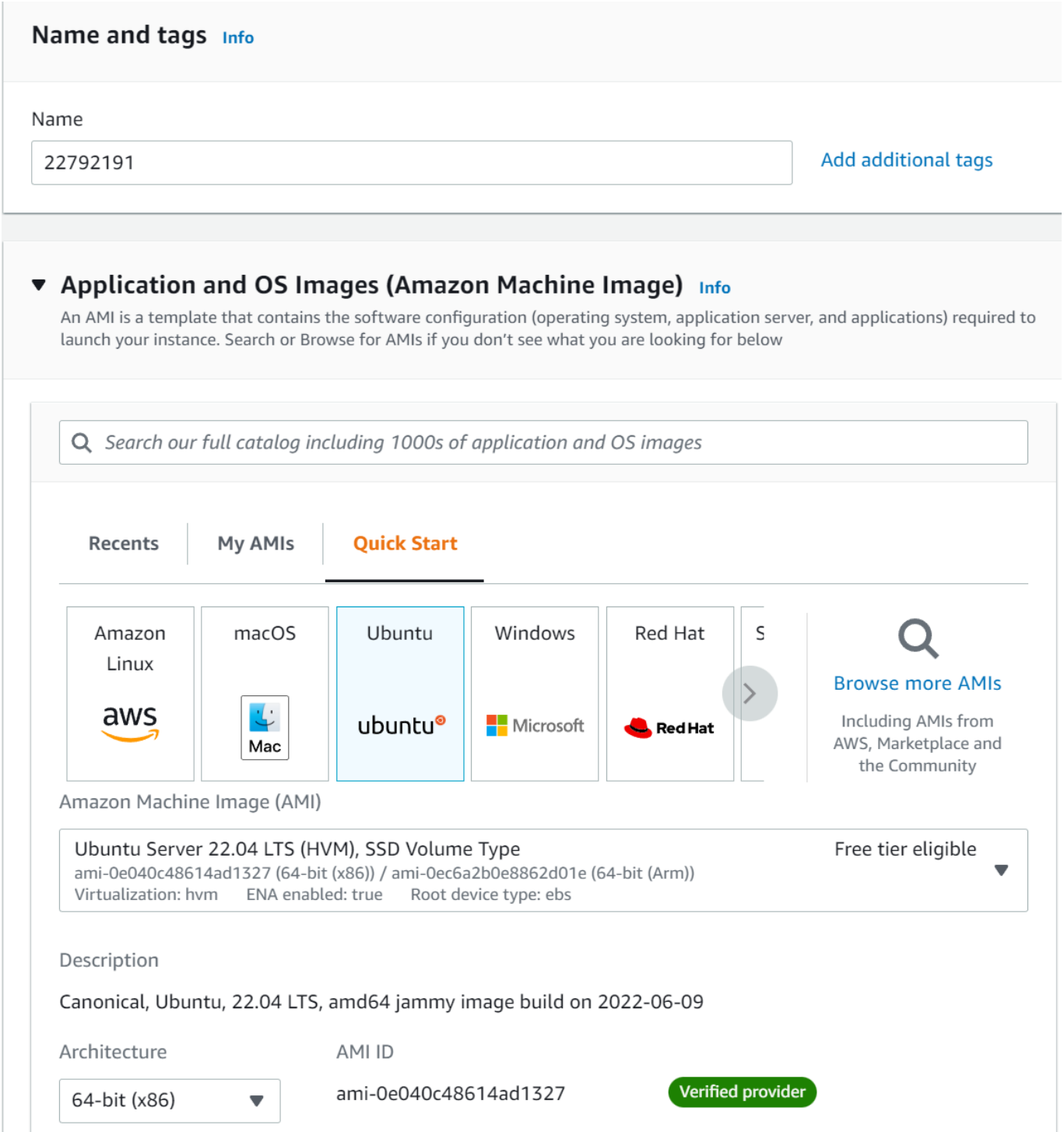
CITS5503 Lab6

Wenxiao Zhang 22792191

Step 1: Create an EC2 instance

1.1 Create an EC2 micro instance using Ubuntu and SSH into it.

using AWS console to launch an instance



Key pair (login) Info

You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.

Key pair name - *required*

22792191-key

Create new key pair

Network settings Info

Edit

Network Info

vpc-0b754f714cd1af245

Subnet Info

No preference (Default subnet in any availability zone)

Auto-assign public IP Info

Enable

Firewall (security groups) Info

A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.

Create security group

Select existing security group

Common security groups Info

Select security groups

Compare security group rules

22792191-sg sg-0625d7c77737ad40c

VPC: vpc-0b754f714cd1af245

Security groups that you add or remove here will be added to or removed from all your network interfaces.

