in y
is a commit on the chosen branch. If you can't find ar
permissions on GitHub. Learn more

Signed in as

20521690 Change Account

Organization *

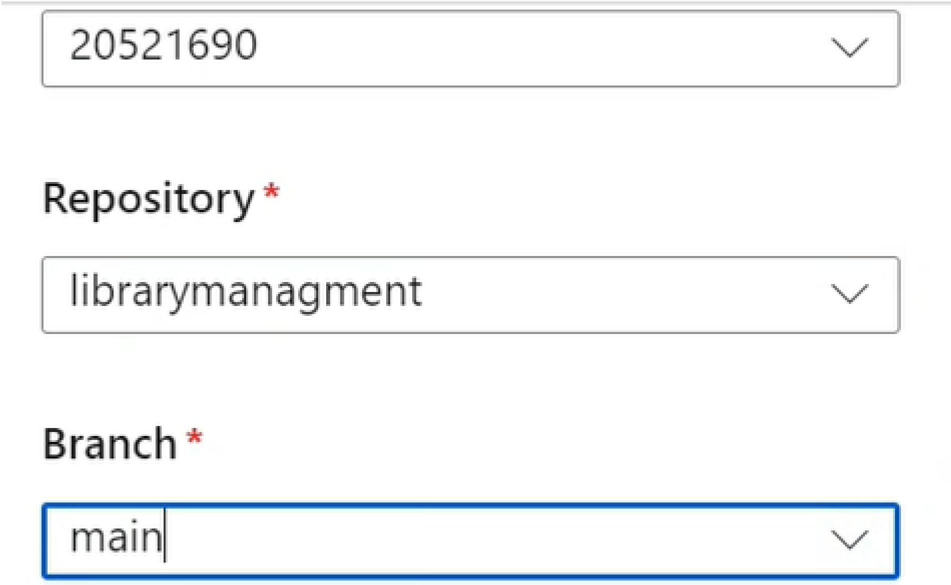
Select organization

Repository *

Select or type repository

Branch *

-> The group uses github with source code "librarymanagement" as shown below



20521690

Repository *

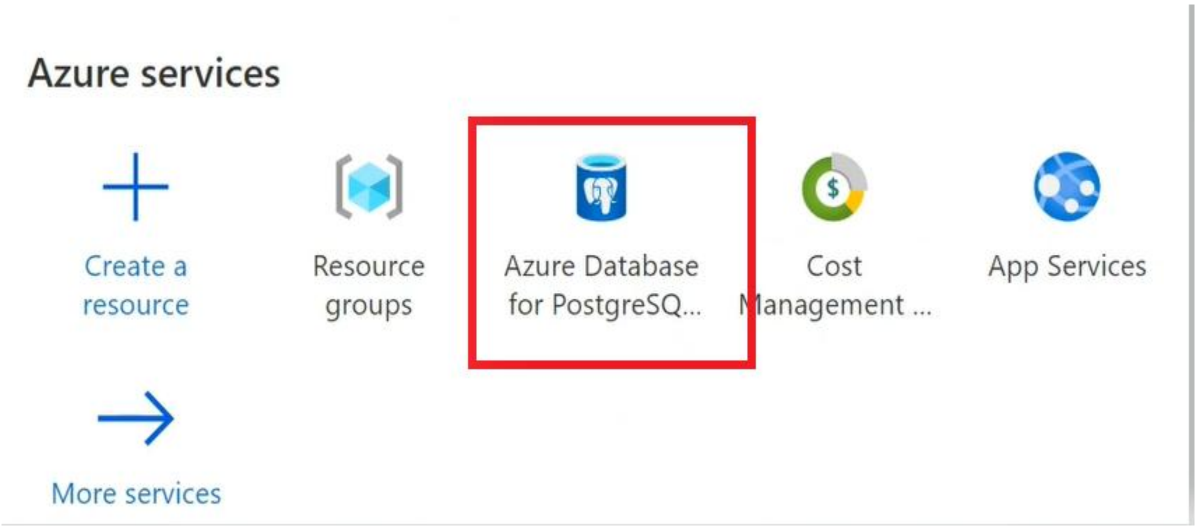
librarymanagment

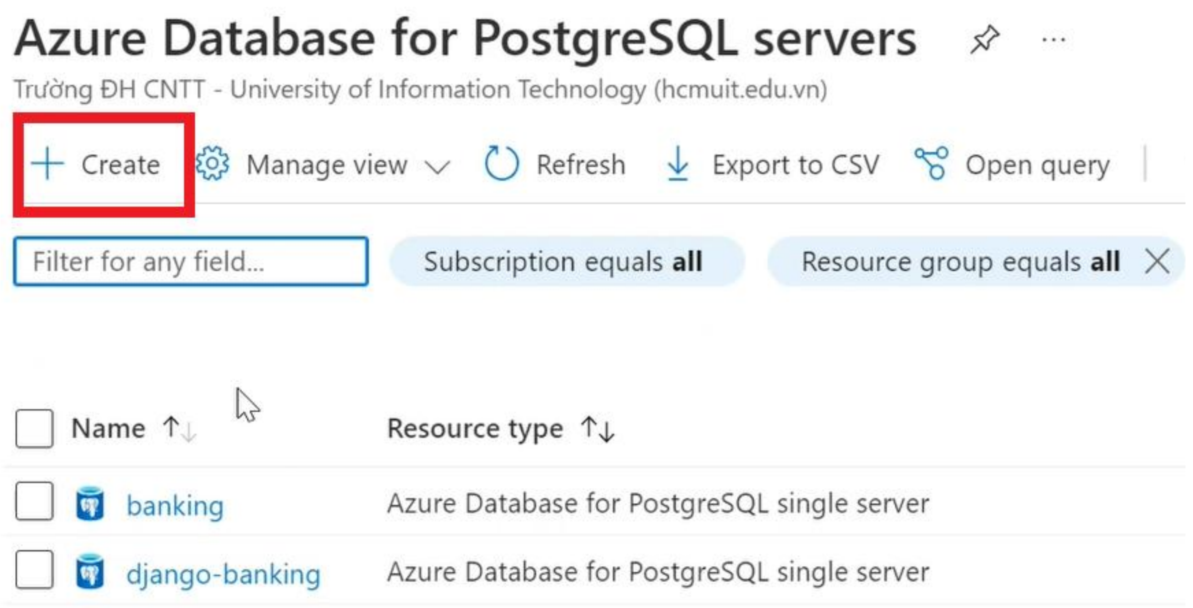
Branch *

main

b, Create an Azure Database for PostgreSQL server by using the Azure portal

- Step 1: Select **Azure Database for PostgreSQL** -> **Create**

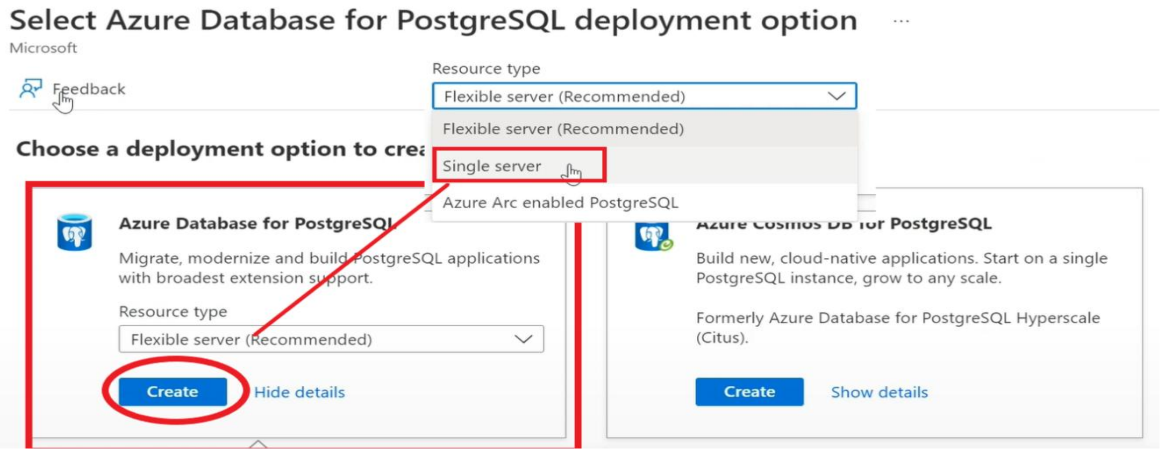



Azure Database for PostgreSQL servers

Trường ĐH CNTT - University of Information Technology (hcmuit.edu.vn)

Name	Resource type
banking	Azure Database for PostgreSQL single server
django-banking	Azure Database for PostgreSQL single server

- Step 2: On the Create a Azure Database for PostgreSQL page -> select **Single server**. (or **Flexible server, .v.**) -> **Create**


Select Azure Database for PostgreSQL deployment option

