Complete OWASP ZAP Guide

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12 min read · Sep 4, 2024

Having trouble finding an OWASP ZAP tutorial that shows you how to use it effectively?

ZAP is an extremely powerful tool for end-to-end testing. It is often used by people who want to take an in-depth look at a web application.

In this tutorial, we'll walk you through its setup and show you an overview of its main interface and some of its features. We will shortly discuss the comparison between ZAP and Burp Suite and show you how to run tests with ZAP.

We'll show you how to use spidering, passive and active scanning, and give you a good start on using ZAP. As you gain confidence, you will be able to discover its other tools.

If you're ready to learn how to use ZAP, let's get started.

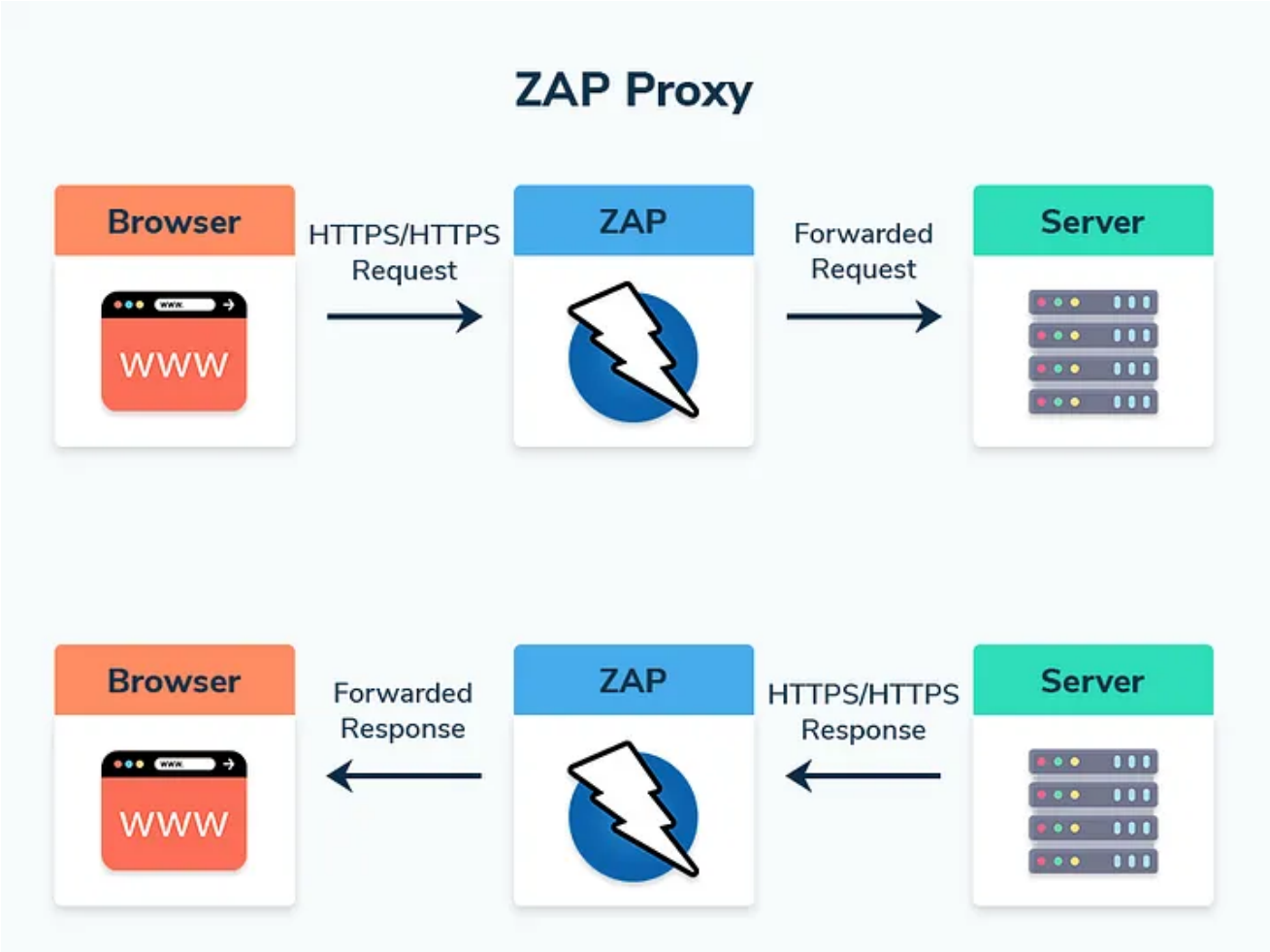
What is ZAP?

Zed Attack Proxy (ZAP) is an open source penetration testing tool, formerly known as OWASP ZAP. It is a multi-dimensional tool often used by penetration testers, bug bounty hunters and developers to scan web applications for security risks during the application testing process.

ZAP offers many features including active and passive scanning and API testing capabilities.

In essence, it is a proxy that acts as a "manipulator-in-the-middle". It allows you to see all the requests you make to a web application and all the responses you receive from it, enabling you to identify vulnerabilities and potential attack vectors in real time.

By intercepting and modifying the traffic between your browser and the web application, ZAP helps you understand how the application behaves under different scenarios and conditions.



ZAP proxy

ZAP can be installed on Windows, Linux and macOS. Docker images are also available. We will show you how to install it on Kali Linux.

The ZAP Open Source Program

ZAP recently joined the Software Security Project (SSP) as one of its founding projects. Despite being free and open source, ZAP has grown into the most popular web scanning tool worldwide and competes directly with commercial projects.

We spoke to Simon Bennetts, the project's founder, who admitted: "We're competing against commercial companies with hundreds of employees... So it's tough."

ZAP is a not-for-profit company run entirely by Bennetts and supported by a small team of dedicated volunteers.

