# MOP Website Vulnerability Scanning

## Document Purpose

In this document I run through the steps for performing some basic MOP website vulnerability scanning using two methods:

1. Nikto Scanning Tools.
2. Manually identifying vulnerabilities through different approaches.

Manually identifying vulnerabilities is a valuable learning objective as it enhances my understanding of website security principles beyond automated scanning approaches like Nikto which specifically send HTTP requests to the target server to efficiently analyse responses.

# Nikto Vulnerability Scanning Tool

**Install Nikto using following command** – **Sudo apt install nikto**

```
┌──(kali㉿kali)-[~]
└─$ sudo apt install nikto
```

- Super/Substitute user do (sudo) – enables root commands. A root user does not need permissions.
- Advanced Package Tool (apt) simplifies installation by resolving package dependencies (required libraries and components are installed).
- (https://www.kali.org/tools/nikto/)

## Basic Nikto Scan of MOP Website

**Run scan of MOP Website** – **nikto -h https://react-test-6najyje5cq-uc.a.run.app/**

- -h option is used to specify the target host to scan, allowing users to provide the hostname or IP address of the target server or website.

```
┌──(kali㉿kali)-[~]
└─$ nikto -h https://react-test-6najyje5cq-uc.a.run.app/
- Nikto v2.5.0
---------------------------------------------------------------------------
+ Multiple IPs found: 216.239.36.53, 216.239.38.53, 216.239.34.53, 216.239.32.53, 2001:4860:4802:34::3
5, 2001:4860:4802:38::35, 2001:4860:4802:36::35, 2001:4860:4802:32::35
+ Target IP:          216.239.36.53
+ Target Hostname:    react-test-6najyje5cq-uc.a.run.app
+ Target Port:        443
---------------------------------------------------------------------------
+ SSL Info:        Subject:  /CN=*.a.run.app
                   Ciphers:  TLS_AES_256_GCM_SHA384
                   Issuer:   /C=US/O=Google Trust Services LLC/CN=GTS CA 1C3
+ Start Time:         2024-03-30 19:18:24 (GMT-4)
---------------------------------------------------------------------------
+ Server: Google Frontend
+ /: The anti-clickjacking X-Frame-Options header is not present. See: https://developer.mozilla.org/e
n-US/docs/Web/HTTP/Headers/X-Frame-Options
+ /: Uncommon header 'x-cloud-trace-context' found, with contents: 859f1577c0cb3d4a65c7423b803e60f3.
+ /: The site uses TLS and the Strict-Transport-Security HTTP header is not defined. See: https://deve
loper.mozilla.org/en-US/docs/Web/HTTP/Headers/Strict-Transport-Security
+ /: An alt-svc header was found which is advertising HTTP/3. The endpoint is: ':443'. Nikto cannot te
st HTTP/3 over QUIC. See: https://developer.mozilla.org/en-US/docs/Web/HTTP/Headers/alt-svc
+ /: The X-Content-Type-Options header is not set. This could allow the user agent to render the conte
nt of the site in a different fashion to the MIME type. See: https://www.netsparker.com/web-vulnerabil
ity-scanner/vulnerabilities/missing-content-type-header/
```

## Scan Findings:

- Server is hosted on Google Cloud Platform, utilising Google Frontend.
- SSL certificate information issued by Google Trust Services LLC.
- Target or primary IP address: **216.239.36.53**
- Multiple other IP addresses are found and listed.
- Target Port: **443**

## Headers

Headers are components of HTTP requests and responses providing message metadata, including type of content being sent, server details, cookies, and caching directives. They facilitate communication between clients and servers, enabling various functionalities such as authentication, content negotiation, and security.

