

Name: Abdurrahman Qureshi

Roll No: 242466

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Assignment No: 2

Aim: To Implement Continuous Deployment Using Ansible

What is Ansible?

Ansible is an open-source automation tool used for configuration management, application deployment, and IT orchestration. It operates on an agentless architecture, meaning no software needs to be installed on the managed systems. Users define a desired state for their infrastructure using simple, human-readable YAML files, and Ansible works to efficiently and reliably enforce that state across all targeted machines, ensuring consistency and reducing manual effort.

What key problem did Ansible's creators aim to solve that existing agent-based tools had not?

Before tools like Ansible, system administrators faced the challenge of manually configuring servers and applications, a slow and error-prone process. Scaling this manual effort for dozens or hundreds of servers was practically impossible. While other configuration tools existed, many required agents to be installed and maintained on every machine, adding complexity and security concerns that Ansible's creators sought to eliminate with a simpler, more robust solution.

Describe the role and structure of an Ansible Playbook in the automation process.

Ansible's approach is declarative and idempotent. Automation is defined in Playbooks, which are YAML files listing a set of tasks. These tasks use modular code to perform specific functions. The core engine connects to nodes via SSH (or WinRM for Windows), executes these modules, and ensures the system matches the declared state. A key feature is idempotency, meaning playbooks can be run safely multiple times without causing unintended changes.

How does the principle of idempotency provide a practical advantage in IT operations?

The primary advantage of Ansible is its simplicity and low barrier to entry, thanks to its agentless design and readable YAML syntax. This reduces management overhead and enhances security. Its idempotent nature ensures predictable and reliable outcomes. Furthermore, its powerful modules and extensive community support make it highly versatile for automating a wide range of tasks, from simple server configuration to complex multi-tier application deployments.

From a business perspective, why should an organization choose to implement Ansible?

You should use Ansible because it fundamentally simplifies IT automation. It saves significant time, eliminates manual errors, and ensures a consistent environment, which is crucial for stability and compliance. By treating your infrastructure as code, Ansible enables version control, repeatability, and seamless scaling. It is the pragmatic choice for organizations seeking to improve operational efficiency, accelerate deployments, and reliably manage complex infrastructure across hybrid environments.