Acknowledging this challenge, Bennetts said, “We’re always looking for people to contribute — ZAP is a shared project.” This call for community involvement speaks volumes for ZAP’s collaborative approach. See ZAP’s contribution guide for ways to get involved.

The project depends on sponsors to raise money, and the Crash Override Open Source Fellowship supports its development. However, ZAP will remain independent.

ZAP encourages users to contribute to the Software Security Project (SSP) to help fund ZAP and other important open source projects.

ZAP with Numbers

Title Statistics for February 2024:

- Number of ZAP starts: 4.708.566
- Number of active scans: 922.722
- Number of notifications: 1.123.926.095
- Number of active scan messages sent: 3.274.968.334

ZAP vs. Burp Suite

ZAP and Burp Suite are similar tools for web application security. However, ZAP is faster and lighter than Burp Suite, and it’s open source and free.

The free version of Burp Suite may be limited in its functionality. There is a paid version with more advanced features, but many of these tools are already included in ZAP.

For example, Burp Suite’s auto-scan feature is only available in its professional version, while ZAP has the same functionality called “ATTACK Mode.”

Burp Suite has an intruder tool, although it is limited to single-core operation. ZAP has an equivalent tool called “Fuzzer.”

ZAP also has features not found in the Burp Suite, such as an automation framework that allows you to control ZAP via a YAML file and a HUD (heads-up display). With the HUD, you can use your favorite ZAP features inside the browser.

Burp Suite to ZAP Feature Map

Burp Suite ZAP Collaborator (Community) OAST Support Add-on Compare Diff Decoder Encoder DOM Invader Eval Villian Add-on Extender Marketplace, Scripts Intercept breakpoints Intruder (Throttled) Fuzzer Live scan (Community) ATTACK Mode Project Files (Community) Session Files proxy proxy Repeater Manual Request Editor, Requestor Add-on Scanner (Community) Active Scanner Sequencer Token Generation and Analysis Target contexts

Setting up Zed Attack Proxy on Kali Linux

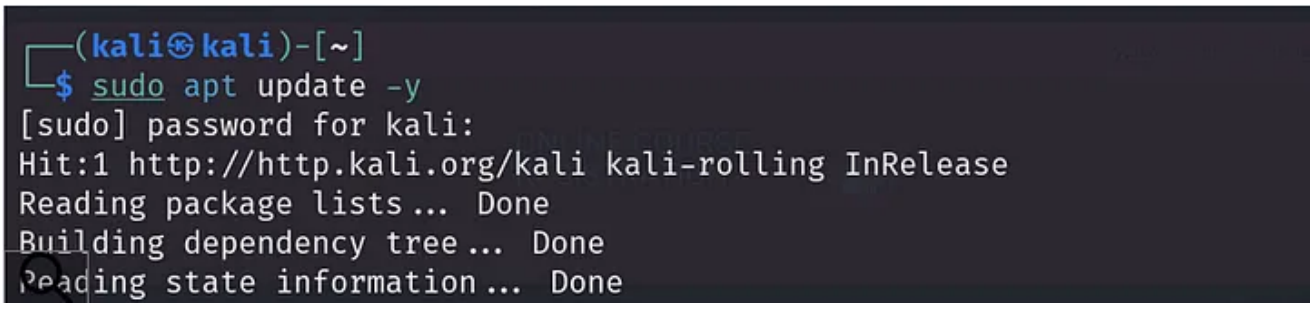
Let’s go through the ZAP installation process from start to finish.

Installing ZAP on Kali Linux

ZAP is not installed in the current version of Kali, which is 2024.1 at the time of this writing. However, it can be easily installed.

Before installing, always update the repositories to ensure the latest version with the command:

```
sudo apt update -y
```



Once done, you can install ZAP with the command:

```
sudo apt install zaproxy
```

Proxy Setup

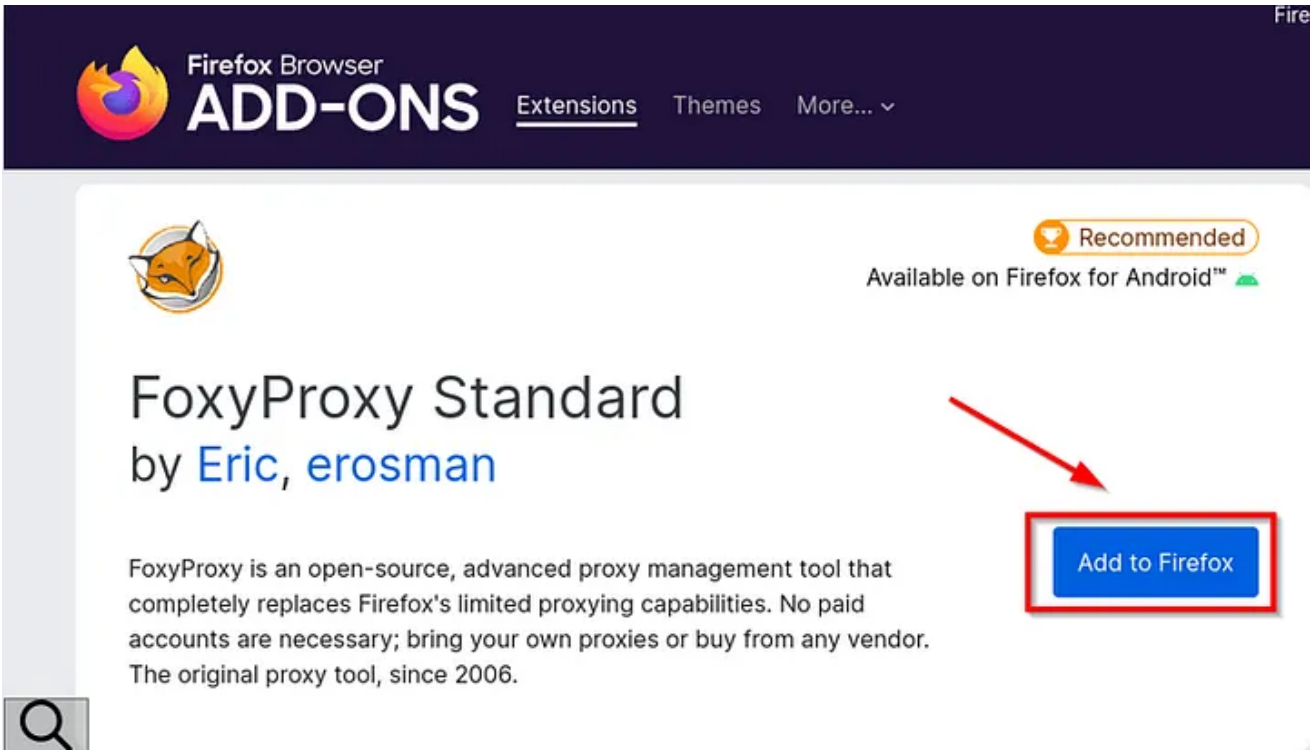
You don't need to set up a proxy like FoxyProxy for your browser like in Burp Suite, as ZAP handles it all. Bennetts tells us that "it's best to let ZAP launch them."