EC2 > Instances > Launch an instance

Success

Successfully initiated launch of instance (i-0c70651b4447dd28d)

Launch log

Instance summary for i-0c70651b4447dd28d (22792191) Info

Updated less than a minute ago

Instance ID i-0c70651b4447dd28d (22792191)	Public IPv4 address 3.25.229.32 | open address
IPv6 address –	Instance state Running
Hostname type IP name: ip-172-31-21-64.ap-southeast-2.compute.internal	Private IP DNS name (IPv4 only) ip-172-31-21-64.ap-southeast-2.compute.internal
Answer private resource DNS name IPv4 (A)	Instance type t2.micro
Auto-assigned IP address 3.25.229.32 [Public IP]	VPC ID vpc-0b754f714cd1af245

using Ubuntu and SSH into it

```
moebuta@Lenovo-MoeBuTa:~/2022s2/cits5503/labs/lab6$ ssh -i 22792191-key.pem ubuntu@3.25.229.3
2
The authenticity of host '3.25.229.32 (3.25.229.32)' can't be established.
ECDSA key fingerprint is SHA256:jHa5M5CzEt06zpJSIspZGLtCNkGPwBIChbGQxH0Kfs0.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '3.25.229.32' (ECDSA) to the list of known hosts.
Welcome to Ubuntu 22.04 LTS (GNU/Linux 5.15.0-1011-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  System information as of Mon Sep 19 15:11:08 UTC 2022

  System load:  0.142578125       Processes:             101
  Usage of /:   19.1% of 7.58GB   Users logged in:       0
  Memory usage: 22%               IPv4 address for eth0: 172.31.21.64
  Swap usage:   0%

0 updates can be applied immediately.


The list of available updates is more than a week old.
To check for new updates run: sudo apt update


The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu@ip-172-31-21-64:~$
```

1.2 update package and install python venv

```
ubuntu@ip-172-31-21-64:~$ sudo apt-get update
Hit:1 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu jam
Get:2 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu jam
Get:3 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu jam
Get:4 http://ap-southeast-2.ec2.archive.ubuntu.com/ubuntu jam
```

```
ubuntu@ip-172-31-21-64:~$ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

```
ubuntu@ip-172-31-21-64:~$ sudo apt-get install python3-venv
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

1.3 install python pip

```
ubuntu@ip-172-31-21-64:~$ sudo bash
root@ip-172-31-21-64:/home/ubuntu# apt install python3-pip
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

1.4 Create a directory with a path /opt/wwc/mysites and cd into that. Set up a virtual environment.

we can see that the directories are all listed properly:

```
root@ip-172-31-21-64:/home/ubuntu# cd ..
root@ip-172-31-21-64:/home# cd ..
root@ip-172-31-21-64:/# mkdir -p /opt/wwc/mysites
root@ip-172-31-21-64:/# ls
bin   dev  home  lib32  libx32      media  opt   root  sbin  srv  tmp  var
boot  etc  lib   lib64  lost+found  mnt    proc  run   snap  sys  usr
root@ip-172-31-21-64:/# cd /opt/wwc/
root@ip-172-31-21-64:/opt/wwc# ls
mysites
root@ip-172-31-21-64:/opt/wwc# cd mysites/
root@ip-172-31-21-64:/opt/wwc/mysites# python3 -m venv venv
root@ip-172-31-21-64:/opt/wwc/mysites# ls
venv
root@ip-172-31-21-64:/opt/wwc/mysites#
```

Activate the virtual environment and install django:

```
root@ip-172-31-21-64:/opt/wwc/mysites# source venv/bin/activate
(venv) root@ip-172-31-21-64:/opt/wwc/mysites# pip3 install django
Collecting django
  Downloading Django-4.1.1-py3-none-any.whl (8.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 8.1/8.1 MB 49.8 MB/s eta 0:00:00
Collecting asgiref<4,>=3.5.2
  Downloading asgiref-3.5.2-py3-none-any.whl (22 kB)
Collecting sqlparse>=0.2.2
  Downloading sqlparse-0.4.2-py3-none-any.whl (42 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 42.3/42.3 KB 3.6 MB/s eta 0:00:00
Installing collected packages: sqlparse, asgiref, django
Successfully installed asgiref-3.5.2 django-4.1.1 sqlparse-0.4.2
(venv) root@ip-172-31-21-64:/opt/wwc/mysites# django-admin startproject lab
```

we can see 3 items: lab, manage.py and polls under the lab project, and items: **init**.py, admin.py, apps.py, migrations, models.py, tests.py and views.py under `polls` directory.

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites# cd lab
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# python3 manage.py startapp polls
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# ls
lab  manage.py  polls
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# cd polls
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab/polls# ls
__init__.py  admin.py  apps.py  migrations  models.py  tests.py  views.py
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab/polls#
```