Microsoft

Feedback
Resource type
Flexible server (Recommended)
Flexible server (Recommended)
Single server
Azure Arc enabled PostgreSQL

Choose a deployment option to crea

Azure Database for PostgreSQL

Migrate, modernize and build PostgreSQL applications with broadest extension support.

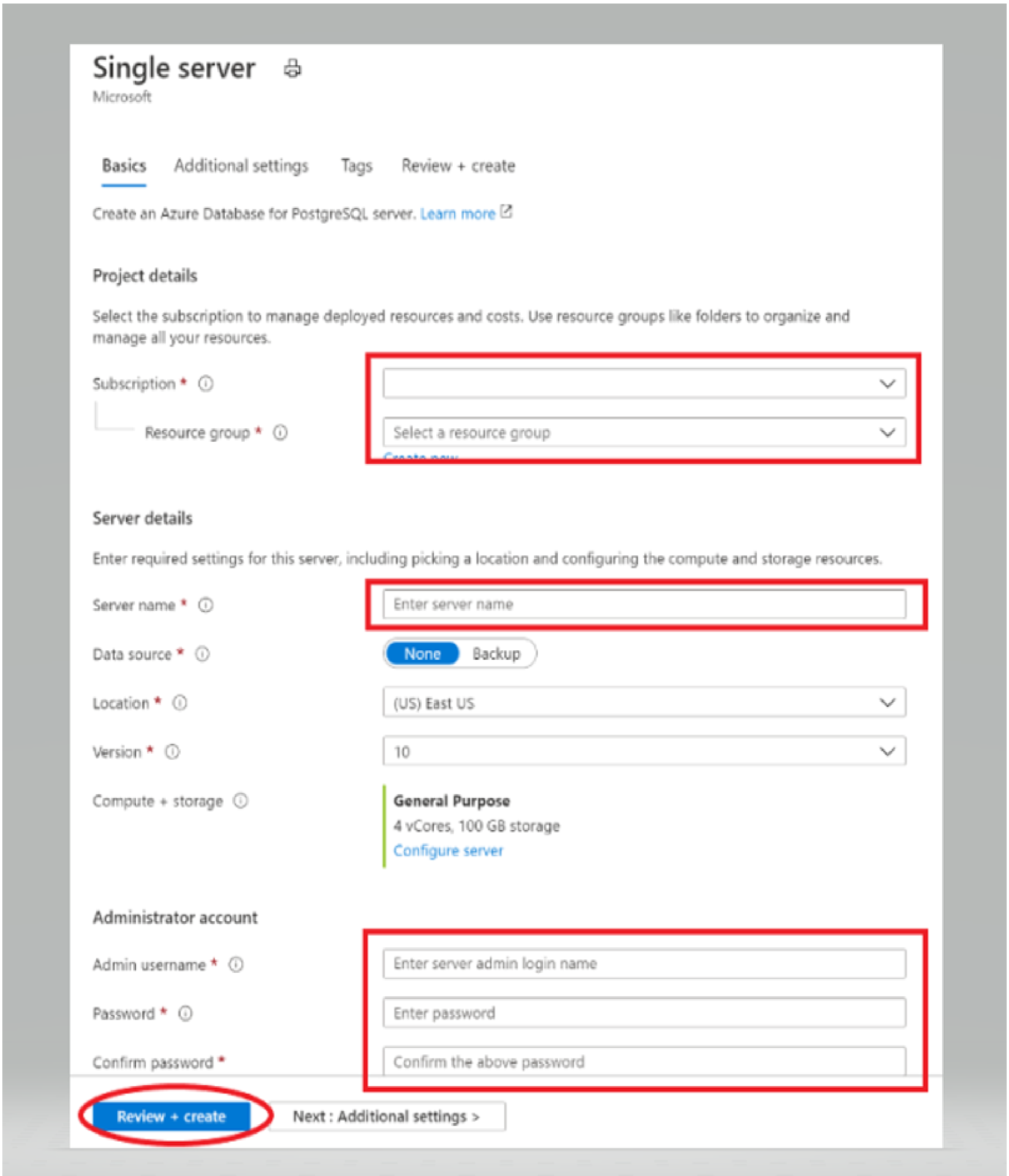
Resource type: Flexible server (Recommended)

Azure Cosmos DB for PostgreSQL

Build new, cloud-native applications. Start on a single PostgreSQL instance, grow to any scale.

Formerly Azure Database for PostgreSQL Hyperscale (Citus).

- Step 3: Now enter the Basics form with the following information.



Single server

Microsoft

Create an Azure Database for PostgreSQL server. Learn more

Project details

Select the subscription to manage deployed resources and costs. Use resource groups like folders to organize and manage all your resources.

Subscription *

Resource group * Select a resource group

Create new

Server details

Enter required settings for this server, including picking a location and configuring the compute and storage resources.