The "Browser Launch" function is automatically configured to work through ZAP and ignore certificate warnings, making it much easier to launch without changing settings. This allows you to quickly start web application testing without additional setup or configuration. Just launch ZAP and you're good to go.

However, if you want to use any of your browsers with an existing profile, like other browser plugins, you must manually configure your browser to use ZAP and import and trust ZAP's CA Certificate.

We'll show you how to set it up in Firefox on Kali.

The first thing you need to do is download it add FoxyProxy.

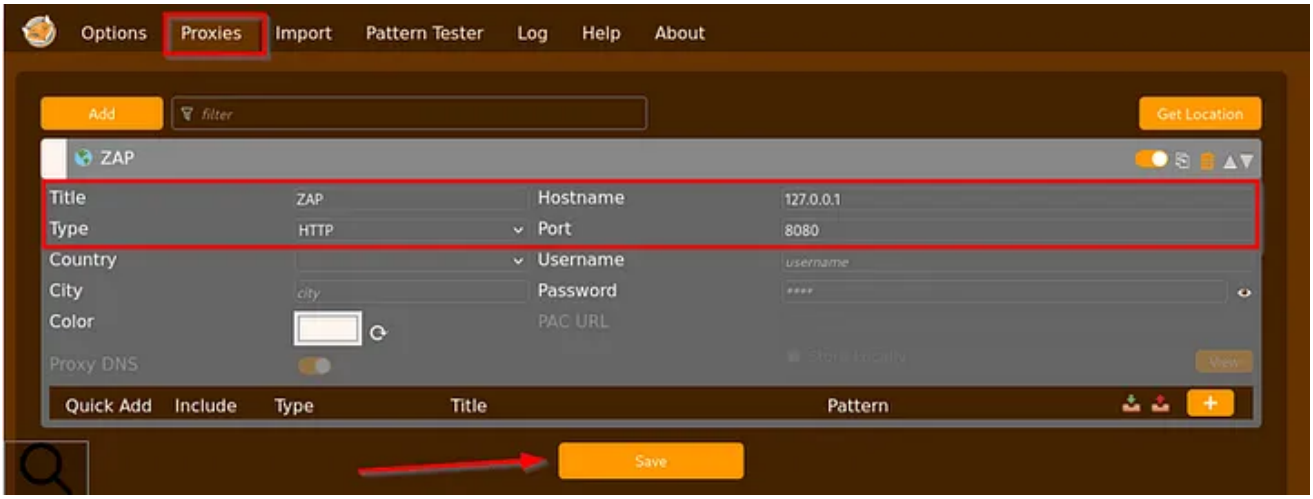


Then open FoxyProxy to set it up.

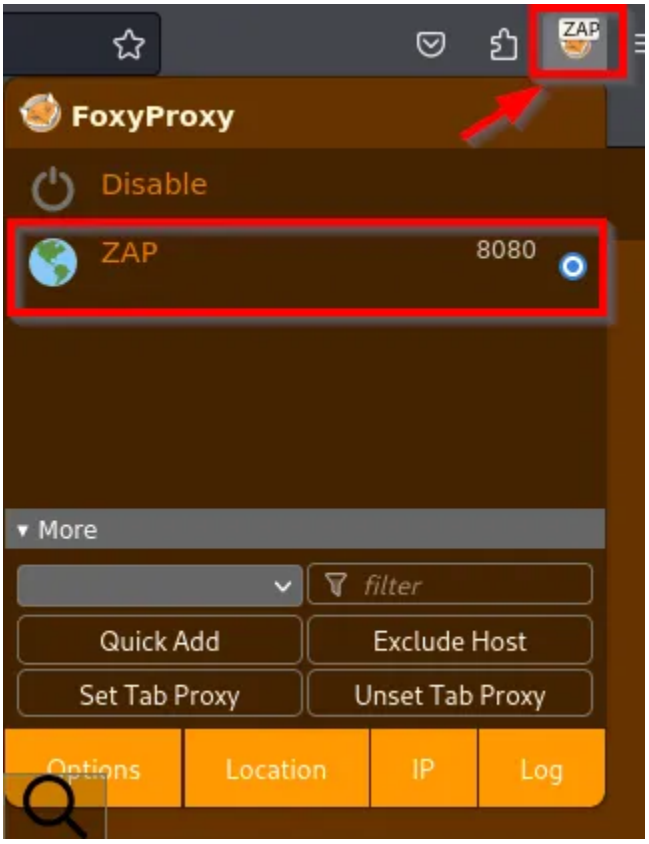
From here, go to the proxies tab and enter the following information:

- Title: ZAP
- Type: HTTP
- Hostname: 127.0.0.1
- Port: 8080

Once you're done, click "Save."

