The Plan:

- Enumerate Azure AD using Stormspotter

Auth'd Recon

Let's leverage Stormspotter to enumerate this Active Directory environment by first authenticating to Azure:

```
cd /shared
cnoio_stormspotter-client
```

We should see output similar to the following:

```
root@ip-10-0-1-241:/shared# cnoio_stormspotter-client
Unable to find image 'cnoio/stormspotter-client:latest' locally latest: Pulling from cnoio/stormspotter-client
...
Status: Downloaded newer image for cnoio/stormspotter-client:latest
root@b30c7bd18fe2:/#
```

Next run the "az login" command to log into azure via the cli:

```
az login
```

We should see output similar to the following:

```
root@b30c7bd18fe2:/# az login
To sign in, use a web browser to open the page https://microsoft.com/devicelogin and enter the code E7DQWLAKY to authenticate.
```

Follow the link https://microsoft.com/devicelogin to authenticate using your padawan credentials

- Username (### is your student number): padawan###@traintestrepeatstage2sec.onmicrosoft.com
- Password: h0w1N0w2BROWN321COW

We should see output similar to the following once we are fully authenticated via the Azure CLI:

```
root@abbfdeb45ea4:/shared# az login
To sign in, use a web browser to open the page https://microsoft.com/devicelogin and enter the code EAGBDHTEN to authenticate.
[
  {
    "cloudName": "AzureCloud",
    "homeTenantId": "5f1661aa-cb2e-47bb-b1cd-d2bc432974a5",
    "id": "74078d2e-d4de-4ca7-ad70-282472836afa",
    "isDefault": true,
    "managedByTenants": [],
    "name": "Pay-As-You-Go",
    "state": "Enabled",
    "tenantId": "5f1661aa-cb2e-47bb-b1cd-d2bc432974a5",
    "user": {
      "name": "padawan001@traintestrepeatstage2sec.onmicrosoft.com",
      "type": "user"
    }
  }
]
```