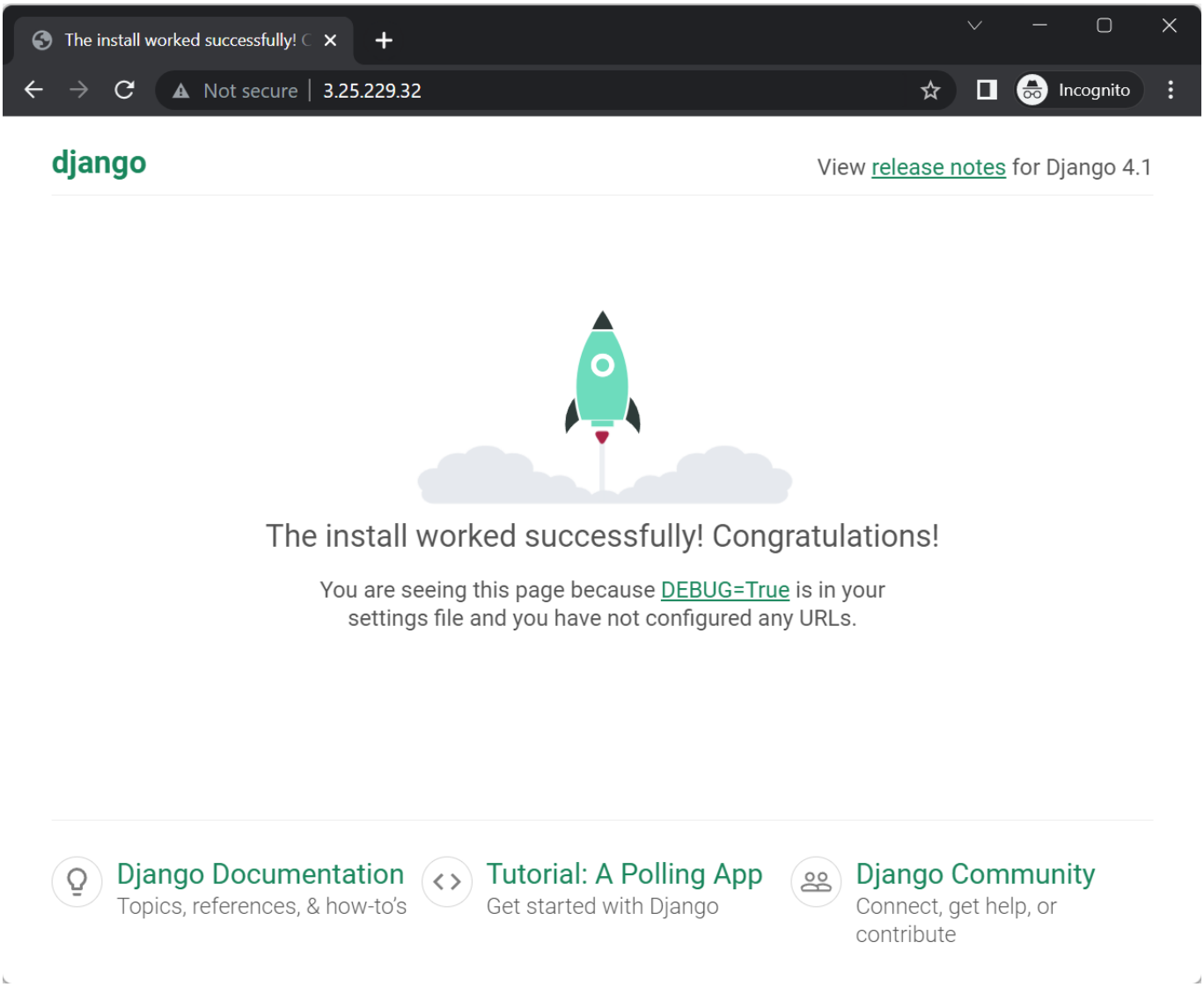
Step 2: Install and configure nginx (under polls)

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab/polls# apt install nginx
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

```
 GNU nano 6.2                    /etc/nginx/sites-enabled/default *                    M
        # include snippets/snakeoil.conf;

        root /var/www/html;

        # Add index.php to the list if you are using PHP
        index index.html index.htm index.nginx-debian.html;

        server_name _;

        location / {
                # First attempt to serve request as file, then
                # as directory, then fall back to displaying a 404.
                # try_files $uri $uri/ =404;
                proxy_set_header X-Forwarded-Host $host;
                proxy_set_header X-Real-IP $remote_addr;
                proxy_pass http://127.0.0.1:8000;
        }

        # pass PHP scripts to FastCGI server
        #
        #location ~ \.php$ {
        #       include snippets/fastcgi-php.conf;
        #
        #       # With php-fpm (or other unix sockets):
        #       fastcgi_pass unix:/run/php/php7.4-fpm.sock;
        #       # With php-cgi (or other tcp sockets):
        #       fastcgi_pass 127.0.0.1:9000;
```

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab/polls# cd /etc/nginx/sites-enabled
(venv) root@ip-172-31-21-64:/etc/nginx/sites-enabled# ls
default
```

```
(venv) root@ip-172-31-21-64:/etc/nginx/sites-enabled# service nginx restart
(venv) root@ip-172-31-21-64:/etc/nginx/sites-enabled# cd /opt/wwc/mysites/lab
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# python3 manage.py runserver 8000
Watching for file changes with StatReloader
Performing system checks...

System check identified no issues (0 silenced).