Header Findings:

- **X-Frame-Options Header Missing**: This helps prevent clickjacking attacks by restricting how the page can be embedded in frames.
- **Strict-Transport-Security Header Missing**: This header that instructs browsers to only interact with the website over HTTPS is not defined. SSL-stripping attack vulnerability.
- **X-Content-Type-Options Header Missing**: The X-Content-Type-Options header, which prevents MIME-sniffing attacks by instructing the browser to respect the declared content type, is not set. Its absence could potentially lead to content rendering issues.
- **Alt-Svc Header Present for HTTP/3**: The Alt-Svc header indicates that the site supports HTTP/3, an evolving protocol that improves web performance and security. However, Nikto cannot directly test HTTP/3 over QUIC, so further testing may be necessary.
- **Uncommon Header x-cloud-trace-context**: A header named x-cloud-trace-context was found, indicating some form of tracing, or debugging mechanism.

## Other Scan Observations

- Nikto did not find any Common Gateway Interface (CGI) directories on the server. CGI directories can sometimes be vulnerable to various security issues if not properly configured.
- Wildcard Certificate Used: The web server is using a wildcard SSL/TLS certificate issued for the domain "*.a.run.app," to secure multiple subdomains under the same certificate.

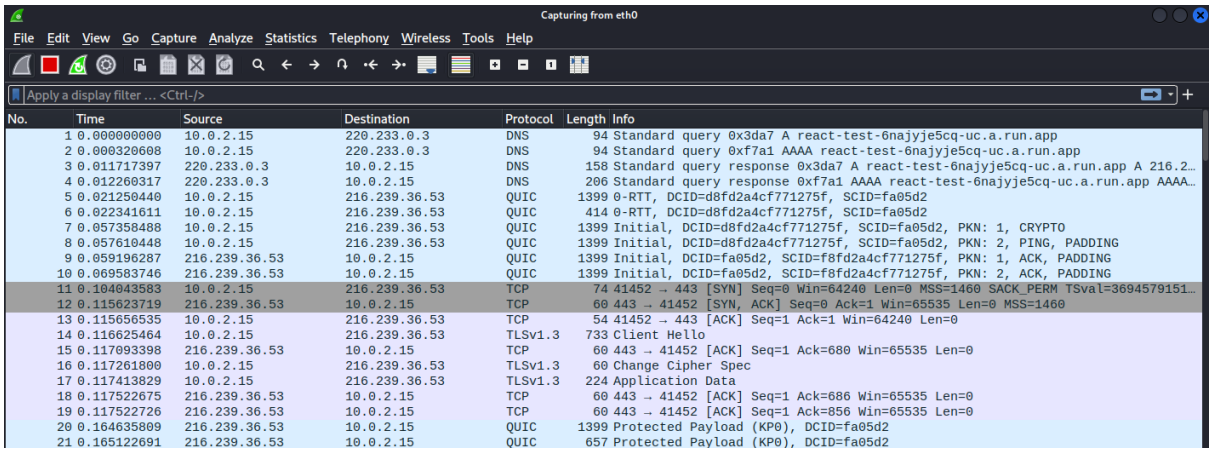
## Next Steps

The Nikto scan reveals some preliminary information including some possible vulnerabilities of the MOP website in its current form. The next steps could include addressing missing security headers like X-Frame-Options and Strict-Transport-Security, further investigation of HTTP/3 support indicated by the Alt-Svc header and ensuring proper CGI directory configuration for enhanced security.