Server name * Enter server name

Data source * None Backup

Location * (US) East US

Version * 10

Compute + storage General Purpose
4 vCores, 100 GB storage
Configure server

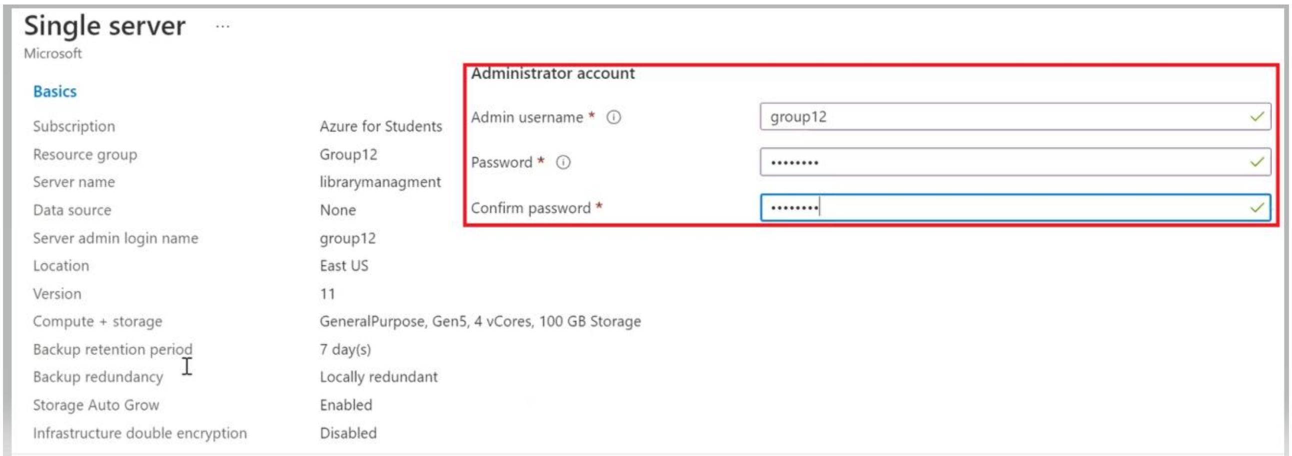
Administrator account

Admin username * Enter server admin login name

Password * Enter password

Confirm password * Confirm the above password

- > Information that the team initiates



Single server ···

Microsoft

Basics

Subscription	Azure for Students
Resource group	Group12
Server name	librarymanagment
Data source	None
Server admin login name	group12
Location	East US
Version	11
Compute + storage	GeneralPurpose, Gen5, 4 vCores, 100 GB Storage
Backup retention period	7 day(s)
Backup redundancy	Locally redundant
Storage Auto Grow	Enabled
Infrastructure double encryption	Disabled

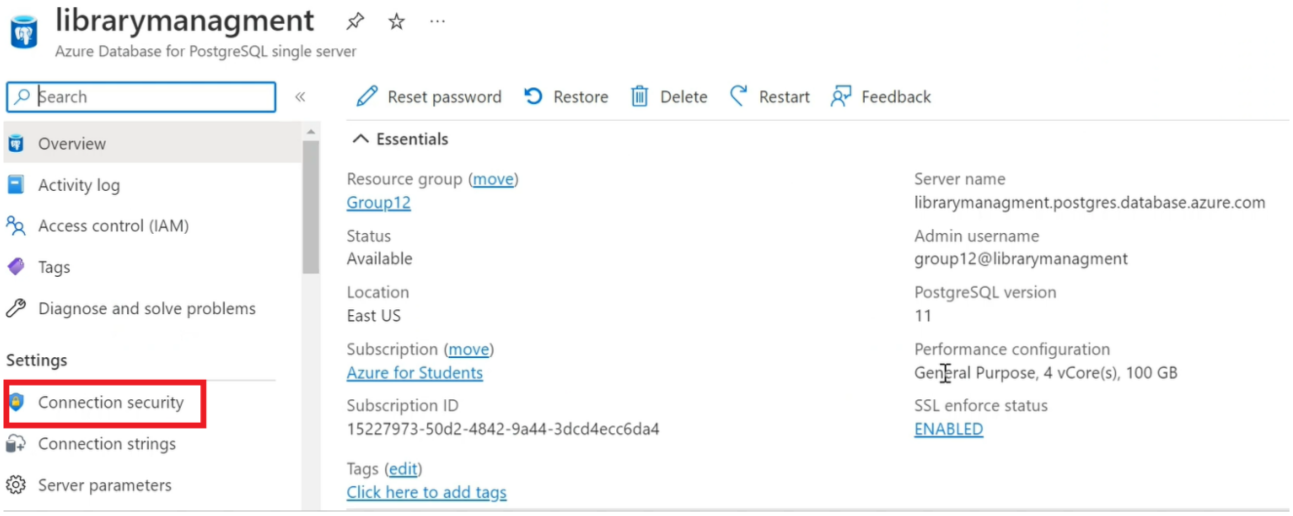
Administrator account

Admin username * group12 ✓

Password * •••••••• ✓

Confirm password * •••••••• ✓

- Step 4: Configure a firewall rule -> Connect security



librarymanagment

Azure Database for PostgreSQL single server

Essentials

Resource group (move)
Group12

Status
Available

Location
East US

Subscription (move)
Azure for Students

Subscription ID
15227973-50d2-4842-9a44-3dcd4ecc6da4

Tags (edit)
Click here to add tags

Server name
librarymanagment.postgres.database.azure.com

Admin username
group12@librarymanagment

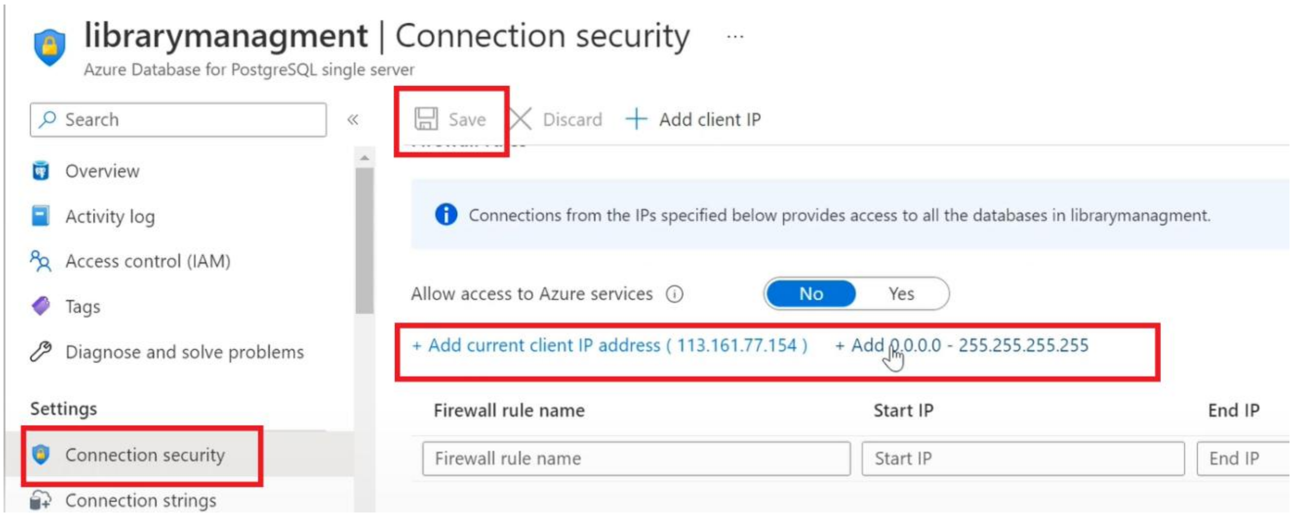
PostgreSQL version
11

Performance configuration
General Purpose, 4 vCore(s), 100 GB

SSL enforce status
ENABLED

-> By default, the server that we create is not publicly accessible. We need to give permissions to our IP address. Go to our server resource in the Azure portal and select Connection security from left-side menu for our server resource. If we're not sure how to find our resource

-> Select address -> Save



librarymanagment | Connection security

Azure Database for PostgreSQL single server

Connections from the IPs specified below provides access to all the databases in librarymanagment.

