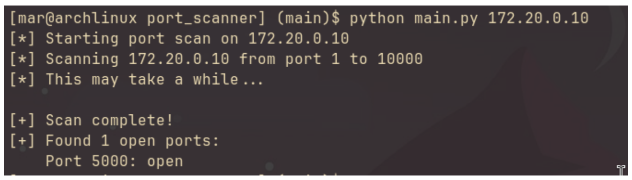
Executive Summary

Part 1: Reconnaissance

Using the initial starter code to verify socket and docker networking working properly, I was able to discover port 5000 on `172.20.0.10` was open.

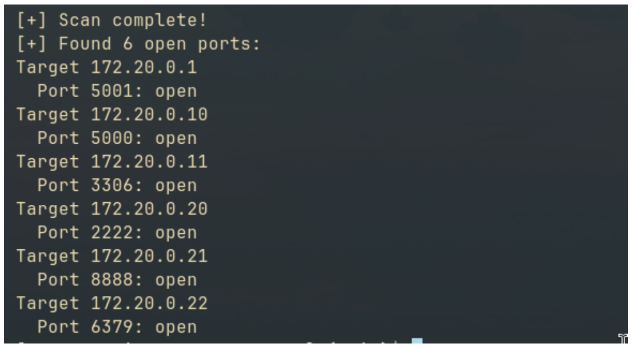


```
[mar@archlinux port_scanner] (main)$ python main.py 172.20.0.10
[*] Starting port scan on 172.20.0.10
[*] Scanning 172.20.0.10 from port 1 to 10000
[*] This may take a while...

[+] Scan complete!
[+] Found 1 open ports:
    Port 5000: open
```

Figure 1: Basic socket test to find port 5000

After implementing some input handling with `argparse`, CIDR handling with `ipaddress`, and threading, I ran `python main.py --target 172.10.0.0/24 --ports 1-10000 --threads 10000` and got the results below.



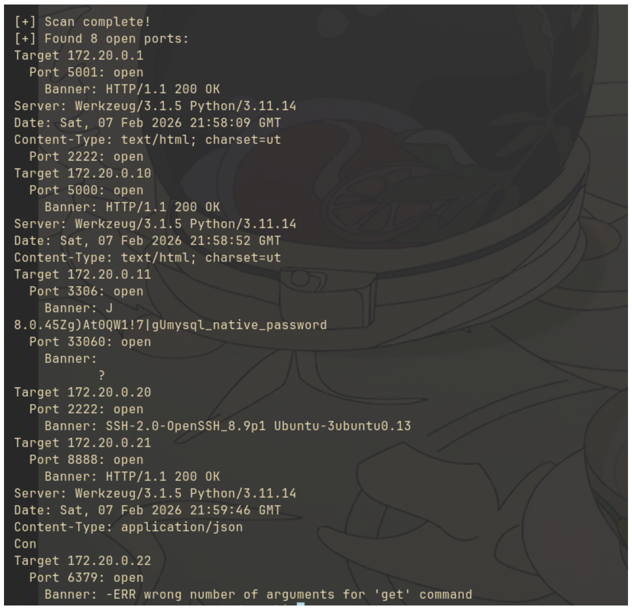
```
[+] Scan complete!
[+] Found 6 open ports:
Target 172.20.0.1
  Port 5001: open
Target 172.20.0.10
  Port 5000: open
Target 172.20.0.11
  Port 3306: open
Target 172.20.0.20
  Port 2222: open
Target 172.20.0.21
  Port 8888: open
Target 172.20.0.22
  Port 6379: open
```

Figure 2: Some open ports on the `172.10.0.0/24`

Implementing some level of banner grabbing by going through some common probing techinques onto the same subnet and ports on Figure 3. This is ran wit all ports `1-65535` to get all ports I'm not certain why `172.20.0.1:2222` appears to allow a socket connection now when Figure 2 doesn't have it open.
Regardless, based on these banners, the services for these ports are

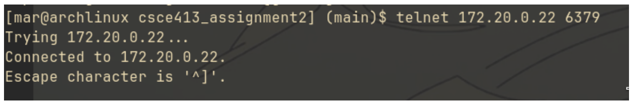
- `172.20.0.1:5001` - `http`
- `172.20.0.10:5000` - `http`
- `172.20.0.11:3306` - `mysql`
- `172.20.0.11:33060` - Unknown
- `172.20.0.20:2222` - `ssh`
- `172.20.0.21:8888` - `http`
- `172.20.0.22:6379` - `telnet`

where the last one knowledge that in `telnet`, `get` is a command and can verify by trying to connect via `telnet`, seen in Figure 4.



```
[+] Scan complete!
[+] Found 8 open ports:
Target 172.20.0.1
  Port 5001: open
    Banner: HTTP/1.1 200 OK
Server: Werkzeug/3.1.5 Python/3.11.14
Date: Sat, 07 Feb 2026 21:58:09 GMT
Content-Type: text/html; charset=ut
  Port 2222: open
Target 172.20.0.10
  Port 5000: open
    Banner: HTTP/1.1 200 OK
Server: Werkzeug/3.1.5 Python/3.11.14
Date: Sat, 07 Feb 2026 21:58:52 GMT
Content-Type: text/html; charset=ut
Target 172.20.0.11
  Port 3306: open
    Banner: J
8.0.45Zg)At0QW1!7|gUmysql_native_password
  Port 33060: open
    Banner:
           ?
Target 172.20.0.20
  Port 2222: open
    Banner: SSH-2.0-OpenSSH_8.9p1 Ubuntu-3ubuntu0.13
Target 172.20.0.21
  Port 8888: open
    Banner: HTTP/1.1 200 OK
Server: Werkzeug/3.1.5 Python/3.11.14
Date: Sat, 07 Feb 2026 21:59:46 GMT
Content-Type: application/json
Con
Target 172.20.0.22
  Port 6379: open
    Banner: -ERR wrong number of arguments for 'get' command
```