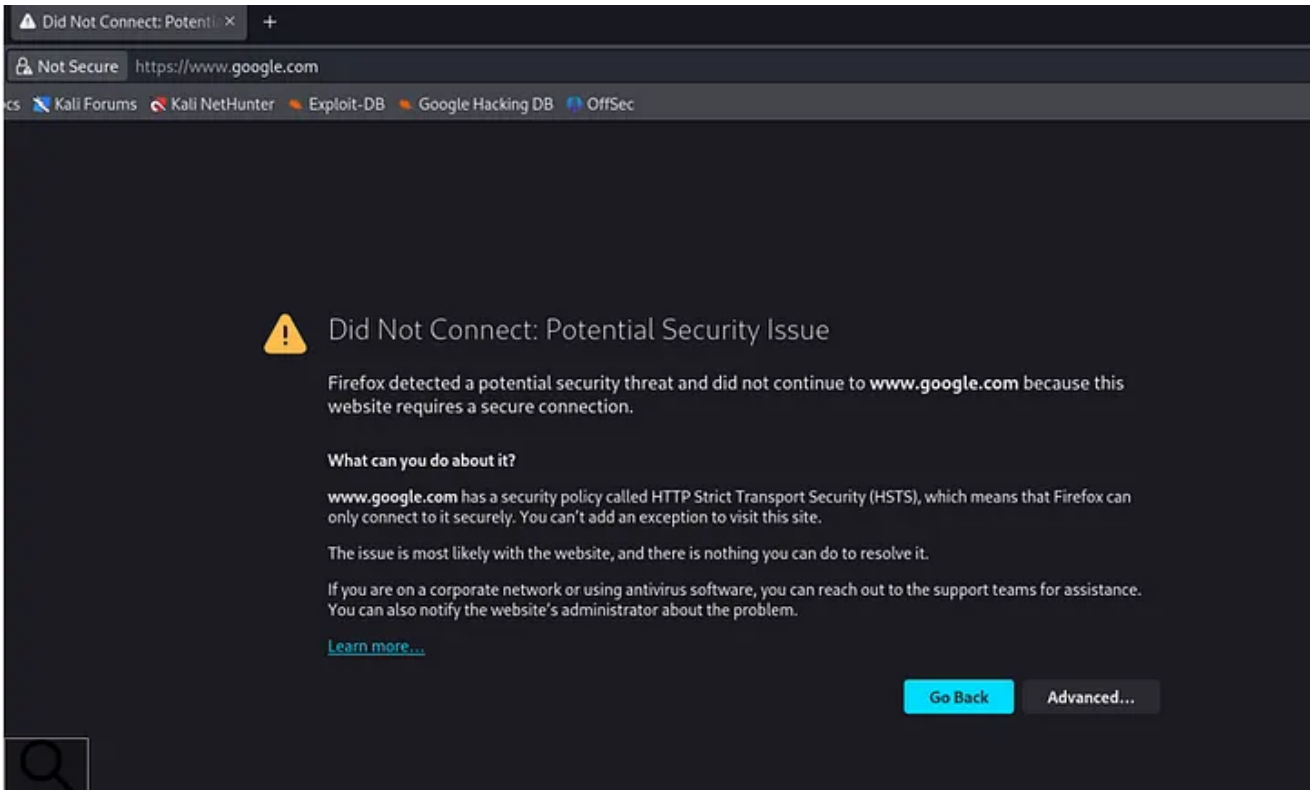


Whenever you want to promote traffic through ZAP, go to the plugin and select "ZAP."



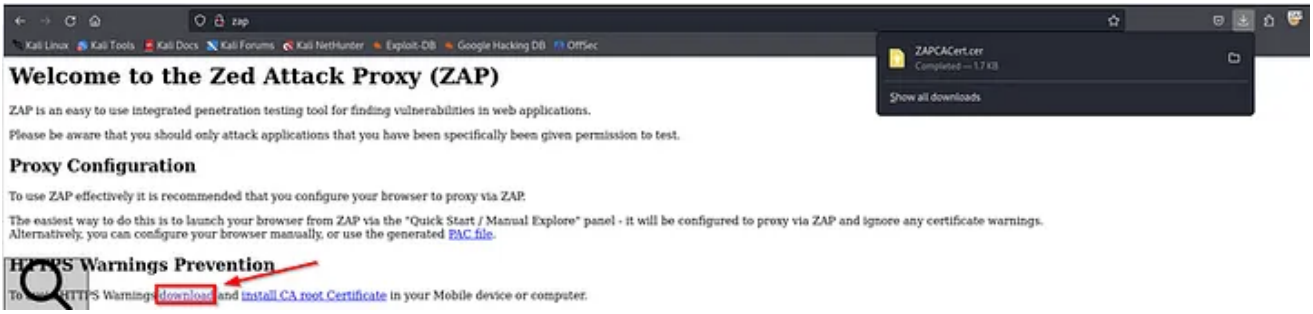
ZAP Certificate Installation

If you are not using ZAP's built-in browser feature, you will need to manually set up the certificate in your browser. If you try to access any website that uses SSL/TLS while using your browser outside of ZAP, you must set it to use ZAP's CA certificate to avoid any certificate warnings.