You have 18 unapplied migration(s). Your project may not work properly until you apply the mi
grations for app(s): admin, auth, contenttypes, sessions.
Run 'python manage.py migrate' to apply them.
September 19, 2022 - 15:25:09
Django version 4.1.1, using settings 'lab.settings'
Starting development server at http://127.0.0.1:8000/
Quit the server with CONTROL-C.
```


The install worked successfully!
Not secure
3.25.229.32
Incognito
django
View release notes for Django 4.1
The install worked successfully! Congratulations!
You are seeing this page because DEBUG=True is in your settings file and you have not configured any URLs.
Django Documentation
Topics, references, & how-to's
Tutorial: A Polling App
Get started with Django
Django Community
Connect, get help, or contribute

Step 3: Changing the code

Edit polls/views.py (just an example) Under lab type vim polls/views.py

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# vim polls/views.py
```

```
from django.shortcuts import render

# Create your views here.
from django.http import HttpResponse

def index(request):
    return HttpResponse("Hello world!")
~
```

Edit polls/urls.py Under lab, type vim polls/urls.py

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# vim polls/urls.py
```

```
from django.urls import path
from . import views

urlpatterns = [path('', views.index, name='index'),]
~
```

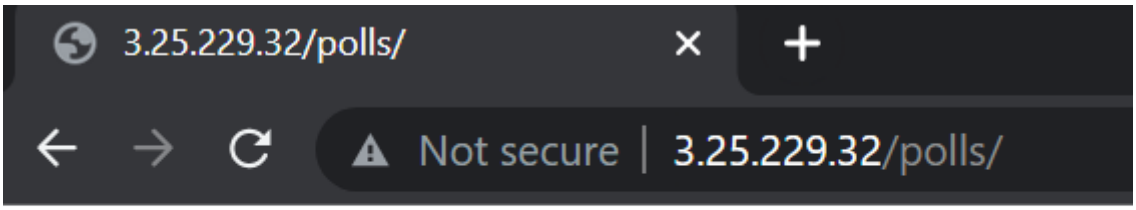
Edit lab/urls.py Under lab, type vim lab/urls.py

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# vim lab/urls.py
```

```
"""lab URL Configuration

The `urlpatterns` list routes URLs to views. For more information please see:
    https://docs.djangoproject.com/en/4.1/topics/http/urls/
Examples:
Function views
    1. Add an import:  from my_app import views
    2. Add a URL to urlpatterns:  path('', views.home, name='home')
Class-based views
    1. Add an import:  from other_app.views import Home
    2. Add a URL to urlpatterns:  path('', Home.as_view(), name='home')
Including another URLconf
    1. Import the include() function: from django.urls import include, path
    2. Add a URL to urlpatterns:  path('blog/', include('blog.urls'))
"""
from django.contrib import admin
from django.urls import include, path

urlpatterns = [
    path('polls/', include('polls.urls')),
    path('admin/', admin.site.urls),
]
```

Now run `python3 manage.py runserver 8000`

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# python3 manage.py runserver 8000
Watching for file changes with StatReloader
Performing system checks...

System check identified no issues (0 silenced).