Next, we will enumerate Azure AD:

```
cd /shared
python3 /StormSpotter/stormcollector/sscollector.pyz cli --azure
```

```
root@abbfdeb45ea4:/shared# az login
To sign in, use a web browser to open the page https://microsoft.com/devicelogin and enter the code EAGBDHTEN to authenticate.
[
  {
    "cloudName": "AzureCloud",
    "homeTenantId": "5f1661aa-cb2e-47bb-b1cd-d2bc432974a5",
    "id": "74078d2e-d4de-4ca7-ad70-282472836afa",
    "isDefault": true,
    "managedByTenants": [],
    "name": "Pay-As-You-Go",
    "state": "Enabled",
    "tenantId": "5f1661aa-cb2e-47bb-b1cd-d2bc432974a5",
    "user": {
      "name": "padawan001@traintestrepeatstage2sec.onmicrosoft.com",
      "type": "user"
    }
  }
]
root@abbfdeb45ea4:/shared# python3 /StormSpotter/stormcollector/sscollector.pyz cli
2021-07-24 16:19:58.853 | INFO     | stormcollector.auth:_get_resource_creds_from_cli:73 - Authenticating to login.microsoftonline.com with CLI credentials.
2021-07-24 16:19:58.853 | INFO     | stormcollector.aad:query_aad:186 - Checking access for Azure AD: https://graph.windows.net
2021-07-24 16:19:58.854 | INFO     | stormcollector.arm:query_arm:128 - Starting enumeration for ARM - https://management.azure.com
2021-07-24 16:19:59.966 | INFO     | stormcollector.arm:query_arm:136 - Enumerating subscription and resource groups for tenant 5f1661aa-cb2e-47bb-b1cd-d2bc432
974a5
2021-07-24 16:20:00.038 | INFO     | stormcollector.arm:_query_management_certs:97 - Enumerating management certs for subscription: 74078d2e-d4de-4ca7-ad70-282
472836afa
2021-07-24 16:20:00.619 | WARNING  | stormcollector.arm:_query_management_certs:105 - Forbidden: Cannot enumerate management certs for 74078d2e-d4de-4ca7-ad70-
282472836afa
2021-07-24 16:20:00.619 | INFO     | stormcollector.arm:_query_rbac:75 - Enumerating rbac permissions for subscription: 74078d2e-d4de-4ca7-ad70-282472836afa
2021-07-24 16:20:13.007 | INFO     | stormcollector.arm:_query_rbac:91 - Finishing rbac permissions for subscription: 74078d2e-d4de-4ca7-ad70-282472836afa
2021-07-24 16:20:13.007 | INFO     | stormcollector.aad:query_aad:234 - Starting enumeration for Azure AD: https://graph.windows.net
2021-07-24 16:20:13.013 | INFO     | stormcollector.aad:query_objects:77 - Starting query for AADUser
2021-07-24 16:20:13.013 | INFO     | stormcollector.aad:query_objects:77 - Starting query for AADServicePrincipal
2021-07-24 16:20:13.013 | INFO     | stormcollector.aad:query_objects:77 - Starting query for AADApplication
2021-07-24 16:20:13.013 | INFO     | stormcollector.aad:query_objects:77 - Starting query for AADRole
2021-07-24 16:20:13.013 | INFO     | stormcollector.aad:query_objects:77 - Starting query for AADGroup
2021-07-24 16:20:13.290 | INFO     | stormcollector.arm:_query_subscription:49 - Querying for resources in subscription - 74078d2e-d4de-4ca7-ad70-282472836afa
2021-07-24 16:20:14.676 | INFO     | stormcollector.aad:query_objects:109 - Finished query for AADGroup
2021-07-24 16:20:14.888 | INFO     | stormcollector.aad:query_objects:109 - Finished query for AADUser
2021-07-24 16:20:15.136 | INFO     | stormcollector.aad:query_objects:109 - Finished query for AADRole
2021-07-24 16:20:16.247 | INFO     | stormcollector.aad:query_objects:109 - Finished query for AADApplication
2021-07-24 16:20:20.763 | INFO     | stormcollector.arm:_query_subscription:70 - Finished querying - 74078d2e-d4de-4ca7-ad70-282472836afa
2021-07-24 16:20:37.923 | INFO     | stormcollector.aad:query_objects:109 - Finished query for AADServicePrincipal
2021-07-24 16:20:37.923 | INFO     | main:main:120 - --- COMPLETE: 39.070257902145386 seconds. ---
2021-07-24 16:20:37.924 | INFO     | main:main:122 - Zipping up output...
2021-07-24 16:20:37.941 | INFO     | main:main:124 - OUTPUT: /shared/results_20210724-161958.zip
root@abbfdeb45ea4:/shared#
```

Note: Stormspotter collector sometimes hangs and/or is throttled while querying Azure graph, if this happens, wait a minute and try again. If it still fails, use the results file here $IMS-CC-FILEBASE$/results_20210725-201429.zip?canvas_download=1

Once we see output similar to the following...

```
root@b30c7bd18fe2:/shared# python3 /StormSpotter/stormcollector/sscollector.pyz cli --azure
2021-07-31 20:00:36.010 | INFO | stormcollector.auth:_get_resource_creds_from_cli:73 - Authenticating to login.microsoftonline.com with CLI credentials.
...
2021-07-31 20:01:07.338 | INFO | main:main:124 - OUTPUT: /shared/results_20210731-200035.zip
root@b30c7bd18fe2:/shared#
```

Next exit out of the docker container via the following command...

```
exit
```

We should see output similar to the following...

```
root@b30c7bd18fe2:/shared# exit
exit
root@ip-10-0-1-241:/shared#
```

Now we can analyze the results via the web interface for Stormspotter.