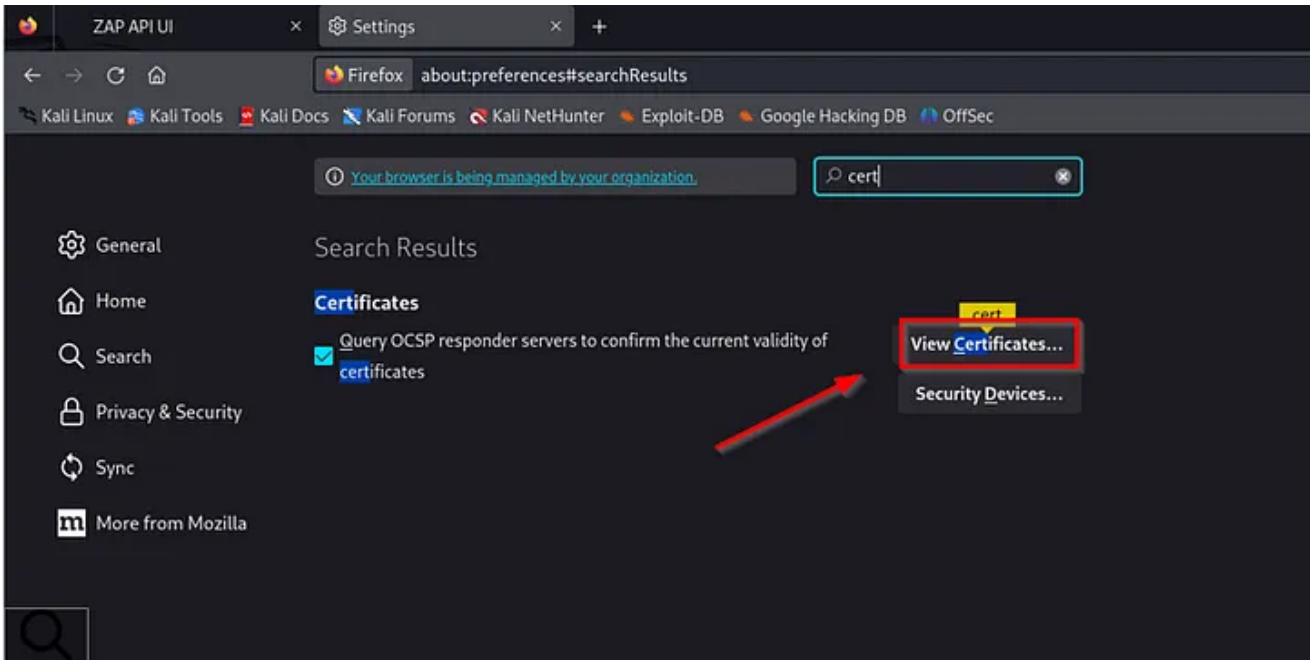
ZAP recommends launching your browser through the "Quick Start" area, but if you prefer to set up your browser manually, here's how to install the certificate. We install it in Firefox.

First, with ZAP enabled and FoxyProxy enabled to use ZAP, go to http://zap. Once there, select "Download" to download the certificate to your system.

