



# Driving OWASP ZAP with Selenium



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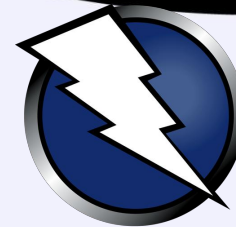
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- OWASP Zed Attack Proxy (ZAP)



“The OWASP Zed Attack Proxy (ZAP) is one of the world’s most popular free security tools and is actively maintained by hundreds of international volunteers. It can help you **automatically find security vulnerabilities** in your web applications while you are developing and testing your applications. Its also a great tool for experienced pentesters to use for **manual security testing.**”

[https://www.owasp.org/index.php/OWASP\\_Zed\\_Attack\\_Proxy\\_Project](https://www.owasp.org/index.php/OWASP_Zed_Attack_Proxy_Project)



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- Selenium



***“Selenium automates browsers.*** That's it! What you do with that power is entirely up to you. Primarily, it is for automating web applications for testing purposes, but is certainly not limited to just that. Boring web-based administration tasks can (and should!) be automated as well.”

<https://www.seleniumhq.org/>



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- Objective

To use OWASP ZAP, to detect web application vulnerabilities in a CI/CD pipeline

- Problem

Web applications have **Basic Authentication, User Logins** and **Form Validation** which stops ZAP in its tracks



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- Solution

Use Selenium scripts to drive ZAP

A project may already have Selenium scripts

ZAP does have Zest scripts but Selenium is more widely known and may already be being maintained on a project



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- ZAP's Passive and Active Scans

**Passive** scans record the requests and responses sent to a web app and creates alerts for detected vulnerabilities

**Active** scans actively modify the recorded requests and responses to determine further vulnerabilities



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- Pipeline Steps

1. Start ZAP
2. Run Selenium Scripts (Passive Scan)
3. Wait for Passive scan to complete
4. Start Active Scan
5. Wait for Active scan to complete
6. Retrieve alerts and report





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- Start ZAP

```
zap.sh \  
-daemon \  
-host some-host \  
-port some-port \  
-config api.addrs.addr.regex=true  
-config api.disablekey=true
```

```
zap.sh - A start up script provided by ZAP  
-daemon - Start in a headless configuration  
-host - The ZAP host  
-port - The ZAP port  
-config api.addrs.addr.regex=true - Allow any source IP to connect  
-config api.disablekey=true - Execute ZAP API endpoints without the need  
for an API key
```

A Docker image called **owasp/zap2docker-bare** exists which can be used to start ZAP



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## Selenium Driver Settings

```
// Set Chrome Options
ChromeOptions chromeOptions = new ChromeOptions();
chromeOptions.addArguments("--ignore-certificate-errors");

// Set proxy
String proxyAddress = "ZAP-HOST:8888";
Proxy proxy = new Proxy();
proxy.setHttpProxy(proxyAddress)
    .setSslProxy(proxyAddress);

// Set Desired Capabilities
DesiredCapabilities capabilities = DesiredCapabilities.chrome();
capabilities.setCapability(CapabilityType.PROXY, proxy);
capabilities.setCapability(CapabilityType.ACCEPT_SSL_CERTS, true);
capabilities.setCapability(CapabilityType.ACCEPT_INSECURE_CERTS,
    true);
capabilities.setCapability(ChromeOptions.CAPABILITY, chromeOptions);
```



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- Security Response Headers

If the target web application has security response headers in place, specifically **Strict-Transport-Security** the web driver should be configured as follows

```
chromeOptions.addArguments("--ignore-certificate-errors");  
capabilities.setCapability(CapabilityType.ACCEPT_SSL_CERTS, true);  
capabilities.setCapability(CapabilityType.ACCEPT_INSECURE_CERTS, true);
```



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- **Passive Scan**

A passive scan is run when Selenium drives the Web Driver through the ZAP proxy

The passive scan creates the scan tree and allows ZAP to be knowledgeable enough about the web application to perform the active scan



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- Wait for Passive Scan

There will always be a short delay for ZAP to complete the passive scan, before alerts and reports are available

The status of a passive active scan is determined by running endpoint **JSON/pscan/view/recordsToScan**

The passive scan is complete when 0 is returned



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```
wait_for_passive_scan_to_complete() {  
  
    STATUS_URL="http://$1:$2/"  
    STATUS_URL+="JSON/pscan/view/recordsToScan/"  
    STATUS_URL+="zapapiformat=JSON&"  
    STATUS_URL+="formMethod=GET&"  
  