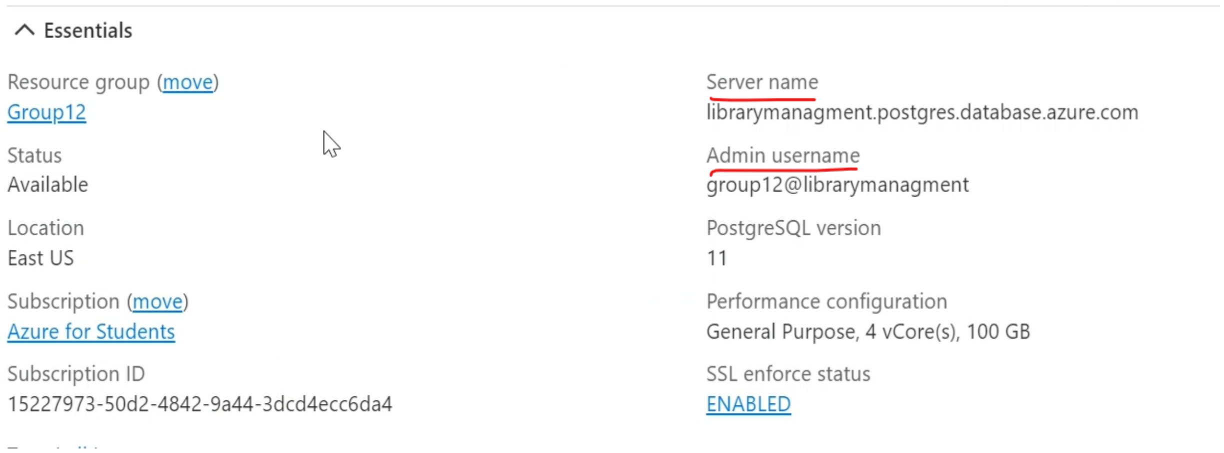
Allow access to Azure services: No [✓] Yes

+ Add current client IP address (113.161.77.154)   + Add 0.0.0.0 - 255.255.255.255

Firewall rule name	Start IP	End IP
Firewall rule name	Start IP	End IP

c, Connect to the server with psql

- Step 1: Make a note of server name, server admin login name, password, and subscription ID for your newly created server from the Overview section of server.



^ Essentials

Resource group (move)
Group12

Status
Available

Location
East US

Subscription (move)
Azure for Students

Subscription ID
15227973-50d2-4842-9a44-3dcd4ecc6da4

Server name
librarymanagment.postgres.database.azure.com

Admin username
group12@librarymanagment

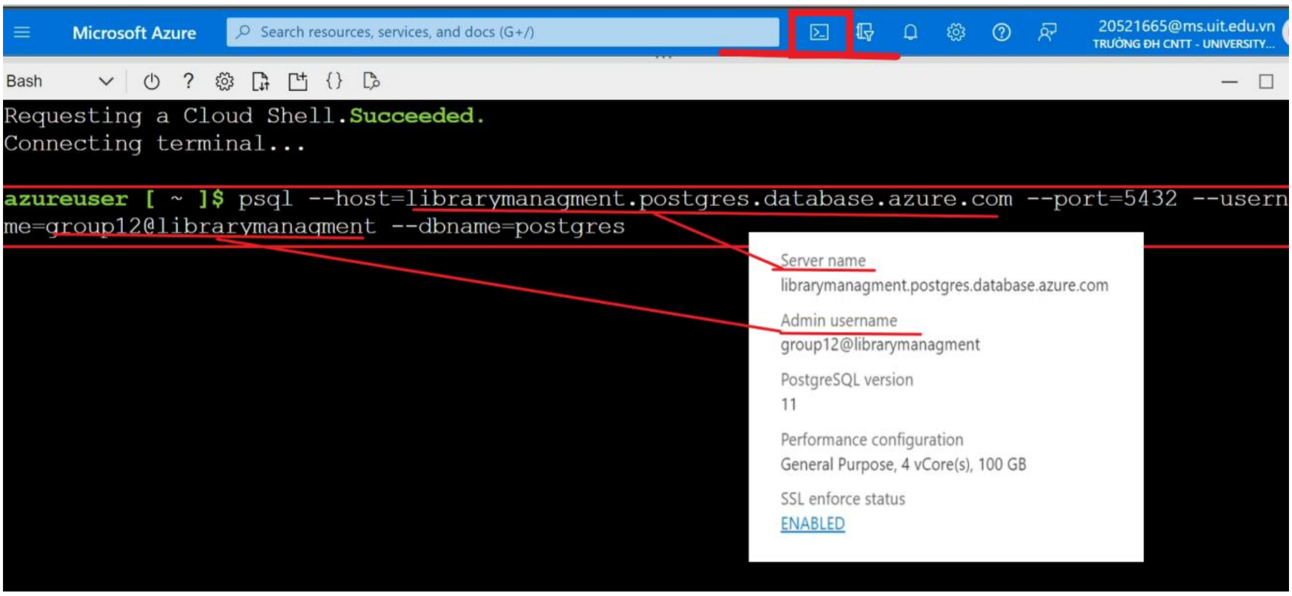
PostgreSQL version
11

Performance configuration
General Purpose, 4 vCore(s), 100 GB

SSL enforce status
ENABLED

- Step 2: Open Azure Cloud Shell in the portal by selecting the icon on the upper-left side. -> Run the following command in the Azure Cloud Shell terminal. Replace values with actual server name and admin user login name. Use the empty database postgres with admin user in this format: <admin-username>@<servername>:

“psql --host=mydemoserver.postgres.database.azure.com --port=5432 --username=myadmin@mydemoserver --dbname=postgres”



Microsoft Azure
Search resources, services, and docs (G+/)
20521665@ms.uit.edu.vn
TRƯỜNG ĐH CNTT - UNIVERSITY...
Bash

```
Requesting a Cloud Shell.Succeeded.
Connecting terminal...

azureuser [ ~ ]$ psql --host=librarymanagment.postgres.database.azure.com --port=5432 --usern
me=group12@librarymanagment --dbname=postgres
```