You have 18 unapplied migration(s). Your project may not work properly until you apply the mi
grations for app(s): admin, auth, contenttypes, sessions.
Run 'python manage.py migrate' to apply them.
September 19, 2022 - 15:48:12
Django version 4.1.1, using settings 'lab.settings'
Starting development server at http://127.0.0.1:8000/
Quit the server with CONTROL-C.
[19/Sep/2022 15:48:18] "GET / HTTP/1.0" 200 12
```



Hello world!

Step 4: Create a load balancer

use AWS console to create a load balancer named `22792191-lb`

Basic configuration

Load balancer name

Name must be unique within your AWS account and cannot be changed after the load balancer is created.

22792191-lb

A maximum of 32 alphanumeric characters including hyphens are allowed, but the name must not begin or end with a hyphen.

Scheme Info

Scheme cannot be changed after the load balancer is created.

- (•) Internet-facing
  An internet-facing load balancer routes requests from clients over the internet to targets. Requires a public subnet. Learn more
- ( ) Internal
  An internal load balancer routes requests from clients to targets using private IP addresses.

IP address type Info

Select the type of IP addresses that your subnets use.

- (•) IPv4
  Recommended for internal load balancers.
- ( ) Dualstack
  Includes IPv4 and IPv6 addresses.

☑ **ap-southeast-2b**

Subnet

subnet-0b15987d0f01c421f ▼

IPv4 settings

Assigned by AWS