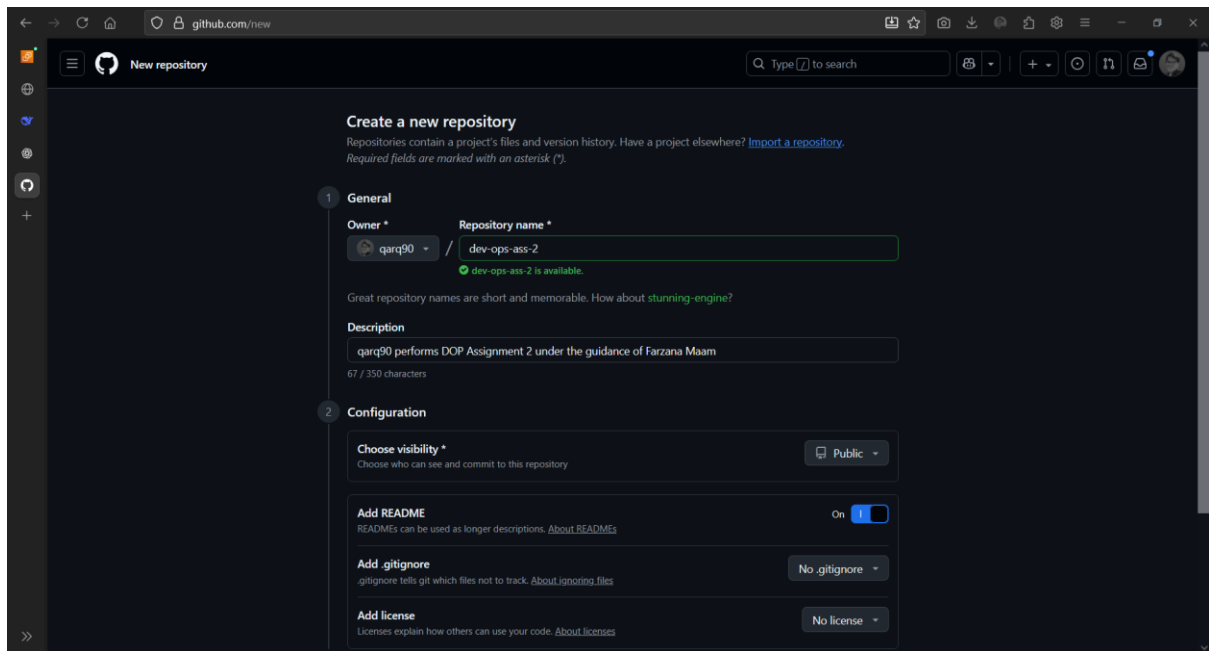
## Procedure:

```
qarq90@DESKTOP-H2RVSMQ: /mnt/c/Users/Abdurrahman Qureshi/Desktop$ sudo apt update
[sudo] password for qarq90:
Get:1 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease
Get:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [1281 kB]
Get:5 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:6 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1482 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [201 kB]
Get:8 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21.6 kB]
Get:9 http://security.ubuntu.com/ubuntu noble-security/main amd64 c-n-f Metadata [8744 B]
Get:10 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.3 kB]
Get:11 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Packages [1938 kB]
Get:12 http://archive.ubuntu.com/ubuntu noble-updates/main Translation-en [286 kB]
Get:13 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [175 kB]
Get:14 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1486 kB]
Get:15 http://security.ubuntu.com/ubuntu noble-security/restricted Translation-en [439 kB]
Get:16 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [377 kB]
Get:17 http://security.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [2848 kB]
Get:18 http://archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [468 kB]
Get:19 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:20 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [212 B]
Get:21 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:22 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [948 B]
Get:23 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7156 B]
Get:24 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [11.0 kB]
Get:25 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:26 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Fetched 18.6 MB in 6s (1631 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
qarq90@DESKTOP-H2RVSMQ: /mnt/c/Users/Abdurrahman Qureshi/Desktop$
```