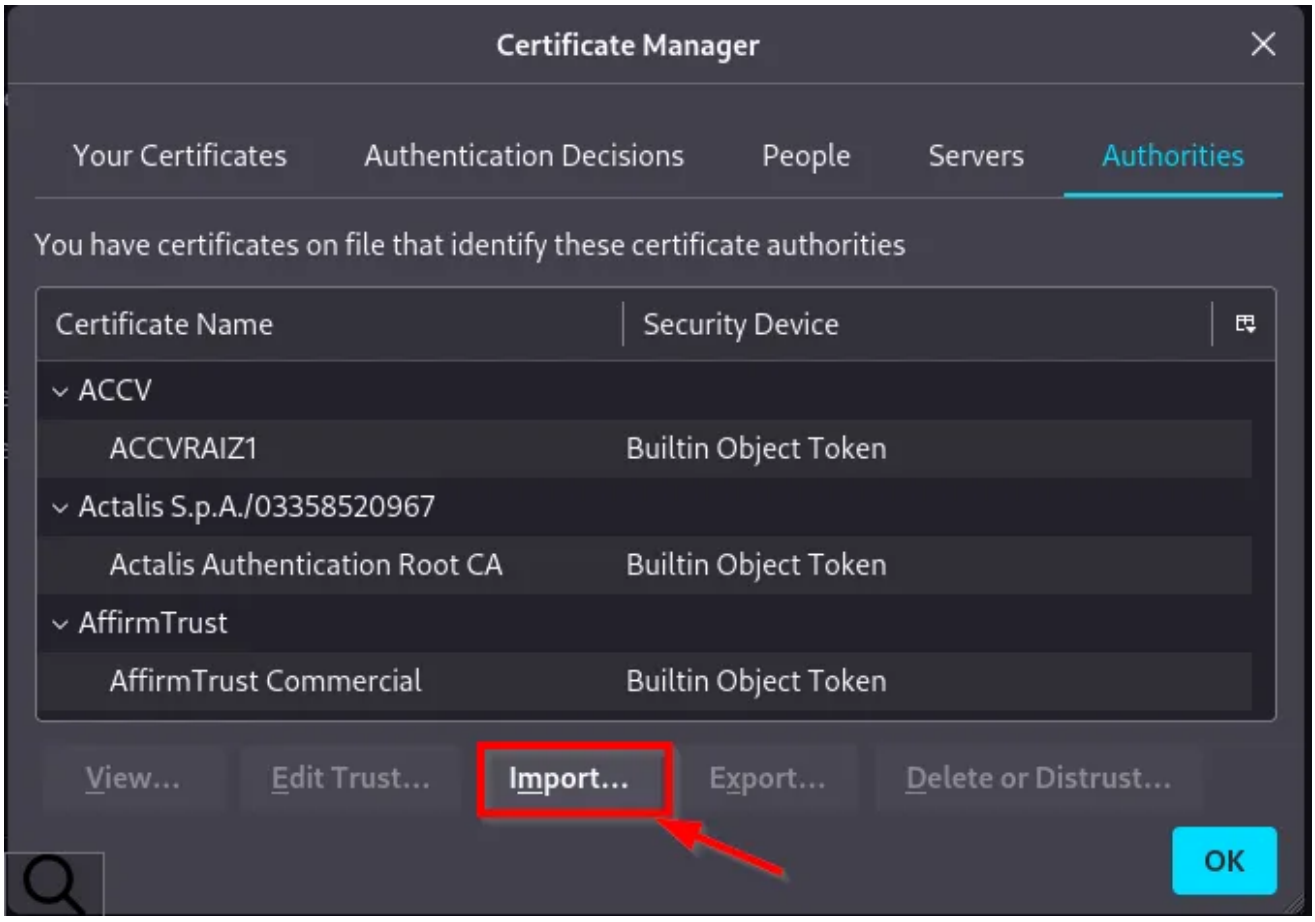


Then go to the Firefox search bar, type about

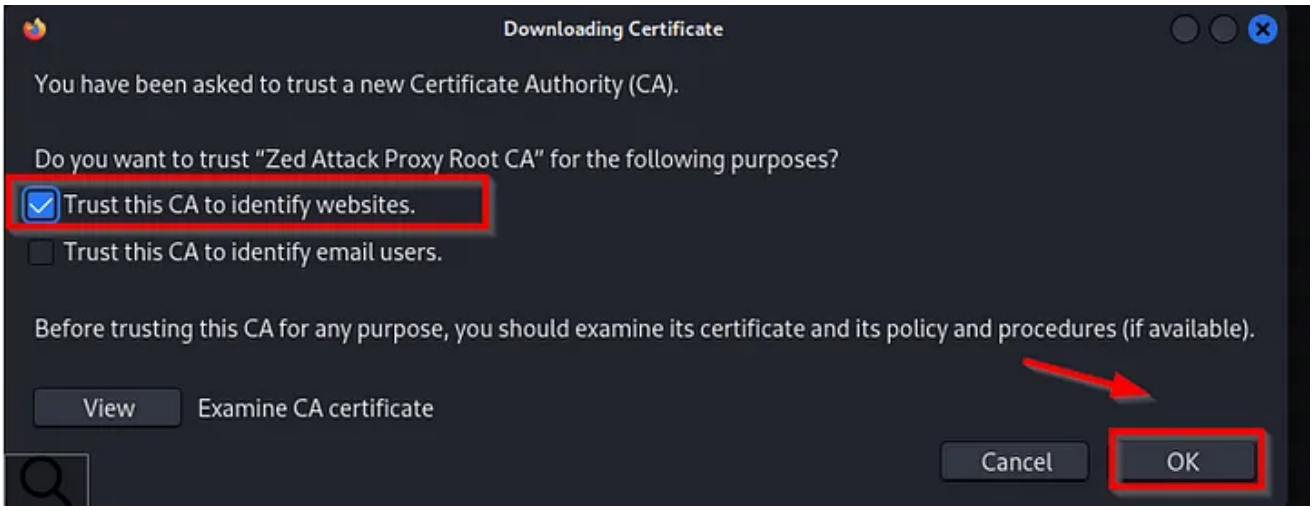
and press Enter. This will take you to the settings page. Search for "certificates" and find the option "View Certificates."



The “View Certificates” button allows you to view all your trusted CA certificates. You can import a new certificate for ZAP by clicking “Import” and selecting the file you downloaded.



In the pop-up window, select “Trust this CA to identify websites” and click OK.