Figure 3: Banner grabbing on `172.10.0.0/24`



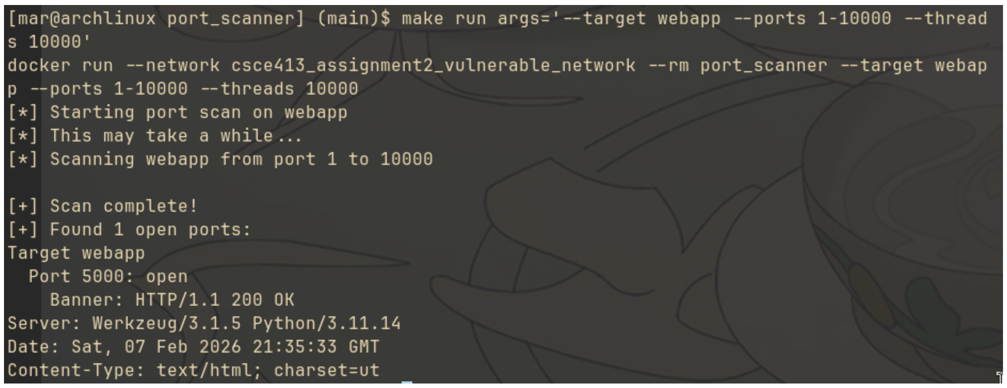
```
[mar@archlinux csce413_assignment2] (main)$ telnet 172.20.0.22 6379
Trying 172.20.0.22...
Connected to 172.20.0.22.
Escape character is '^]'.
```

Figure 4: Telnet connection on `172.10.0.22:6379`

Connecting to `172.20.0.11:33060` with `nc`, all I get is the `?` as seen in the banner and no other information. I was not able to determine what this service could possibly be.
Accessing the SSH server, credentials are shown when connecting with `ssh`, I was able to read out the flag `FLAG{h1dd3n_s3rv1c3s_n33d_pr0t3ct10n}`.
Viewing the website at `172.20.0.10:5000`, it suggests going to the route `/api/secrets`, which returns the flag `FLAG{n3tw0rk_tr4ff1c_1s_n0t_s3cur3}`. It notes this is the api token.
Curling these http services, at `172.20.0.21:8888`, it appears to be some sort of api route. Here it says that there's a flag route that also needs a token with hint to intercept network traffic, which is likely refering the the flag I got noted to be api token. Based on this description, it likely for part 2 regarding analyzing network traffic.

```
{
  "authentication": {
    "alternative": "?token=<token> query parameter",
    "header": "Authorization: Bearer <token>",
    "hint": "The token can be found by intercepting network traffic...",
    "type": "Bearer token"
  },
  "endpoints": [
    {
      "description": "API information",
      "method": "GET",
      "path": "/"
    },
    {
      "description": "Health check",
      "method": "GET",
      "path": "/health"
    },
    {
      "description": "Get flag (requires authentication)",
      "method": "GET",
      "path": "/flag"
    },
    {
      "description": "Get secret data (requires authentication)",
      "method": "GET",
      "path": "/data"
    }
  ],
  "message": "This is a hidden API service. Authentication required.",
  "port": 8888,
  "service": "Secret API Server",
  "status": "running",
  "version": "1.0"
}
```

To show that domain names work, I set up running the python script within a docker container so it can resolve the domain names, which are the container names in the network. This can be seen in Figure 5.



```
[mar@archlinux port_scanner] (main)$ make run args='--target webapp --ports 1-10000 --thread
s 10000'
docker run --network csce413_assignment2_vulnerable_network --rm port_scanner --target webap
p --ports 1-10000 --threads 10000
[*] Starting port scan on webapp
[*] This may take a while...
[*] Scanning webapp from port 1 to 10000

[+] Scan complete!
[+] Found 1 open ports:
Target webapp
  Port 5000: open
    Banner: HTTP/1.1 200 OK
Server: Werkzeug/3.1.5 Python/3.11.14
Date: Sat, 07 Feb 2026 21:35:33 GMT
Content-Type: text/html; charset=ut
```

Figure 5: Domain name resolution of `webapp`

To summarize,

- `172.20.0.1:5001` - `http` using Werkzeug/3.1.5 with Python 3.11.14 (Flask server)
- `172.20.0.10:5000` - `http` using Werkzeug/3.1.5 with Python 3.11.14 (Flask server). Has corresponding flag `FLAG{n3tw0rk_tr4ff1c_1s_n0t_s3cur3}`
- `172.20.0.11:3306` - `mysql`
- `172.20.0.11:33060` - Unknown
- `172.20.0.20:2222` - `ssh` with OpenSSH 8.9 on Ubuntu

- `172.20.0.21:8888` - `http` using Werkzeug/3.1.5 with Python 3.11.14 (Flask server)
- `172.20.0.22:6379` - `telnet`

Part 2: MITM Attack

Part 3: Security Fixes

Port Knocking

Honeypot

Remediation Recommendations

Conclusion