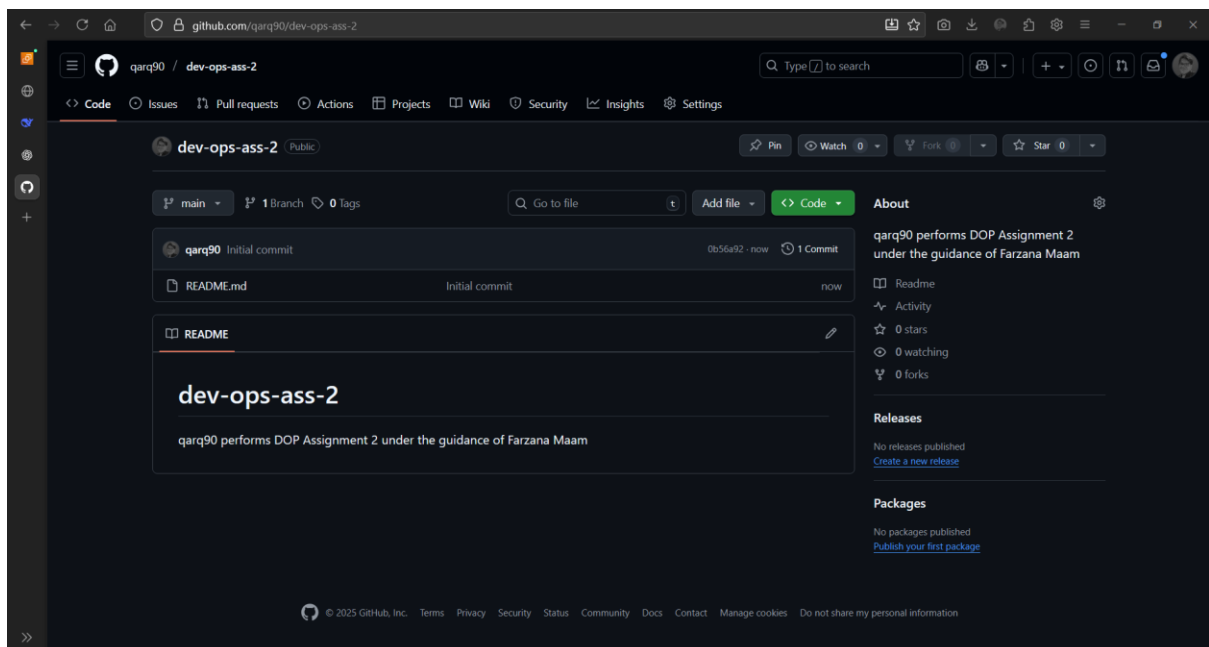
Updating package lists from repositories.

```
qarq90@DESKTOP-H2RVSMQ: /mnt/c/Users/Abdurrahman Qureshi/Desktop$
Enabling module authn_core.
Enabling module auth_basic.
Enabling module access_compat.
Enabling module authn_file.
Enabling module authz_user.
Enabling module alias.
Enabling module dir.
Enabling module autoindex.
Enabling module env.
Enabling module mime.
Enabling module negotiation.
Enabling module setenvif.
Enabling module filter.
Enabling module deflate.
Enabling module status.
Enabling module reqtimeout.
Enabling conf charset.
Enabling conf localized-error-pages.
Enabling conf other-vhosts-access-log.
Enabling conf security.
Enabling conf serve-cgi-bin.
Enabling site 000-default.
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /usr/lib/systemd/system/apache2.service.
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /usr/lib/systemd/system/apache-htcacheclean.service.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.6) ...
qarq90@DESKTOP-H2RVSMQ: /mnt/c/Users/Abdurrahman Qureshi/Desktop$ ansible --version
ansible [core 2.16.3]
  config file = None
  configured module search path = ['/home/qarq90/.ansible/plugins/modules', '/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python3/dist-packages/ansible
  ansible collection location = /home/qarq90/.ansible/collections:/usr/share/ansible/collections
  executable location = /usr/bin/ansible
  python version = 3.12.3 (main, Aug 14 2025, 17:47:21) [GCC 13.3.0] (/usr/bin/python3)
  jinja version = 3.1.2
  libyaml = True
qarq90@DESKTOP-H2RVSMQ: /mnt/c/Users/Abdurrahman Qureshi/Desktop$
```

Successfully Installed Ansible



## Creating New GitHub Repository



## Repository Created Successfully

```
qarq90@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop$ git clone https://github.com/qarq90/dev-ops-ass-2.git
Cloning into 'dev-ops-ass-2'...
remote: Enumerating objects: 3, done.
remote: Counting objects: 100% (3/3), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0 (from 0)
Receiving objects: 100% (3/3), done.
qarq90@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop$ ls
'Docker Desktop.lnk'  desktop.ini  dev-ops-ass-2  'dev-ops-ass-2'  'dev-ops-ass-2'
qarq90@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop$ cd dev-ops-ass-2
qarq90@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop/dev-ops-ass-2$ ls
README.md
qarq90@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop/dev-ops-ass-2$
```

## Repository Cloned

### index.html:

<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<title>Hello Page</title>

<style>

body {

display: grid;

grid-template-columns: repeat(3, 1fr);

grid-template-rows: repeat(3, 1fr);

gap: 10px;

height: 100vh;

margin: 0;

padding: 10px;

box-sizing: border-box;

font-family: 'Courier New', Courier, monospace;

}

img {

grid-column: 2;

grid-row: 1;

max-width: 100%;

height: auto;

justify-self: center;

align-self: center;