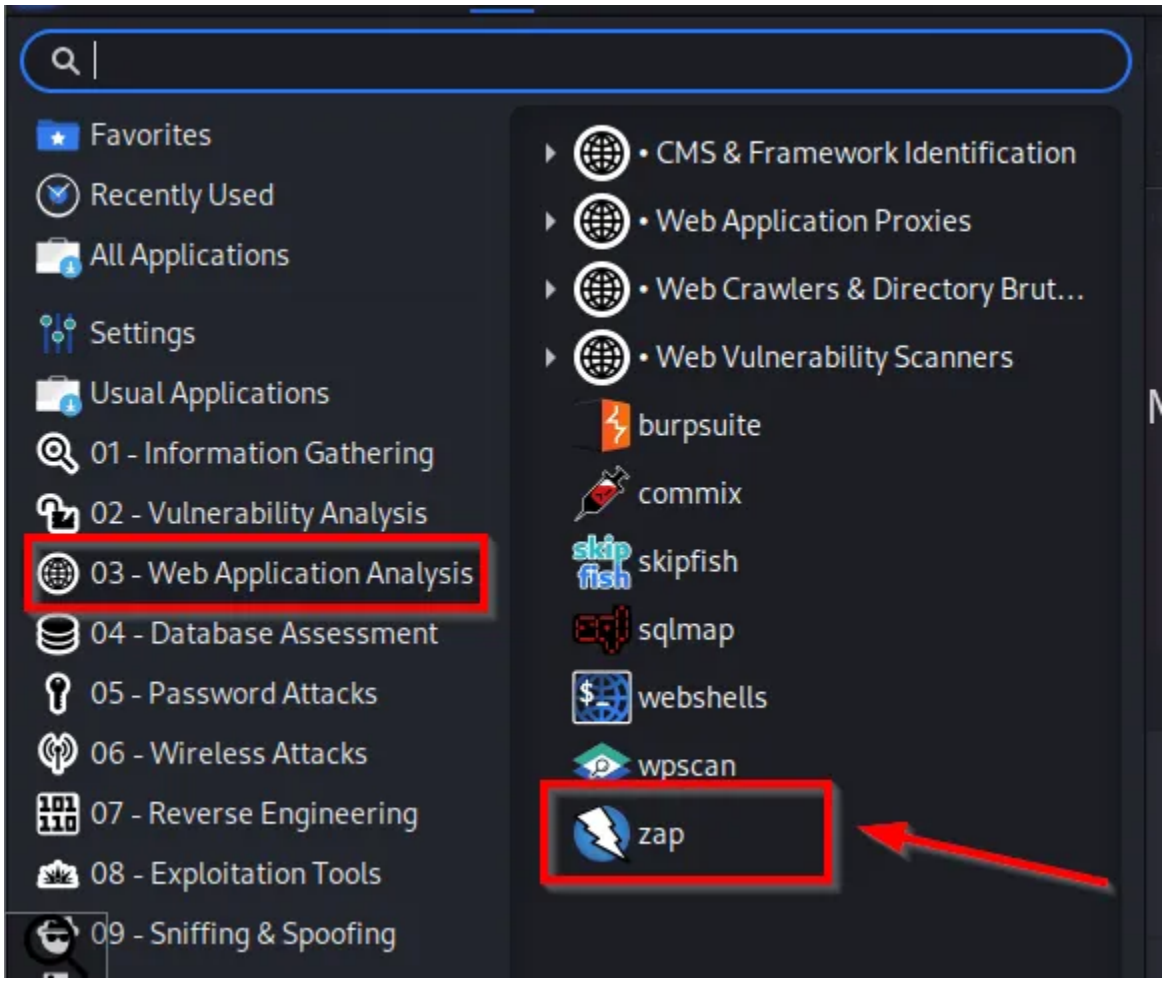


Any encrypted traffic will work when the ZAP proxy is active, allowing us to intercept requests.

Now that everything is set up, in the next section we'll walk you through using some of ZAP's features. ZAP has a lot of tools, but we won't be able to cover them all here. We'll show you a few to get you started.

Starting ZAP

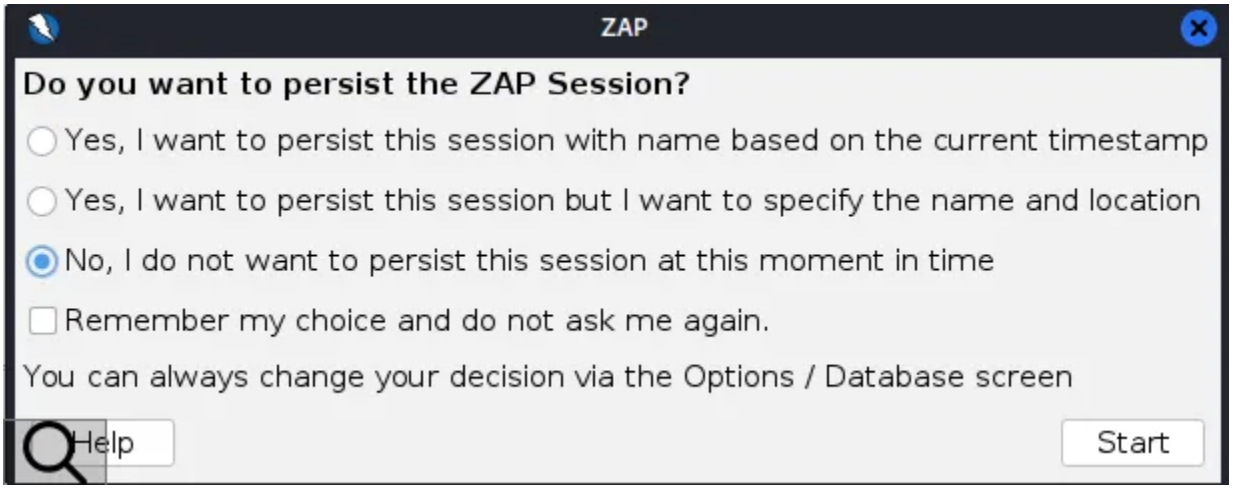
You can start ZAP in Kali in one of two ways: by entering zaproxy in the terminal or by opening it from the application menu under "Web Application Analysis."



When you start ZAP, you will see a screen asking, "Do you want to keep this ZAP session?"

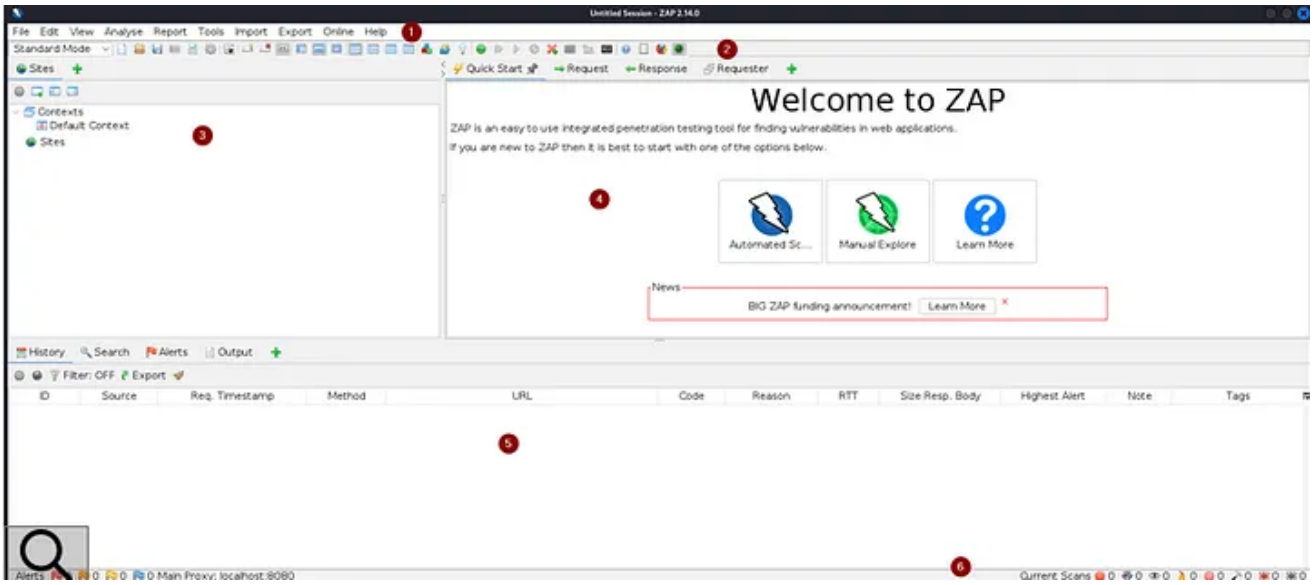
Retention will store everything in an HSQL database that you can access to view its contents or reload into ZAP to view all request history, site information, etc.