Start the web interface with the following command:

```
cnoio_stormspotter
```

We should see output similar to the following...

```
Starting stormspotter_stormspotter-neo4j_1 ... done
Starting stormspotter_stormspotter-frontend_1 ... done
Starting stormspotter_stormspotter-backend_1  ... done
Attaching to stormspotter_stormspotter-neo4j_1, stormspotter_stormspotter-frontend_1, stormspotter_stormspotter-backend_1
stormspotter-neo4j_1      | Selecting JVM - Version:11.0.12, Name:OpenJDK 64-Bit Server VM, Vendor:Oracle Corporation
stormspotter-frontend_1   |
stormspotter-frontend_1   |  Quasar CLI.......... v1.2.1
stormspotter-frontend_1   |  Listening at........ http://61c9b7fffadf:9091
stormspotter-frontend_1   |  Web server root..... /usr/src/app
stormspotter-frontend_1   |  Gzip................ enabled
stormspotter-frontend_1   |  Cache (max-age)..... 86400
stormspotter-frontend_1   |  Micro-cache......... 1s
stormspotter-frontend_1   |  History mode........ enabled
stormspotter-frontend_1   |  Index file.......... index.html
stormspotter-frontend_1   |
stormspotter-backend_1    | INFO:     Started server process [1]
stormspotter-backend_1    | INFO:     Waiting for application startup.
stormspotter-backend_1    | INFO:     Application startup complete.
stormspotter-backend_1    | INFO:     Uvicorn running on http://0.0.0.0:9090 (Press CTRL+C to quit)
stormspotter-neo4j_1      | Changed password for user 'neo4j'.
stormspotter-neo4j_1      | 2021-07-24 16:48:37.308+0000 INFO  Starting...
stormspotter-neo4j_1      | 2021-07-24 16:48:38.239+0000 INFO  ======== Neo4j 4.3.2 ========
stormspotter-neo4j_1      | 2021-07-24 16:48:38.745+0000 INFO  org.neo4j.internal.kernel.api.security.AbstractSecurityLog$SecurityLogLine@69d021c1
stormspotter-neo4j_1      | 2021-07-24 16:48:38.745+0000 INFO  org.neo4j.internal.kernel.api.security.AbstractSecurityLog$SecurityLogLine@6d5508a5
stormspotter-neo4j_1      | 2021-07-24 16:48:38.864+0000 INFO  Bolt enabled on 0.0.0.0:7687.
stormspotter-neo4j_1      | 2021-07-24 16:48:39.287+0000 INFO  Remote interface available at http://localhost:7474/
stormspotter-neo4j_1      | 2021-07-24 16:48:39.289+0000 INFO  Started.
```

Open a second SSH session to your Public EC2's Instance.

Determine your Public EC2's Instance's Internet IP Address:

```
curl ipcurl.net/n
```

We should see output similar to the following (e.g. the IP Address of our Public EC2 instance is 3.129.90.235):

```
root@ip-10-0-1-241:~# curl ipcurl.net/n
3.129.90.235
root@ip-10-0-1-241:~#
```

You will need to find the file name of the output file created from StormSpotter...

We can use the following command to find it...

```
ls -alF /shared/results_*-*.zip
```

We should see output similar to the following....

```
root@ip-10-0-1-241:~# ls -alF /shared/results_*-*.zip
-rw-r--r-- 1 root root 24107 Jul 31 20:01 /shared/results_20210731-200035.zip
root@ip-10-0-1-241:~#
```

Upload the results file to the Stormspotter API using the following command (replace "`results_20210801-202634.zip`" with the results file you created earlier with Stormspotter collector)

```
curl -F 'upload=@/shared/results_20210801-202634.zip' http://localhost:9090/api/upload
```

We should see output similar to the following:

```
root@ip-10-0-1-241:~# curl -F 'upload=@/shared/results_20210731-200035.zip' http://localhost:9090/api/upload

{"status":"Upload Success"}

root@ip-10-0-1-241:~#
```