}

h1 {

grid-column: 2;

```
        grid-row: 2;
        text-align: center;
        margin: 0;
        align-self: center;
    }

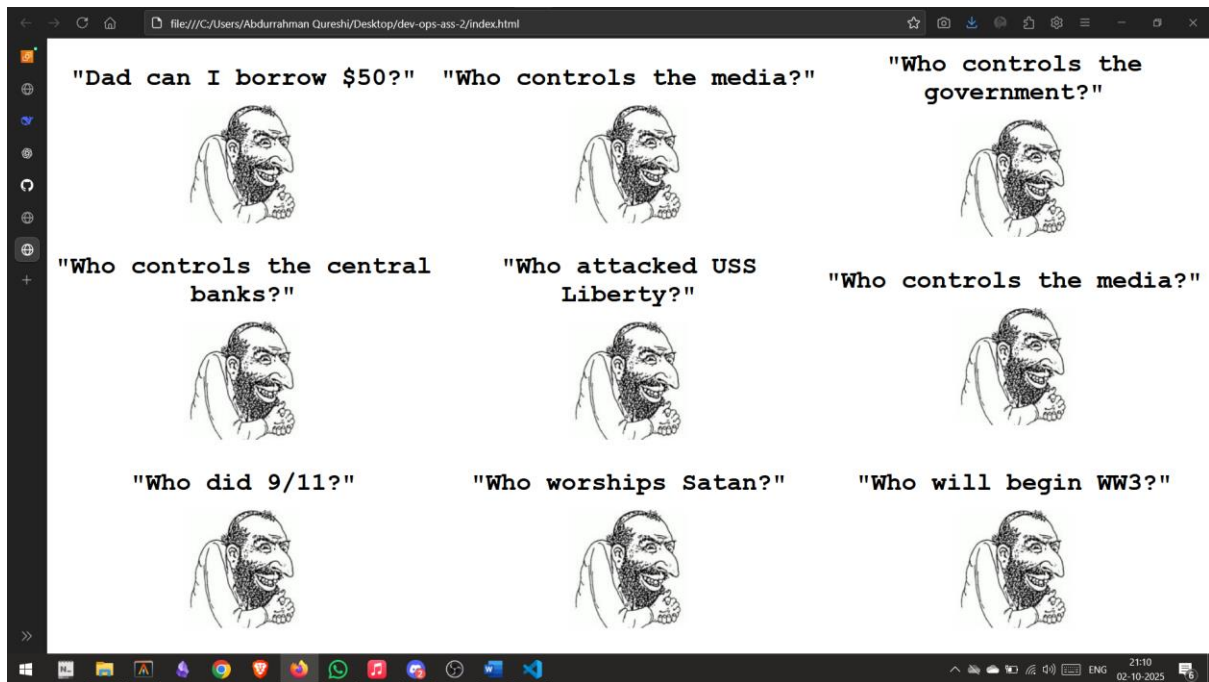
    div {
        display: flex;
        flex-direction: column;
        align-items: center;
        justify-content: center;
        gap: 16px;
    }
</style>
</head>

<body>
    <div>
        <h1>
            "Dad can I borrow $50?"
        </h1>
        
    </div>
    <div>
        <h1>
            "Who controls the media?"
        </h1>
        
    </div>
    <div>
        <h1>
            "Who controls the government?"
        </h1>
        
    </div>
    <div>
        <h1>
            "Who controls the central banks?"
        </h1>
        
    </div>
    <div>
        <h1>
            "Who attacked USS Liberty?"
        </h1>
    </div>
</body>
</html>
```

```

</div>
<div>
  <h1>
    "Who controls the media?"
  </h1>
  
</div>
<div>
  <h1>
    "Who did 9/11?"
  </h1>
  
</div>
<div>
  <h1>
    "Who worships Satan?"
  </h1>
  
</div>
<div>
  <h1>
    "Who will begin WW3?"
  </h1>
  
</div>
</body>

</html>
```