☑ **ap-southeast-2c**

Subnet

subnet-0abd7d09f748bc284 ▼

IPv4 settings

Assigned by AWS

Security groups Info

A security group is a set of firewall rules that control the traffic to your load balancer.

Security groups

Select up to 5 security groups

Create new security group

22792191-sg sg-0625d7c77737ad40c

VPC: vpc-0b754f714cd1af245

Listeners and routing Info

A listener is a process that checks for connection requests using the port and protocol you configure. The rules that you define to its registered targets.

▼ Listener **HTTP:80**

Protocol: HTTP

Port: 80

1-65535

Default action Info

Forward to: 22792191-tg HTTP

Target type: Instance, IPv4

Create target group

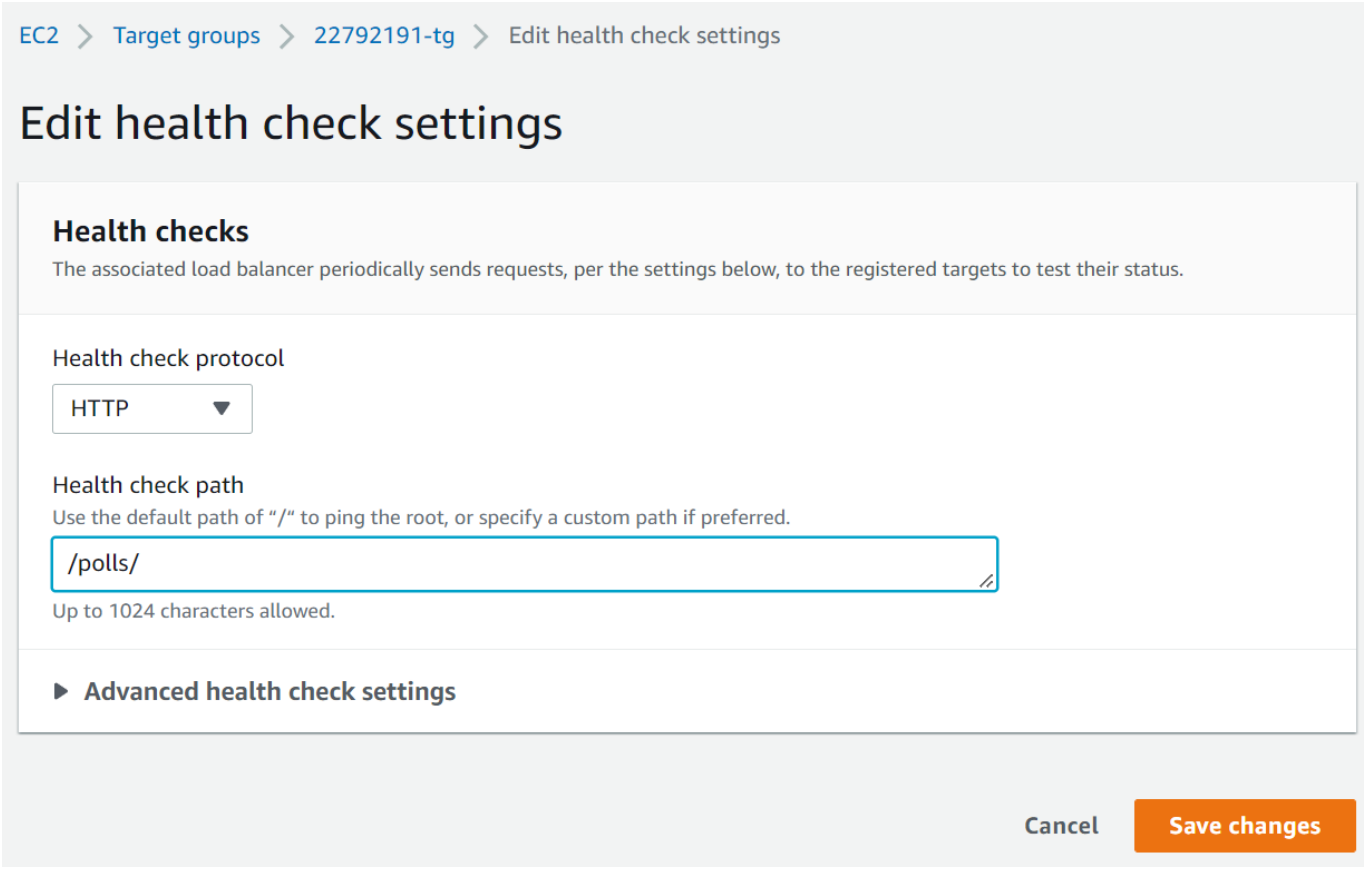
Create Load Balancer | Actions

search : 22792191-lb 22792191

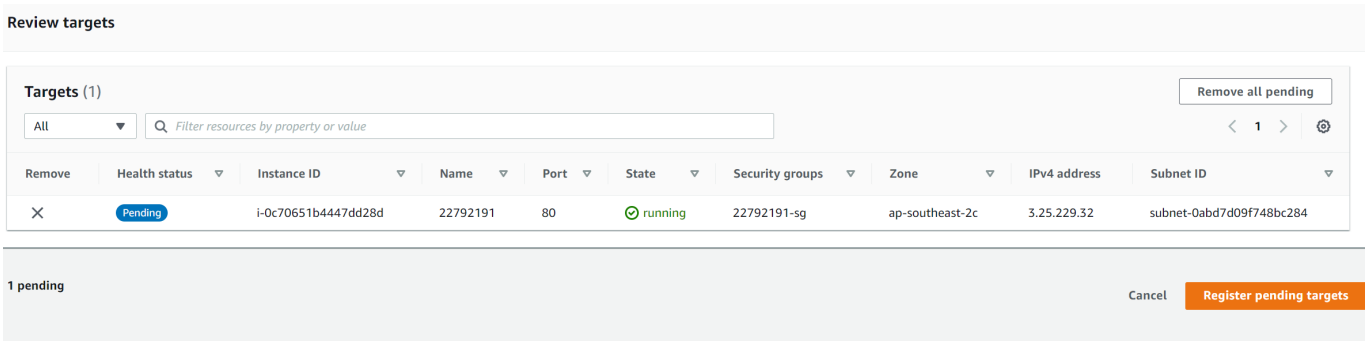
1 to 1 of 1

Name	DNS name	State	VPC ID	Availability Zones	Type	Created At
22792191-lb	22792191-lb-416046187.ap-…	Provisioning	vpc-0b754f714cd1af245	ap-southeast-2c, ap-so…	application	September 19, 2022 at 11:5…

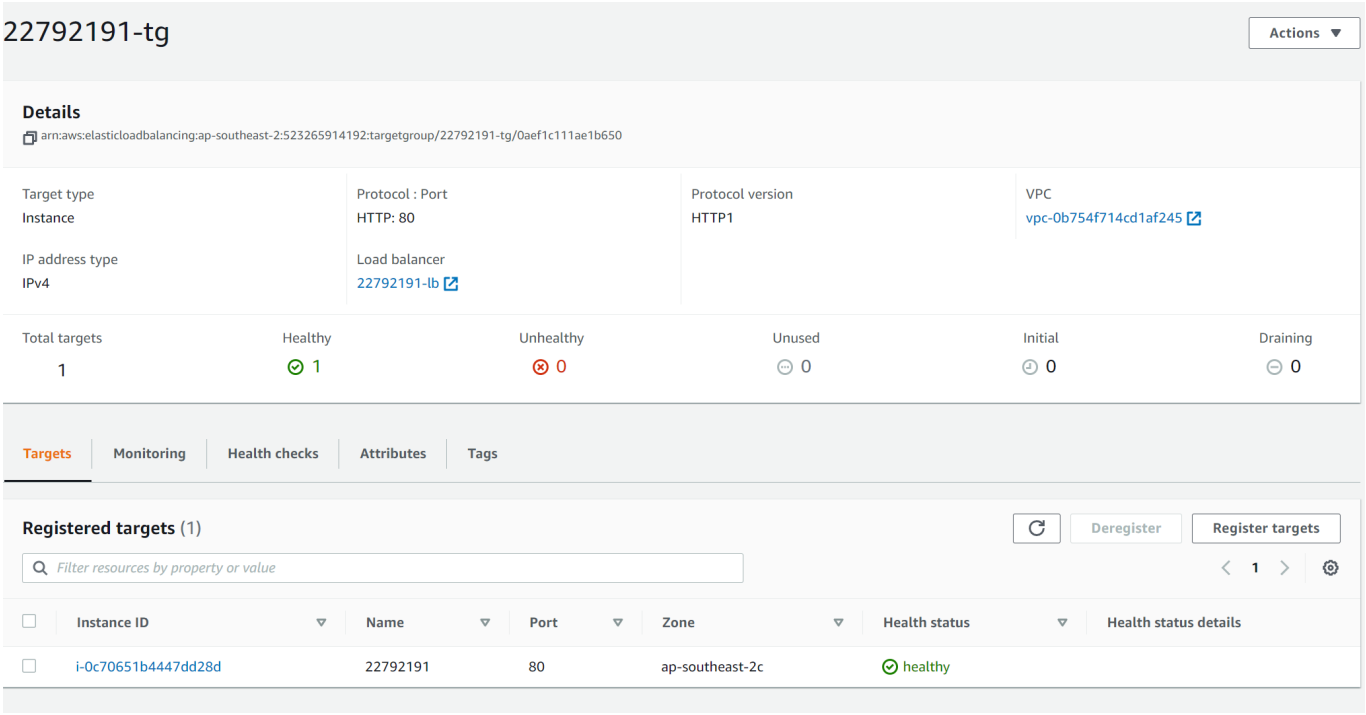
Change the path of the health check of the target group



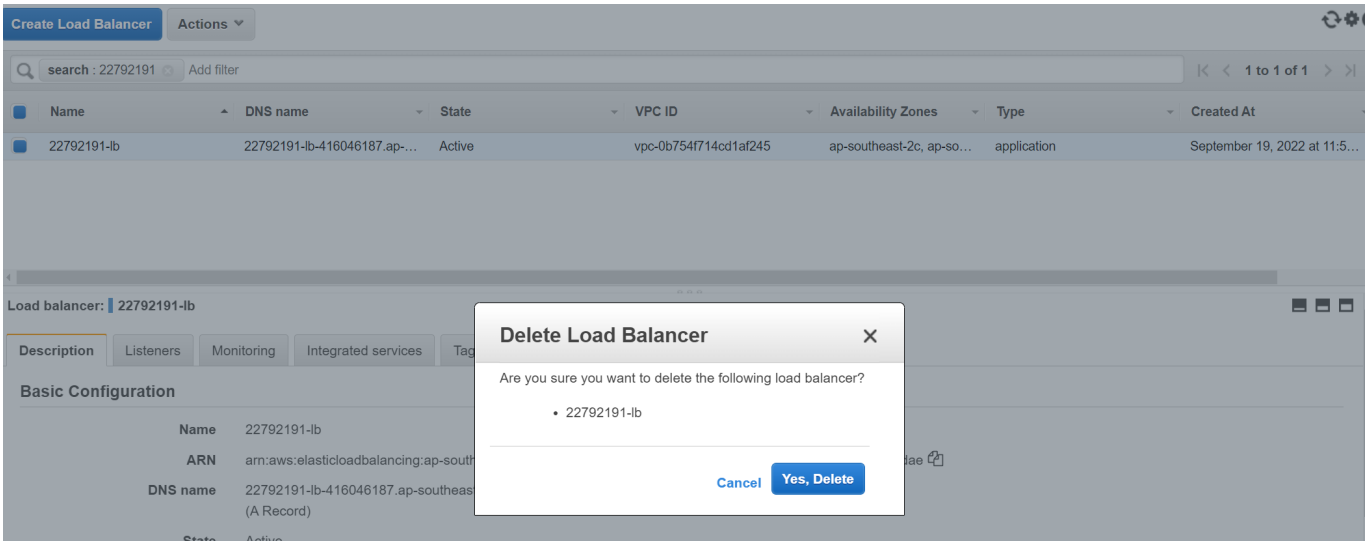
Register the instance into the target group `22792191-tg`

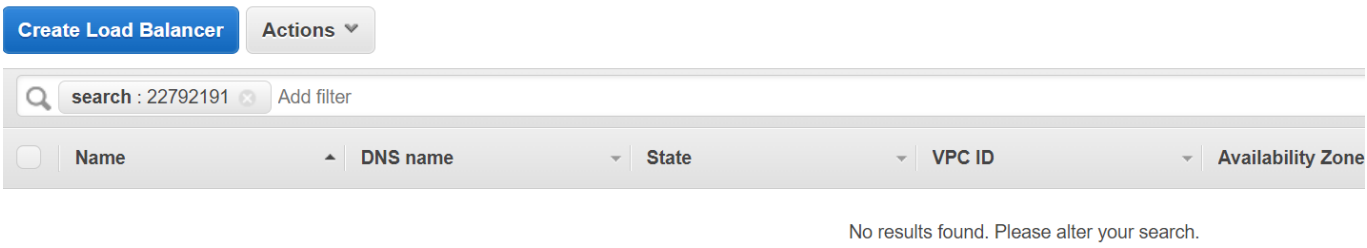


We can see that the instance is healthy now



Delete load balancer





Extension step

configure aws in the instance