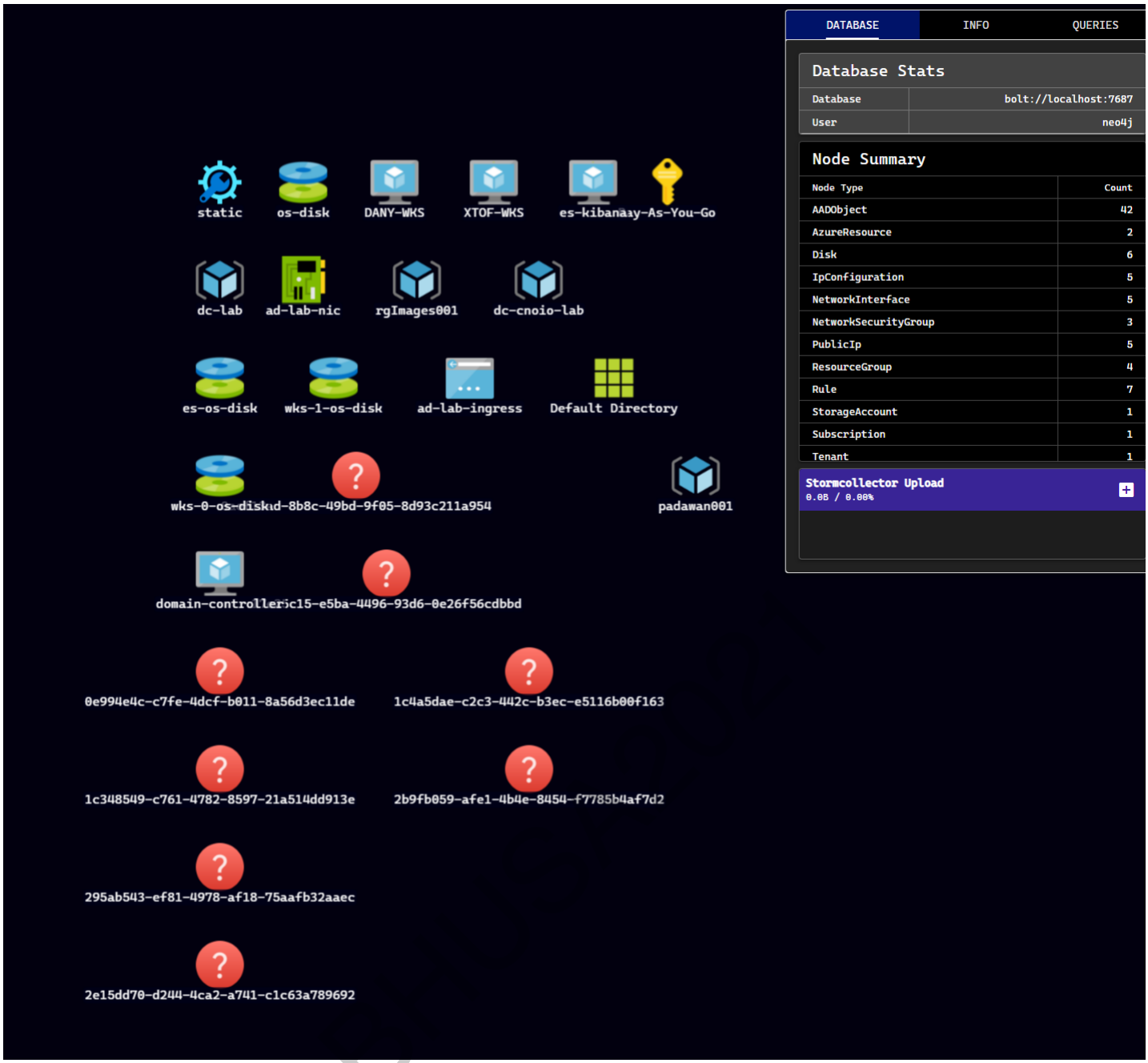
And then browse to the web interface (replacing ip.ip.ip.ip with your EC2 instance's public IP address e.g. 3.129.90.235):

```
http://ip.ip.ip.ip:9091/
```

Login using:

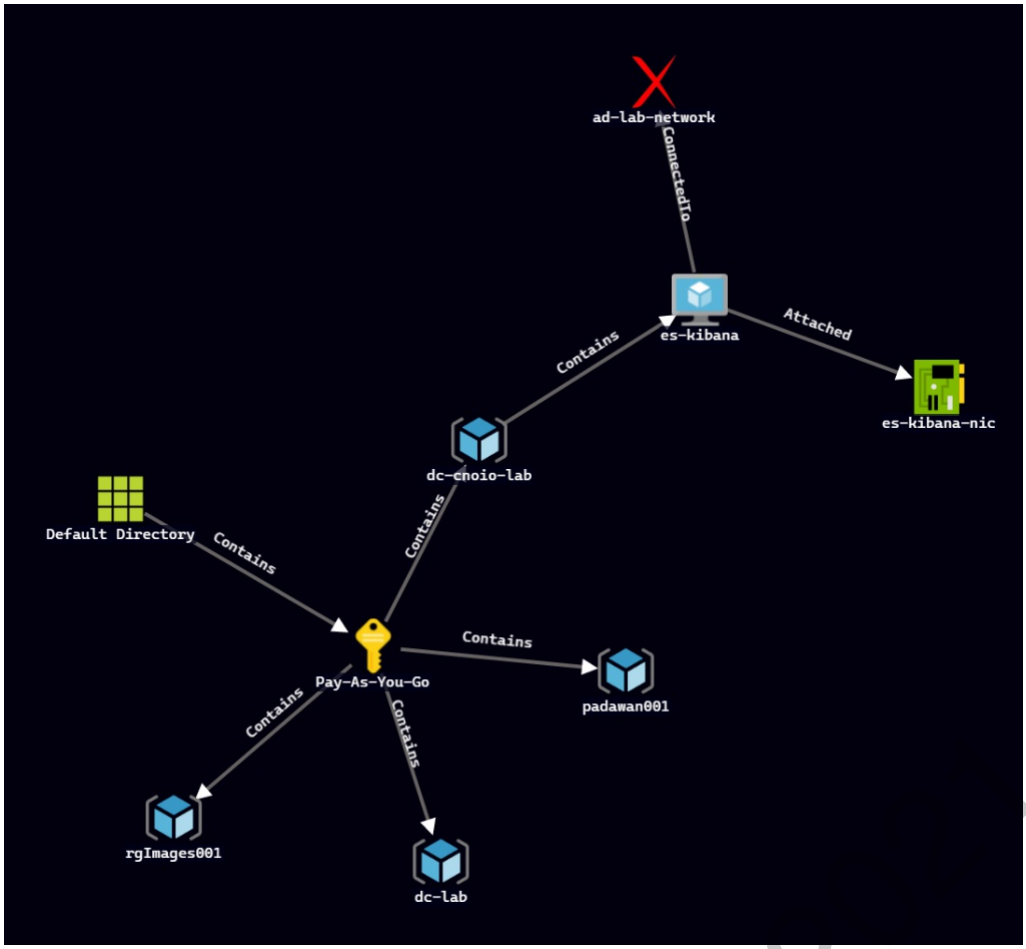
- Username: neo4j
- Password: password
- Server: bolt://ip.ip.ip.ip:7687

NOTE: Make sure to change localhost to your public IP in the server field!



From the interface, you can click on nodes (icons) and expand relationships between objects

We should see output similar to the following:



References:

https://www.synacktiv.com/en/publications/azure-ad-introduction-for-red-teamers.html

https://github.com/LMGsec/o365creeper

https://doubleoctopus.com/security-wiki/threats-and-tools/password-spraying/#:~:text=Password%20spraying%20is%20an%20attack,account%20by%20guessing%20the%20password.

https://www.coalfire.com/The-Coalfire-Blog/March-2019/Password-Spraying-What-to-Do-and-How-to-Avoid-It

https://www.youtube.com/watch?v=SG2ibjuzRJM