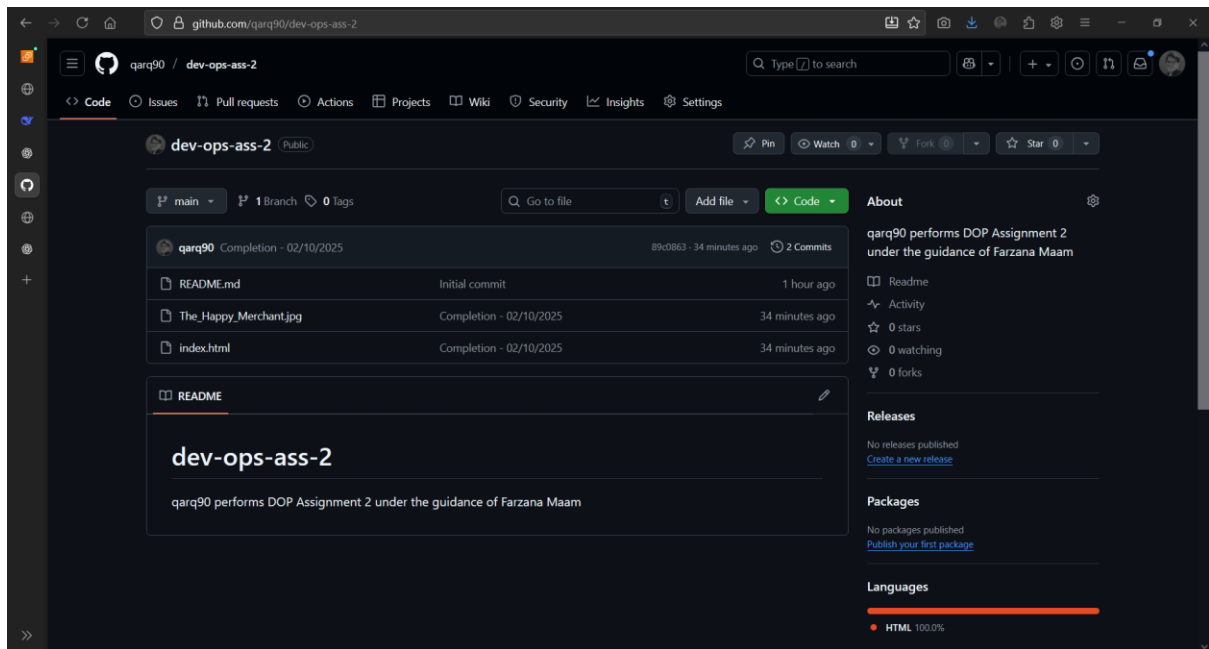


Output of index.html

```
qarq90@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop/dev-ops-ass-2$ git add .
qarq90@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop/dev-ops-ass-2$ git commit -m "Completion - 02/10/2025"
[main 89c0863] Completion - 02/10/2025
2 files changed, 104 insertions(+)
create mode 100644 The_Happy_Merchant.jpg
create mode 100644 index.html
```

Changes committed and pushed to repository



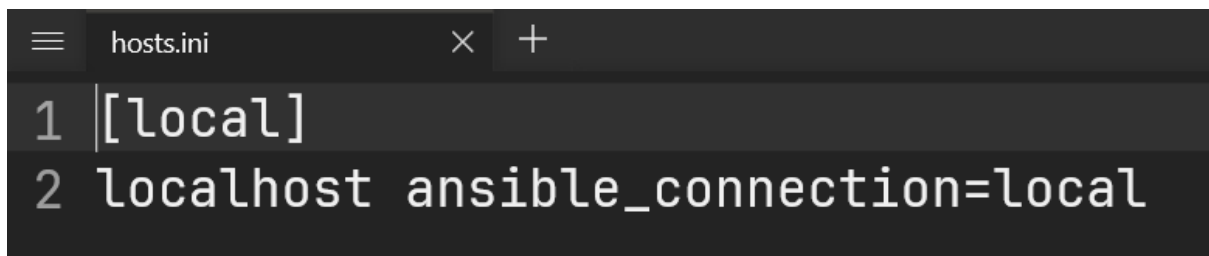


Repository Updated

hosts.ini

[local]

localhost ansible\_connection=local



deploy.yml

---

- name: Continuous Deployment on Localhost

hosts: local

become: yes

tasks:

- name: Install Apache Web Server

apt:

name: apache2

state: present

update\_cache: yes

- name: Configure Git safe directory  
command: git config --global --add safe.directory /var/www/html/app  
become: yes
- name: Remove existing app directory to avoid conflicts  
file:  
  path: /var/www/html/app  
  state: absent
- name: Pull code from GitHub  
git:  
  repo: 'https://github.com/qarq90/dev-ops-ass-2.git'  
  dest: /var/www/html/app  
  version: main  
  force: yes
- name: Copy ALL website files to root web folder  
copy:  
  src: /var/www/html/app/  
  dest: /var/www/html/  
  remote\_src: yes  
  owner: www-data  
  group: www-data  
  mode: '0755'
- name: Set proper permissions on web directory  
file:  
  path: /var/www/html  
  owner: www-data  
  group: www-data  
  mode: '0755'  
  recurse: yes
- name: Restart Apache  
service:  
  name: apache2  
  state: restarted:
- name: Install Apache Web Server  
apt:  
  name: apache2  
  state: present  
  update\_cache: yes
- name: Pull code from GitHub

git:

repo: 'https://github.com/qarq90/dev-ops-ass-2.git'

dest: /var/www/html/app

version: main

- name: Copy index.html to root web folder

copy:

src: /var/www/html/app/index.html

dest: /var/www/html/index.html

remote\_src: yes

- name: Restart Apache

service:

name: apache2

state: restarted

```

1 ---
2 - name: Continuous Deployment on Localhost
3   hosts: local
4   become: yes
5   tasks:
6     - name: Install Apache Web Server
7       apt:
8         name: apache2
9         state: present
10        update_cache: yes
11
12    - name: Configure Git safe directory
13      command: git config --global --add safe.directory /var/www/html/app
14      become: yes
15
16    - name: Remove existing app directory to avoid conflicts
17      file:
18        path: /var/www/html/app|
19        state: absent
20
21    - name: Pull code from GitHub
22      git:
23        repo: 'https://github.com/qarq90/dev-ops-ass-2.git'
24        dest: /var/www/html/app
25        version: main
26        force: yes
27
28    - name: Copy ALL website files to root web folder
29      copy:
30        src: /var/www/html/app/
31        dest: /var/www/html/
32        remote_src: yes
33        owner: www-data
34        group: www-data
35        mode: '0755'
36
37    - name: Set proper permissions on web directory
38      file:
39        path: /var/www/html
40        owner: www-data
41        group: www-data
42        mode: '0755'
43        recurse: yes
44
45    - name: Restart Apache
46      service:
47        name: apache2
48        state: restarted

```

deploy.yml File

```

qarq98@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop/ansible$ ansible-playbook -i hosts.ini deploy.yml --ask-become-pass
BECOME password:

PLAY [Continuous Deployment on Localhost] *****

TASK [Gathering Facts] *****
ok: [127.0.0.1]

TASK [Install Apache Web Server] *****
ok: [127.0.0.1]

TASK [Pull code from GitHub] *****
changed: [127.0.0.1]

TASK [Copy index.html to root web folder] *****
changed: [127.0.0.1]

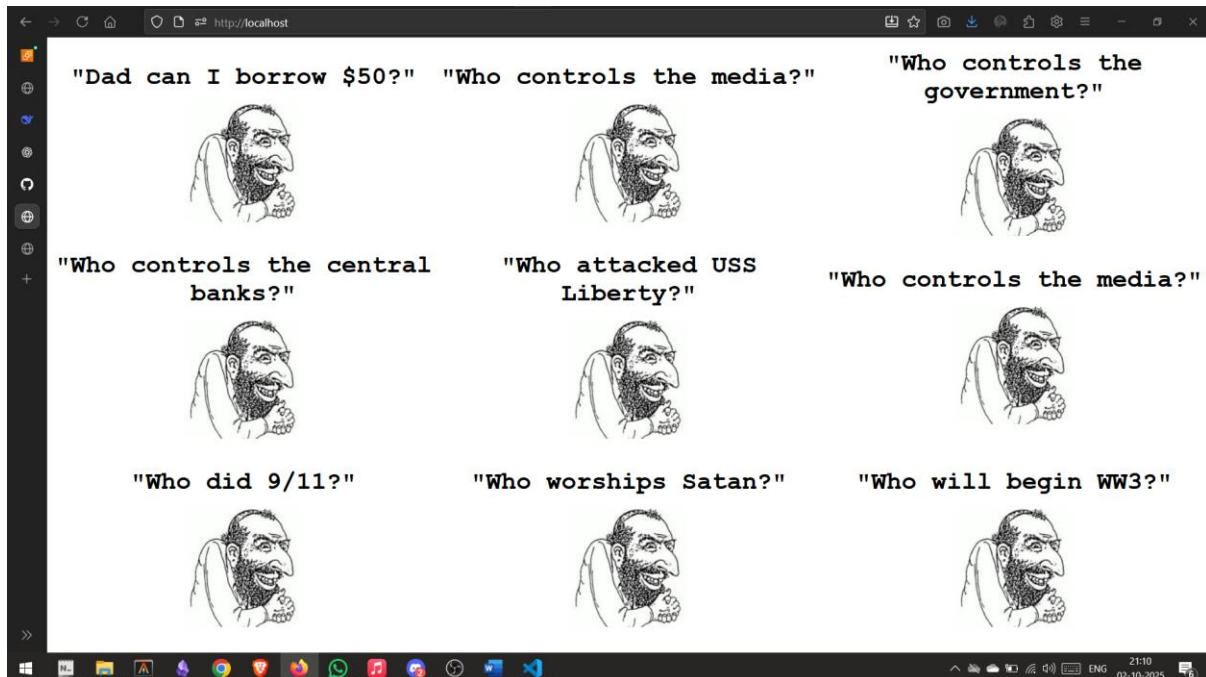
TASK [Restart Apache] *****
changed: [127.0.0.1]

PLAY RECAP *****
127.0.0.1 : ok=5 changed=3 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0

qarq98@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop/ansible$