```
root@ip-172-31-21-64:/home/ubuntu# apt-get install awscli
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

```
root@ip-172-31-21-64:/home/ubuntu# aws configure
AWS Access Key ID [None]: AKIAXTVIUGVICEVQLDGH
AWS Secret Access Key [None]: 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
Default region name [None]: ap-southeast-2
Default output format [None]: json
root@ip-172-31-21-64:/home/ubuntu#
```

Install DynamoDB and JRE in the instance

```
root@ip-172-31-21-64:/opt/wwc/mysites/lab/dynamodb# mkdir dynamodb
root@ip-172-31-21-64:/opt/wwc/mysites/lab/dynamodb# cd dynamodb
root@ip-172-31-21-64:/opt/wwc/mysites/lab/dynamodb/dynamodb# apt-get install default-jre
Reading package lists... Done
Building dependency tree... Done
```

```
root@ip-172-31-21-64:/opt/wwc/mysites/lab/dynamodb/dynamodb# wget https://s3-ap-northeast
-1.amazonaws.com/dynamodb-local-tokyo/dynamodb_local_latest.tar.gz
--2022-09-20 09:08:29--  https://s3-ap-northeast-1.amazonaws.com/dynamodb-local-tokyo/dyn
amodb_local_latest.tar.gz
Resolving s3-ap-northeast-1.amazonaws.com (s3-ap-northeast-1.amazonaws.com)... 52.219.12.
62
Connecting to s3-ap-northeast-1.amazonaws.com (s3-ap-northeast-1.amazonaws.com)|52.219.12
.62|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 44591273 (43M) [application/x-tar]
Saving to: ‘dynamodb_local_latest.tar.gz’

dynamodb_local_latest. 100%[=======================>]  42.53M  12.0MB/s    in 4.0s

2022-09-20 09:08:33 (10.7 MB/s) - ‘dynamodb_local_latest.tar.gz’ saved [44591273/44591273
]
```

```
root@ip-172-31-21-64:/opt/wwc/mysites/lab/dynamodb/dynamodb# ls
DynamoDBLocal.jar  LICENSE.txt  THIRD-PARTY-LICENSES.txt
DynamoDBLocal_lib  README.txt   dynamodb_local_latest.tar.gz
```

```
root@ip-172-31-21-64:/opt/wwc/mysites/lab/dynamodb/dynamodb# java -Djava.library.pat
h=./DynamoDBLocal_lib -jar DynamoDBLocal.jar -sharedDb
Initializing DynamoDB Local with the following configuration:
Port:   8000
InMemory:       false
DbPath: null
SharedDb:       false
shouldDelayTransientStatuses:   false
CorsParams:     null
```