Server name
librarymanagment.postgres.database.azure.com

Admin username
group12@librarymanagment

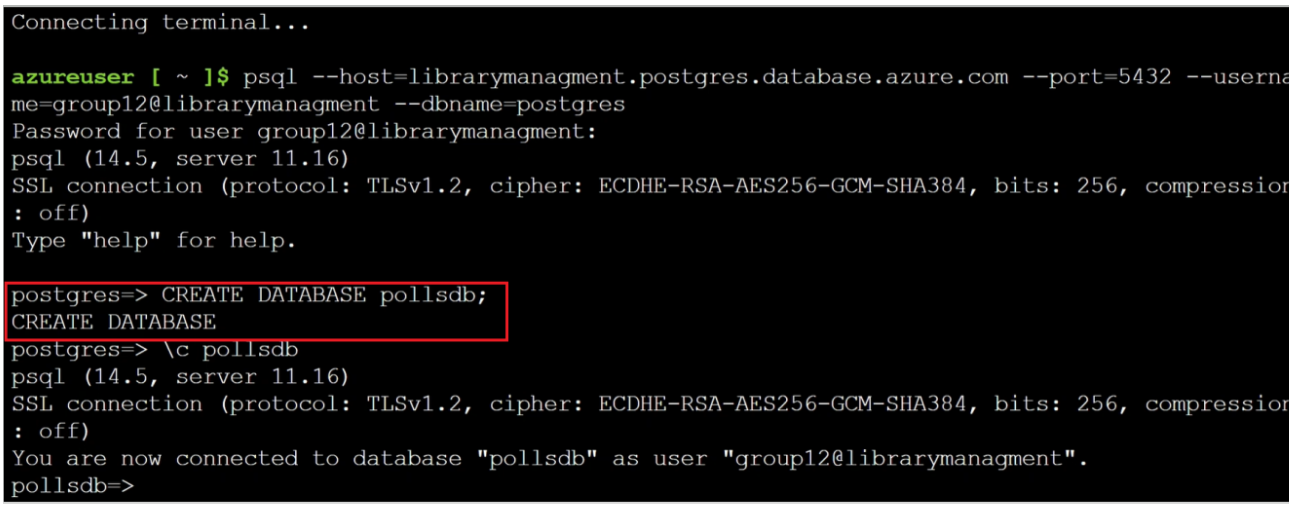
PostgreSQL version
11

Performance configuration
General Purpose, 4 vCore(s), 100 GB

SSL enforce status
ENABLED

- Step 3: In the same Azure Cloud Shell terminal, create a database: “postgres=> **CREATE DATABASE <enter database’s name>;**”

-> Switch connections to the newly created guest database: “**\c <enter database’s name>**”

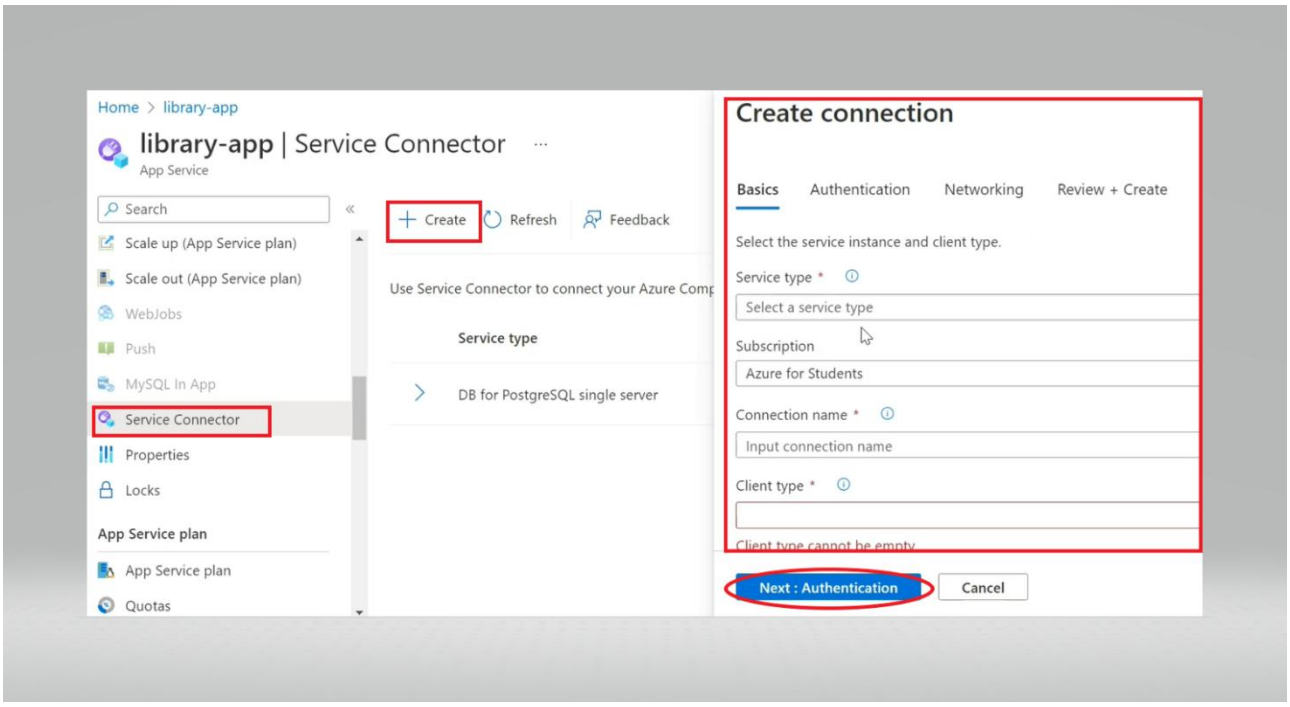


```
Connecting terminal...

azureuser [ ~ ]$ psql --host=librarymanagment.postgres.database.azure.com --port=5432 --userna
me=group12@librarymanagment --dbname=postgres
Password for user group12@librarymanagment:
psql (14.5, server 11.16)
SSL connection (protocol: TLSv1.2, cipher: ECDHE-RSA-AES256-GCM-SHA384, bits: 256, compressio
: off)
Type "help" for help.

postgres=> CREATE DATABASE pollsdb;
CREATE DATABASE
postgres=> \c pollsdb
psql (14.5, server 11.16)
SSL connection (protocol: TLSv1.2, cipher: ECDHE-RSA-AES256-GCM-SHA384, bits: 256, compressio
: off)
You are now connected to database "pollsdb" as user "group12@librarymanagment".
pollsdb=>
```

- Step 4: Navigate to page for the App Service instance in the Azure portal. -> Select **Service Connector -> Create -> Enter the Basics form with the following information.** -> Next: Authentication



Select the service instance and client type.