```

Ansible Playbook executed successfully



Output on localhost

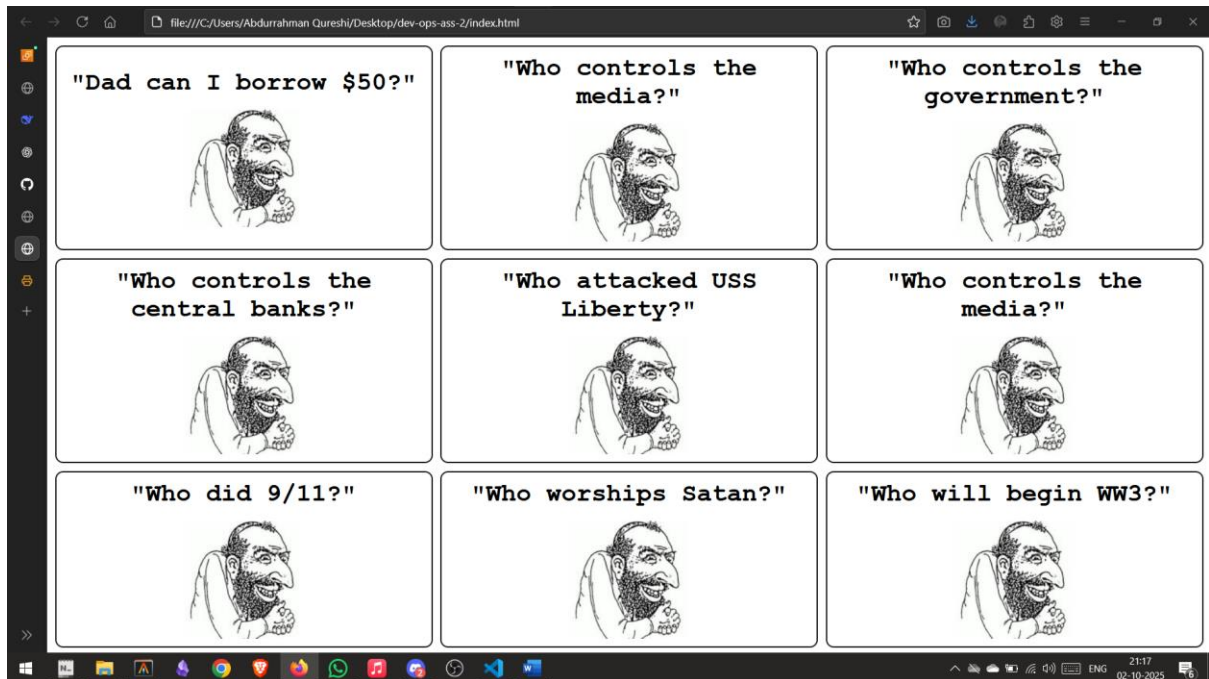
## Code Changes:

```

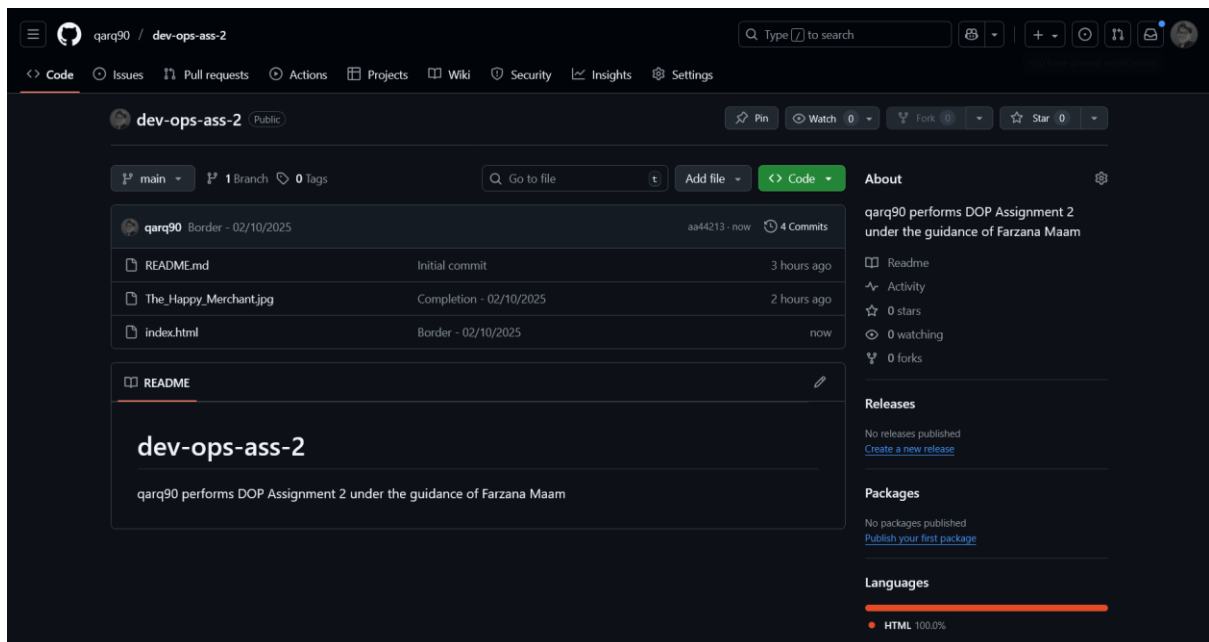
div {
  border: 2px black solid; // Added this Line
  border-radius: 10px;    // Added this Line
  padding: 10px;          // Added this Line
  box-sizing: border-box; // Added this Line
}

```

}



Output Changes (Added a border)



Changes pushed to repository

```

qarq98@DESKTOP-H2RV5MQ:/mnt/c/Users/Abdurrahman Qureshi/Desktop/ansible$ ansible-playbook -i hosts.ini deploy.yml --ask-become-pass
BECOME password:

PLAY [Continuous Deployment on Localhost] *****

TASK [Gathering Facts] *****
ok: [127.0.0.1]

TASK [Install Apache Web Server] *****
ok: [127.0.0.1]

TASK [Configure Git safe directory] *****
changed: [127.0.0.1]

TASK [Remove existing app directory to avoid conflicts] *****
changed: [127.0.0.1]

TASK [Pull code from GitHub] *****
changed: [127.0.0.1]

TASK [Copy ALL website files to root web folder] *****
changed: [127.0.0.1]

TASK [Set proper permissions on web directory] *****
changed: [127.0.0.1]

TASK [Restart Apache] *****
changed: [127.0.0.1]

PLAY RECAP *****
127.0.0.1 : ok=8 changed=6 unreachable=0 failed=0 skipped=0 rescued=0 ignored=0

```

Playbook executed again successfully



Latest changes reflected on localhost