# Manual Website Observation

## Target IP Address

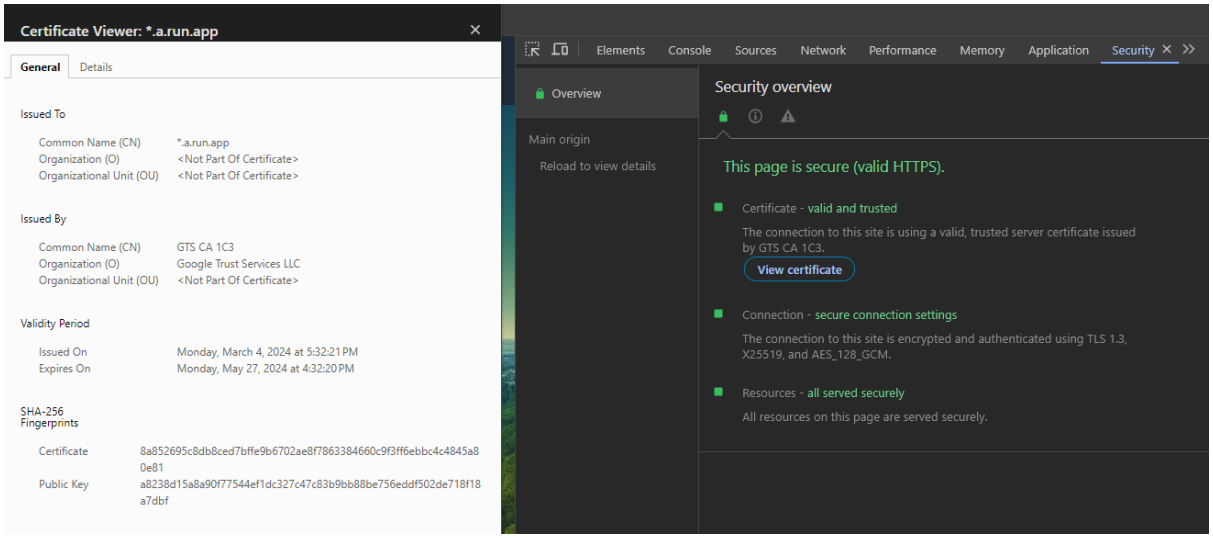
- Using Wireshark to observe my network traffic, I can observe the interaction with the IP address **216.239.36.53** as I load the MOP webpage.




- The IP address facilitates communication with Google's servers, handling various aspects of webpage loading including Domain Name Server (DNS) resolution, Quick UDP Internet Connection (QUIC) traffic for faster and more secure communication, TCP handshake, and TLS handshake.

## SSL Certificate

- Secure Sockets Layer certificate authenticates the identity of a website and enables secure encrypted communication between a web browser and a web server.
- Navigate via Chrome Options: *More Tools → Developer Tools → Security Tab*




- This certificate information confirms that the website is secured using SSL/TLS encryption and is issued by a trusted Certificate Authority (Google Trust Services LLC). It also provides details about the validity period of the certificate.

## Multiple IP Addresses

**Run nslookup** – **nslookup react-test-6najyje5cq-uc.a.run.app**

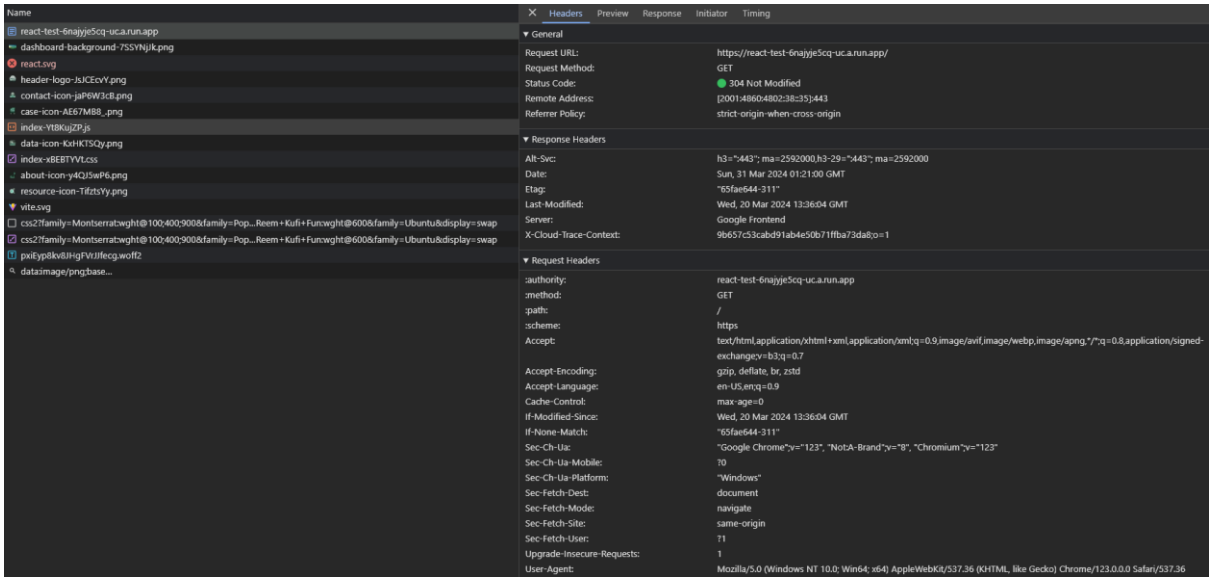
- nslookup is a command-line tool to query for information about domain names.
- Multiple IP addresses might be used for redundancy, load balancing, or serving different regions for a given domain.

```
┌──(kali㉿kali)-[~]
└─$ nslookup react-test-6najyje5cq-uc.a.run.app
Server:         220.233.0.3
Address:        220.233.0.3#53

Non-authoritative answer:
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 216.239.36.53
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 216.239.38.53
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 216.239.34.53
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 216.239.32.53
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 2001:4860:4802:34::35
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 2001:4860:4802:38::35
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 2001:4860:4802:36::35
Name:   react-test-6najyje5cq-uc.a.run.app
Address: 2001:4860:4802:32::35
```