Create a table in DynamoDB

```
root@ip-172-31-21-64:/home/ubuntu# aws dynamodb create-table --table-name
=MyTable --attribute-definitions AttributeName=userId,AttributeType=S Att
ributeName=elementName,AttributeType=S --key-schema AttributeName=userId,
KeyType=HASH AttributeName=elementName,KeyType=RANGE --provisioned-throug
hput ReadCapacityUnits=10,WriteCapacityUnits=10 --endpoint-url=http://127
.0.0.1:8000
{
    "TableDescription": {
        "AttributeDefinitions": [
            {
                "AttributeName": "userId",
                "AttributeType": "S"
            },
            {
                "AttributeName": "elementName",
                "AttributeType": "S"
            }
        ],
        "TableName": "MyTable",
        "KeySchema": [
            {
                "AttributeName": "userId",
                "KeyType": "HASH"
            },
            {
                "AttributeName": "elementName",
                "KeyType": "RANGE"
            }
        ],
        "TableStatus": "ACTIVE",
        "CreationDateTime": 1663665759.006,
        "ProvisionedThroughput": {
            "LastIncreaseDateTime": 0.0,
            "LastDecreaseDateTime": 0.0,
            "NumberOfDecreasesToday": 0,
            "ReadCapacityUnits": 10,
            "WriteCapacityUnits": 10
        },
        "TableSizeBytes": 0,
        "ItemCount": 0,
        "TableArn": "arn:aws:dynamodb:ddblocal:000000000000:table/MyTable
"
    }
}
```

Insert an element into the DynamoDB

```
root@ip-172-31-21-64:/opt/wwc# aws dynamodb put-item --table-name MyTable
 --item '{"id": {"S": "1"}, "userId":{"S": "1"}, "elementName": {"S":"tes
t"}}' --endpoint-url=http://127.0.0.1:8000
root@ip-172-31-21-64:/opt/wwc#
```

scan the table to see the element

```
root@ip-172-31-21-64:/opt/wwc# aws dynamodb scan --table-name MyTable --e
ndpoint-url=http://127.0.0.1:8000
{
    "Items": [
        {
            "userId": {
                "S": "1"
            },
            "id": {
                "S": "1"
            },
            "elementName": {
                "S": "test"
            }
        }
    ],
    "Count": 1,
    "ScannedCount": 1,
    "ConsumedCapacity": null
}
root@ip-172-31-21-64:/opt/wwc#
```

install boto3

```
root@ip-172-31-21-64:/opt/wwc/mysites# source venv/bin/activate
(venv) root@ip-172-31-21-64:/opt/wwc/mysites# pip3 install boto3
Collecting boto3
  Downloading boto3-1.24.76-py3-none-any.whl (132 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 132.5/132.5 KB 4.7 MB/s eta 0:00:00
Collecting botocore<1.28.0,>=1.27.76
  Downloading botocore-1.27.76-py3-none-any.whl (9.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 9.1/9.1 MB 48.2 MB/s eta 0:00:00
Collecting jmespath<2.0.0,>=0.7.1
```

Modify code in `polls/views.py`

```
 GNU nano 6.2                                    polls/views.py
from django.shortcuts import render

# Create your views here.
from django.http import HttpResponse
import boto3
from boto3.dynamodb.conditions import Key

TABLE = 'MyTable'

dynamodb = boto3.resource('dynamodb', region_name='ap-southeast-2', endpoint_url='http://localhost:8000')

table = dynamodb.Table(TABLE)

def index(request):
    response = table.query(KeyConditionExpression=Key('userId').eq('1'))

    return HttpResponse(response['Items'][0]['elementName'])
```

Modify nginx proxy port number into 8001 and restart service

```
        index index.html index.htm index.nginx-debian.html;

        server_name _;

        location / {
                # First attempt to serve request as file, then
                # as directory, then fall back to displaying a 404.
                # try_files $uri $uri/ =404;
                proxy_set_header X-Forwarded-Host $host;
                proxy_set_header X-Real-IP $remote_addr;
                proxy_pass http://127.0.0.1:8001;
        }

        # pass PHP scripts to FastCGI server
```

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# nano /etc/nginx/sites-enabled/default
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# service nginx restart
```

Deploy Django in 8001 port

```
(venv) root@ip-172-31-21-64:/opt/wwc/mysites/lab# python3 manage.py runserver 8001
Watching for file changes with StatReloader
Performing system checks...

System check identified no issues (0 silenced).

You have 18 unapplied migration(s). Your project may not work properly until you apply the migrations for app(s):
 admin, auth, contenttypes, sessions.
Run 'python manage.py migrate' to apply them.
September 20, 2022 - 09:56:39
Django version 4.1.1, using settings 'lab.settings'
Starting development server at http://127.0.0.1:8001/
Quit the server with CONTROL-C.
[20/Sep/2022 09:56:42] "GET /polls/ HTTP/1.0" 200 4
```

Open the browser and we can see the `elementName` value: "test" is displayed in the browser.

test