Service type * : Select a service type

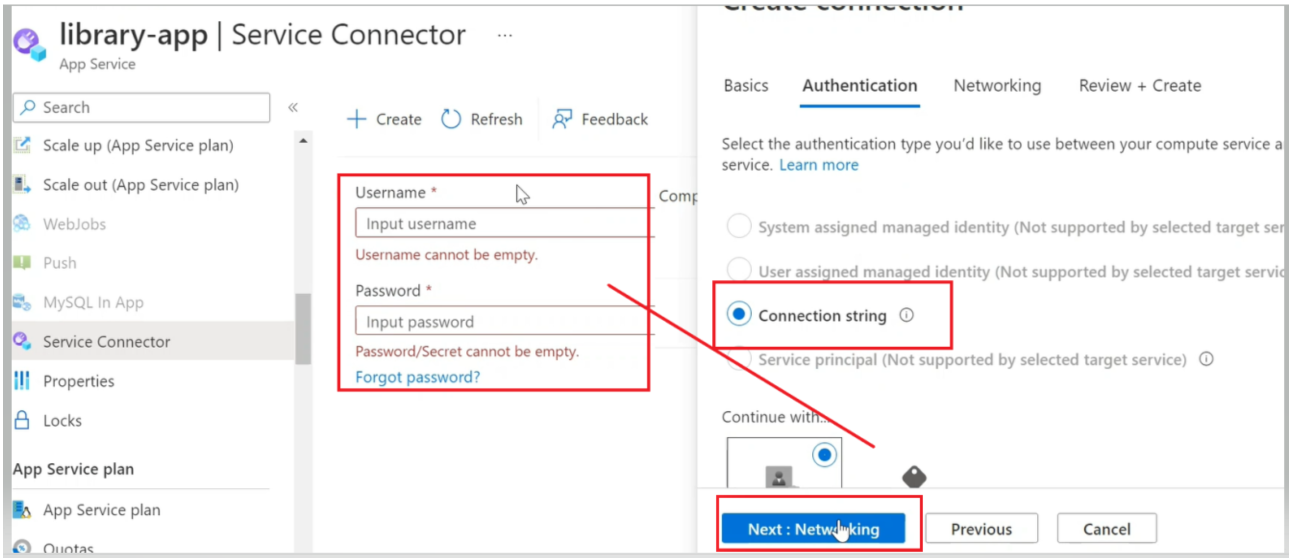
Subscription : Azure for Students

Connection name * : Input connection name

Client type * :

Client type cannot be empty

-> Select **Connection string** -> Enter **Username and Password** for database -> Next: Networking -> Next: Review + Create -> Create



Username *

Input username

Username cannot be empty.

Password *

Input password

Password/Secret cannot be empty.

Forgot password?

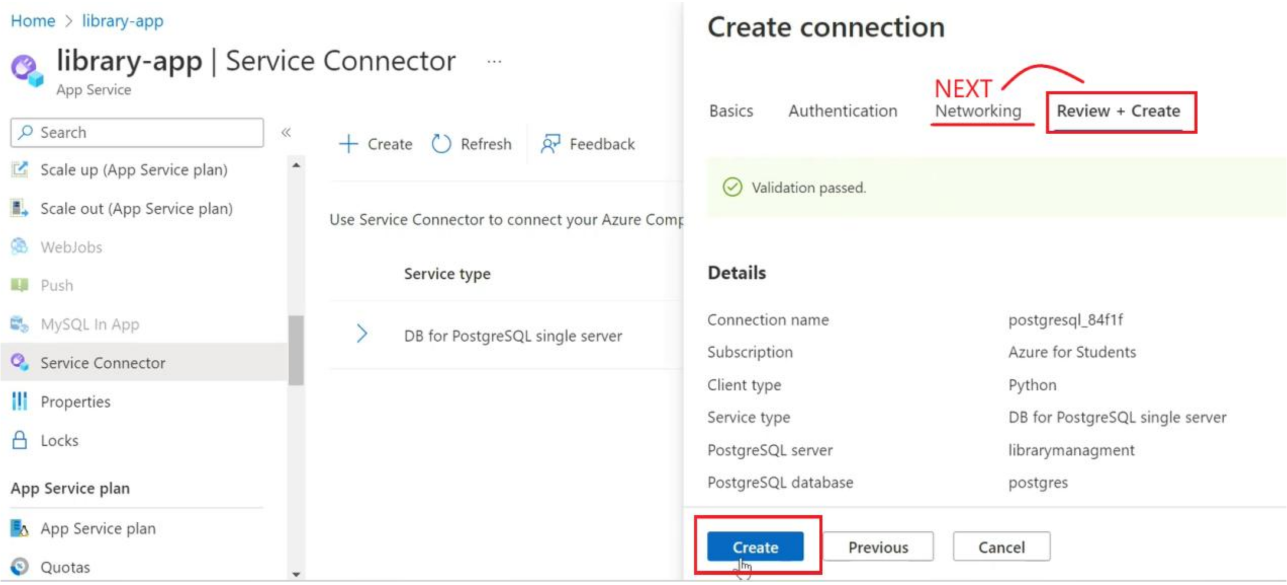
Select the authentication type you'd like to use between your compute service a service. Learn more

○ System assigned managed identity (Not supported by selected target ser

○ User assigned managed identity (Not supported by selected target servic

● Connection string

○ Service principal (Not supported by selected target service)



Use Service Connector to connect your Azure Comp

Service type
DB for PostgreSQL single server

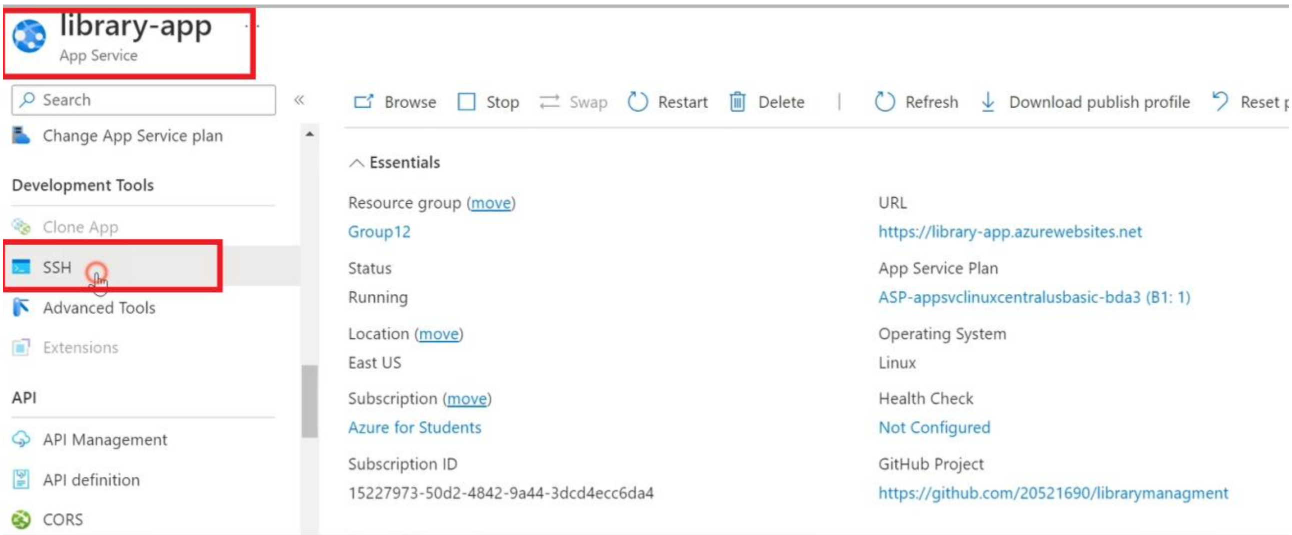
Validation passed.