## Header Recognition

- Navigate via Chrome Options: *More Tools → Developer Tools → Network Tab*
- After reloading the page, I can observe a list of network requests appearing in the Network tab. From here I can select and view the specific headers sent and received during the request-response cycle.



# MOP Website Port Scanning

## Port Scanning

Port scanning is important because it helps identify an applications open ports, providing insights into potential services running and associated vulnerabilities. By understanding the exposed services better security measures can be implemented.

## NMAP

- Nmap is a network scanning tool used to discover hosts and services on a network - creating a map of the network.
- Below I scan the MOP domain using: **nmap react-test-6najyje5cq-uc.a.run.app**

```
┌──(kali㉿kali)-[~]
└─$ nmap react-test-6najyje5cq-uc.a.run.app

Starting Nmap 7.93 ( https://nmap.org ) at 2024-03-30 23:16 EDT
Nmap scan report for react-test-6najyje5cq-uc.a.run.app (216.239.36.53)
Host is up (0.014s latency).
Other addresses for react-test-6najyje5cq-uc.a.run.app (not scanned): 216.239.38.53 216.239.34.53 216.
239.32.53 2001:4860:4802:34::35 2001:4860:4802:38::35 2001:4860:4802:36::35 2001:4860:4802:32::35
Not shown: 998 filtered tcp ports (no-response)
PORT    STATE SERVICE
80/tcp  open  http
443/tcp open  https

Nmap done: 1 IP address (1 host up) scanned in 4.62 seconds
```

- The scan identified two open ports: **port 80 for HTTP** and **port 443 for HTTPS**.
- Below I observe the open ports of the other identified addresses:

```
┌──(kali㉿kali)-[~]
└─$ nmap 216.239.38.53
Starting Nmap 7.93 ( https://nmap.org ) at 2024-03-31 00:28 EDT
Nmap scan report for 216.239.38.53
Host is up (0.013s latency).
Not shown: 998 filtered tcp ports (no-response)
PORT    STATE SERVICE
80/tcp  open  http
443/tcp open  https

Nmap done: 1 IP address (1 host up) scanned in 7.02 seconds

┌──(kali㉿kali)-[~]
└─$ nmap 216.239.34.53
Starting Nmap 7.93 ( https://nmap.org ) at 2024-03-31 00:28 EDT
Nmap scan report for 216.239.34.53
Host is up (0.015s latency).
All 1000 scanned ports on 216.239.34.53 are in ignored states.
Not shown: 1000 filtered tcp ports (no-response)

Nmap done: 1 IP address (1 host up) scanned in 62.72 seconds
```

- The results remain consistent when scanning IP addresses associated with the 216.239.38.53, 216.239.38.54, etc. Ports 80 and 443 are open on all scanned IP addresses, suggesting the same web services are accessible from multiple IP addresses.
- I also use Nmap flags -sV -sC for service version detection and additional information.

## Next Steps

To enhance vulnerability detection further I will conduct comprehensive vulnerability scanning using tools like Nessus or OpenVAS, coupled with manual inspection to identify potential misconfigurations and less common vulnerabilities.