    SCAN_STATUS=0  
    until [ $SCAN_STATUS -eq 0 ]; do  
        sleep 10  
  
        # Get Scan status  
        SCAN_STATUS_RES=$(curl -s $STATUS_URL)  
  
        # Parse scan status  
        SCAN_STATUS=$(echo $SCAN_STATUS_RES | jq -r '.recordsToScan')  
  
        # Display status  
        echo Scan $SCAN_STATUS% complete  
  
    done  
  
    echo Passive Scan Complete  
}  
  
wait_for_passive_scan_to_complete $ZAP_HOST $ZAP_PORT
```



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- Start Active Scan

An active scan is started by running endpoint  
**JSON/ascan/action/scan**

If ZAP is reachable, this endpoint returns a new Scan ID



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```
start_active_scan() {  
  
    SCAN_URL="http://$1:$2/"  
    SCAN_URL+="JSON/ascan/action/scan/"  
    SCAN_URL+="zapapiformat=JSON&"  
    SCAN_URL+="formMethod=GET&"  
    SCAN_URL+="url=https://$3&"  
  
    # Start Active ZAP Scan  
    SCAN_ID_RES=$(curl -s $SCAN_URL)  
  
    # Parse for scan ID  
    SCAN_ID=$(echo $SCAN_ID_RES | jq -r '.scan')  
  
    # Display scan ID  
    echo Scan ID: $SCAN_ID  
}  
  
ZAP_HOST="localhost"  
ZAP_PORT="8080"  
TARGET="my-app.azurewebsites.net"  
  
start_active_scan $ZAP_HOST $ZAP_PORT $TARGET
```





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- Wait for Active Scan

The status of an active scan is determined by running endpoint **JSON/ascan/view/status**

If the scan exists, a value between 0 and 100 is returned, representing the percentage of the scan which has completed



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```
wait_for_active_scan_to_complete() {  
  
    STATUS_URL="http://$1:$2/"  
    STATUS_URL+="JSON/ascan/view/status/?"  
    STATUS_URL+="zapapikey=JSON&"  
    STATUS_URL+="apikey=&"  
    STATUS_URL+="formMethod=GET&"  
    STATUS_URL+="scanId=$SCAN_ID"  
  
    SCAN_STATUS=0  
    until [ $SCAN_STATUS -eq 100 ]; do  
        sleep 10  
  
        # Get Scan status  
        SCAN_STATUS_RES=$(curl -s $STATUS_URL)  
  
        # Parse scan status  
        SCAN_STATUS=$(echo $SCAN_STATUS_RES | jq -r '.status')  
  
        # Display status  
        echo Scan $SCAN_STATUS% complete  
  
    done  
  
    echo Active Scan Complete  
}
```

```
wait_for_active_scan_to_complete $ZAP_HOST $ZAP_PORT
```



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- **Get Scan Results**

Once the active scan is complete, the alerts in the form of a JSON file and an HTML report can be retrieved from ZAP

Alerts: **JSON/core/view/alerts**

Report: **OTHER/core/other/htmlreport**



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- Get Alerts

```
get_alerts() {  
  
    ALERTS_URL="http://$1:$2/"  
    ALERTS_URL+="JSON/core/view/alerts/?"  
    ALERTS_URL+="zapapiformat=JSON&"  
    ALERTS_URL+="formMethod=GET&"  
    ALERTS_URL+="baseurl=https://$3&"  
  
    curl -s $ALERTS_URL > alerts.json  
}
```

```
get_alerts $ZAP_HOST $ZAP_PORT $TARGET
```



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- Get Report

```
get_report() {  
  
    REPORT_URL="http://$1:$2/"  
    REPORT_URL+="OTHER/core/other/htmlreport/"  
    REPORT_URL+="formMethod=GET"  
  
    curl -s $REPORT_URL > report.html  
}  
  
get_report $ZAP_HOST $ZAP_PORT
```



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- **Bonus**

If you are targeting a web application with **Strict-Transport-Security** and you are using a browser, you will need to add ZAP's Dynamic SSL Certificate to your browser.

To retrieve the ZAP's SSL certificate do either:

1. **ZAP -> Preferences -> Options -> Dynamic SSL Certificate**
2. **HTTP GET ZAP\_HOST:ZAP\_PORT://OTHER/core/other/rootcert**

To import the ZAP SSL Certificate into Firefox:

**Settings -> Privacy & Security -> View Certificates -> Authorities -> Import**



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Thank You