Details

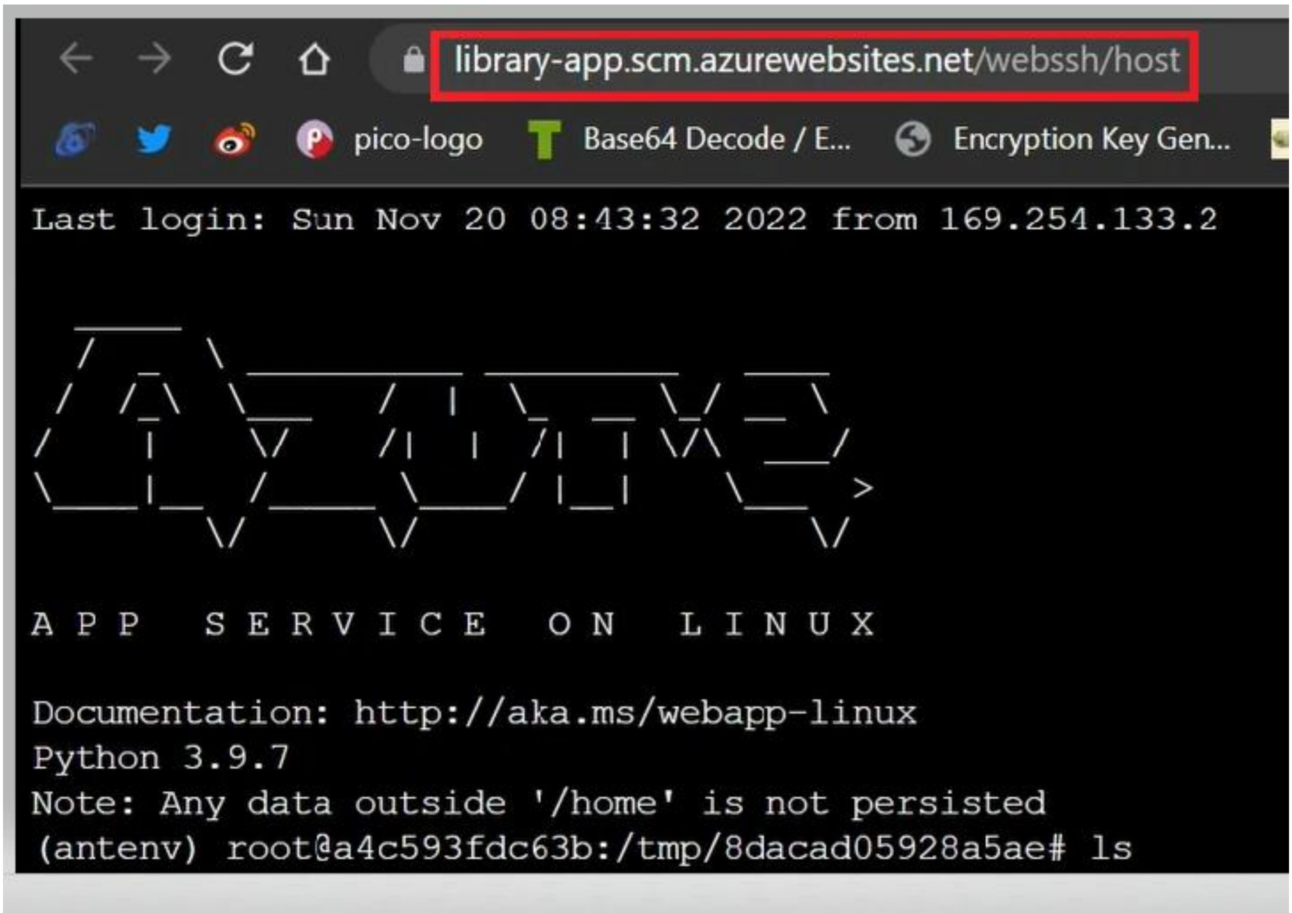
Connection name	postgresql_84f1f
Subscription	Azure for Students
Client type	Python
Service type	DB for PostgreSQL single server
PostgreSQL server	librarymanagment
PostgreSQL database	postgres

d, Run Django database migrations

- Step 1: On the page for the App Service -> select SSH (under Development Tools on the left side), and then Go to open an SSH console on the web app server



Resource group (move)	URL
Group12	https://library-app.azurewebsites.net
Status	App Service Plan
Running	ASP-appsvclinuxcentralusbasic-bda3 (B1: 1)
Location (move)	Operating System
East US	Linux
Subscription (move)	Health Check
Azure for Students	Not Configured
Subscription ID	GitHub Project
15227973-50d2-4842-9a44-3dcd4ecc6da4	https://github.com/20521690/librarymanagment



```
Last login: Sun Nov 20 08:43:32 2022 from 169.254.133.2

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A P P   S E R V I C E   O N   L I N U X

Documentation: http://aka.ms/webapp-linux
Python 3.9.7
Note: Any data outside '/home' is not persisted
(antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# ls
```

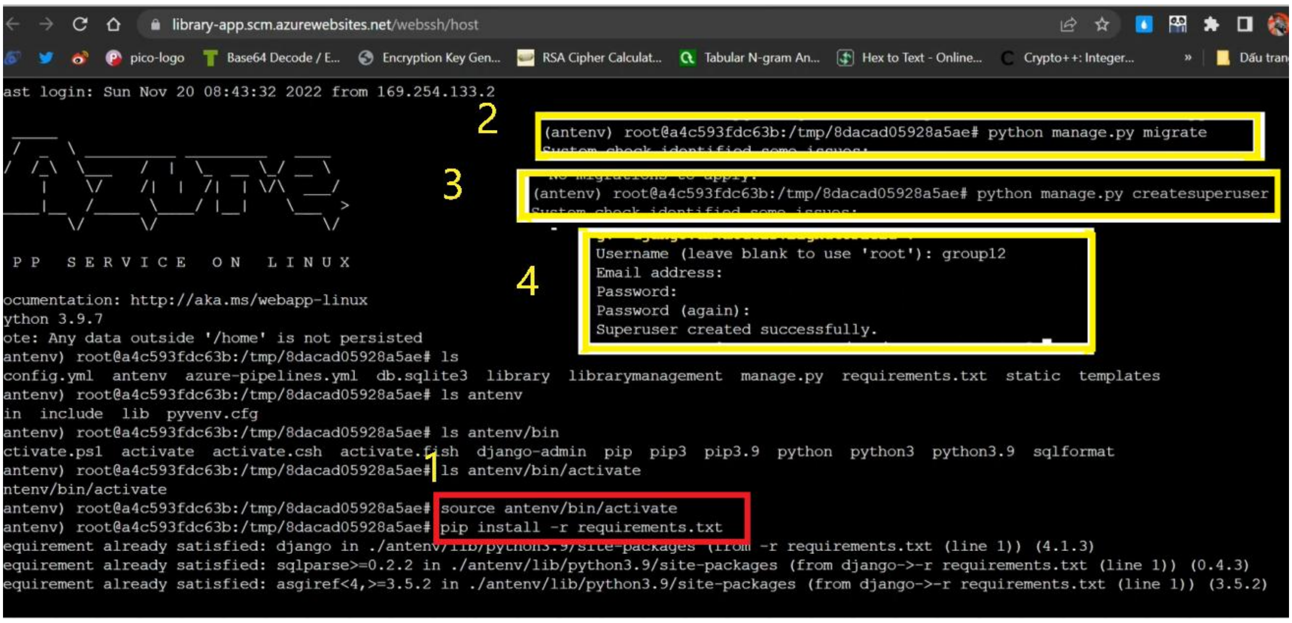
- Step 2:

* 1- Activate the virtual environment: “**source antenv/bin/activate**”

- Install dependencies: “**pip install -r requirements.txt**”

* 2- Run database migrations: “**python manage.py migrate**”

* 3+4- Create an administrator login for the app: “**python manage.py createsuperuser**”



```
ast login: Sun Nov 20 08:43:32 2022 from 169.254.133.2

 P P   S E R V I C E   O N   L I N U X

ocumentation: http://aka.ms/webapp-linux
ython 3.9.7
ote: Any data outside '/home' is not persisted
antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# ls
config.yml  antenv  azure-pipelines.yml  db.sqlite3  library  librarymanagement  manage.py  requirements.txt  static  templates
antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# ls antenv
in  include  lib  pyvenv.cfg
antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# ls antenv/bin
ctivate.ps1  activate  activate.csh  activate.fish  django-admin  pip  pip3  pip3.9  python  python3  python3.9  sqlformat
antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# ls antenv/bin/activate
ntenv/bin/activate
antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# source antenv/bin/activate
antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# pip install -r requirements.txt
equirement already satisfied: django in ./antenv/lib/python3.9/site-packages (from -r requirements.txt (line 1)) (4.1.3)
equirement already satisfied: sqlparse>=0.2.2 in ./antenv/lib/python3.9/site-packages (from django->-r requirements.txt (line 1)) (0.4.3)
equirement already satisfied: asgiref<4,>=3.5.2 in ./antenv/lib/python3.9/site-packages (from django->-r requirements.txt (line 1)) (3.5.2)
```

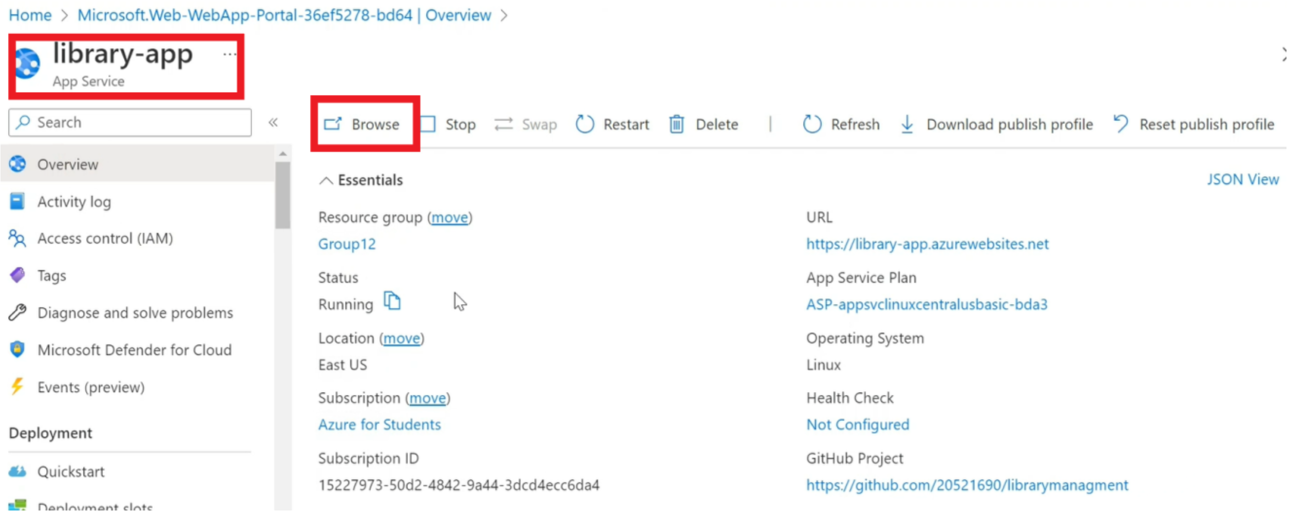
```
(antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# python manage.py migrate
```

```
(antenv) root@a4c593fdc63b:/tmp/8dacad05928a5ae# python manage.py createsuperuser
```

```
Username (leave blank to use 'root'): group12
Email address:
Password:
Password (again):
Superuser created successfully.
```

III. Result and conclusion

- At the App Service page -> Access browse -> web app created



Resource group (move)
Group12

Status
Running

Location (move)
East US

Subscription (move)
Azure for Students

Subscription ID
15227973-50d2-4842-9a44-3dcd4ecc6da4

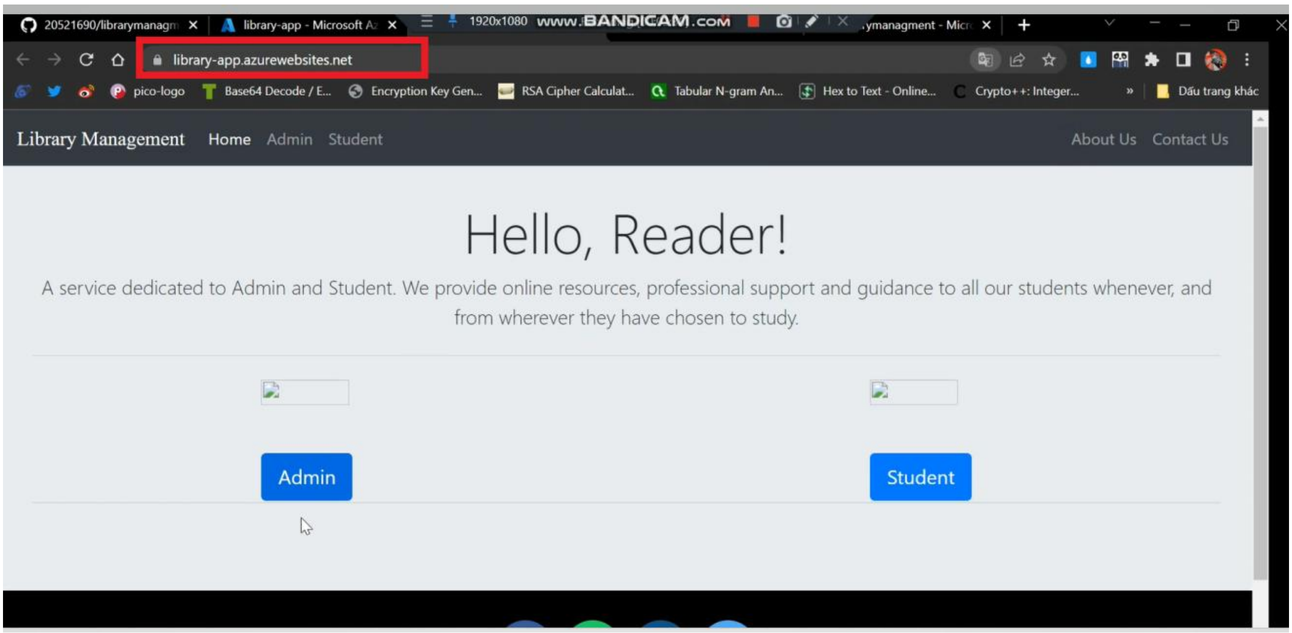
URL
https://library-app.azurewebsites.net

App Service Plan
ASP-appsvclinuxcentralusbasic-bda3

Operating System
Linux

Health Check
Not Configured

GitHub Project
https://github.com/20521690/librarymanagment



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Appendix

1. Task
2. Self-assessment
3. Answer