We'll select "No, I don't want to keep this session right now."



Overview of ZAP

Before we start using ZAP, let's take a look at the main interface and show where some of the main features are located. The interface has a lot of information, but remember, ZAP does a lot of things.



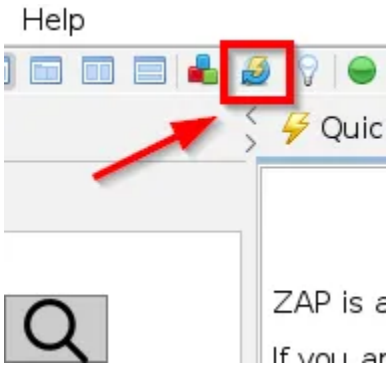
- **Menu:** Here you can create and manage sessions, generate reports, find tools, get help and more.
- **Toolbar:** It includes buttons that provide shortcuts to the most frequently used features.
- **Tree Window:** Displays the hierarchical view of the site you are testing and the script tree.
- **Quick Start/Task Window:** This is a quick and easy way to use ZAP, especially if you are new to it. It also displays requests, responses, and scripts that you can edit.
- **History tab:** Displays a log of all HTTP requests and responses sent and received through ZAP.
- **Search Tab:** Allows you to search through requests and responses.
- **Notifications Tab:** Displays security alerts found during scans.
- **Exit Tab:** Provides detailed output from various scans and processes.

- **Footer:** Displays ZAP status information.
- **Notification Counter:** Displays a summary of the notifications found. It is colored (such as red, yellow, etc.) to represent the severity of alerts found during the scanning process.
- **Main Proxy:** This is the primary proxy setting that ZAP uses, which is set to "localhost:8080."
- **Current Scans:** This section displays any current scans, with icons indicating their status or progress.

Updating Extensions

Before you start using ZAP, you should always check and update any extensions that need updating. This ensures you have the latest experience.

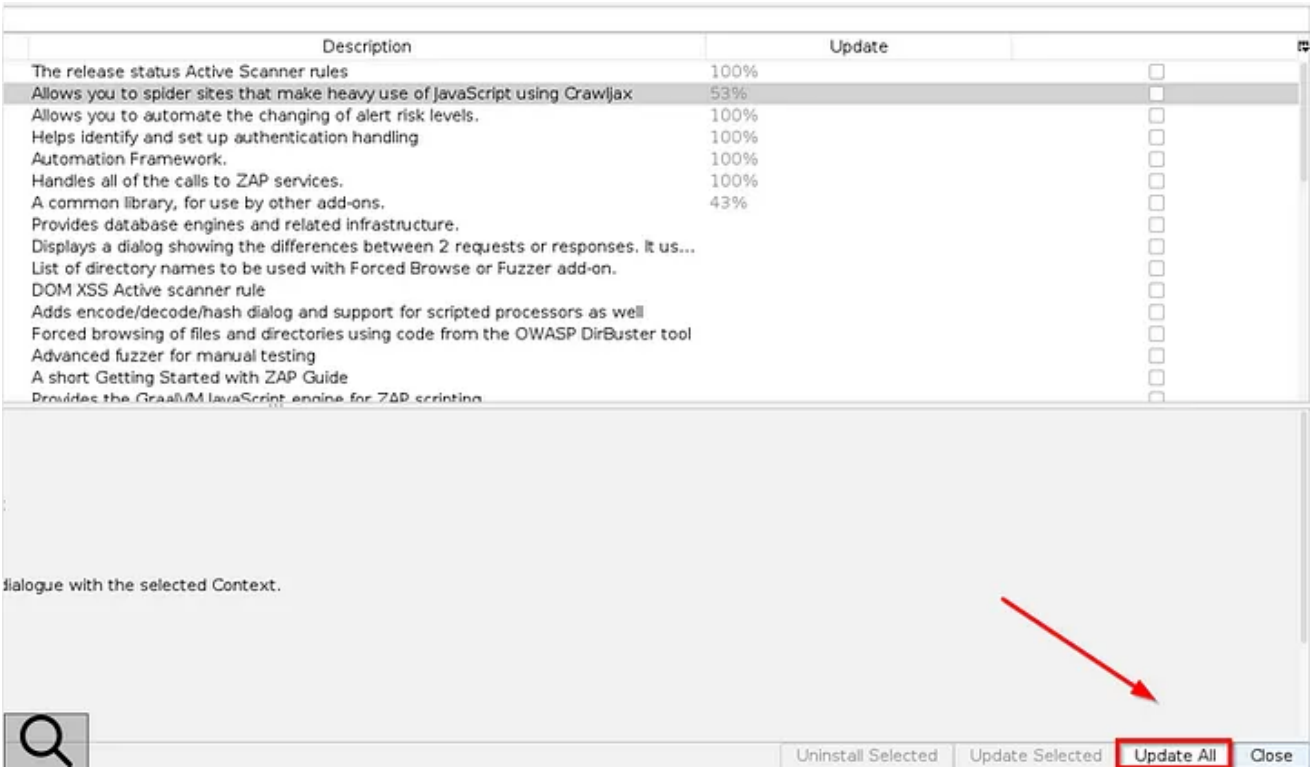
Press CTRL + U or use the toolbar shortcut to check for updates.



This will open the installed extensions. Next to each extension, you can see the version number and a brief description of what it does. If a newer version of an extension is available, you'll see "Update" to the right of the description.

You can choose the ones you want to update individually, but the best way is to update everything at once.

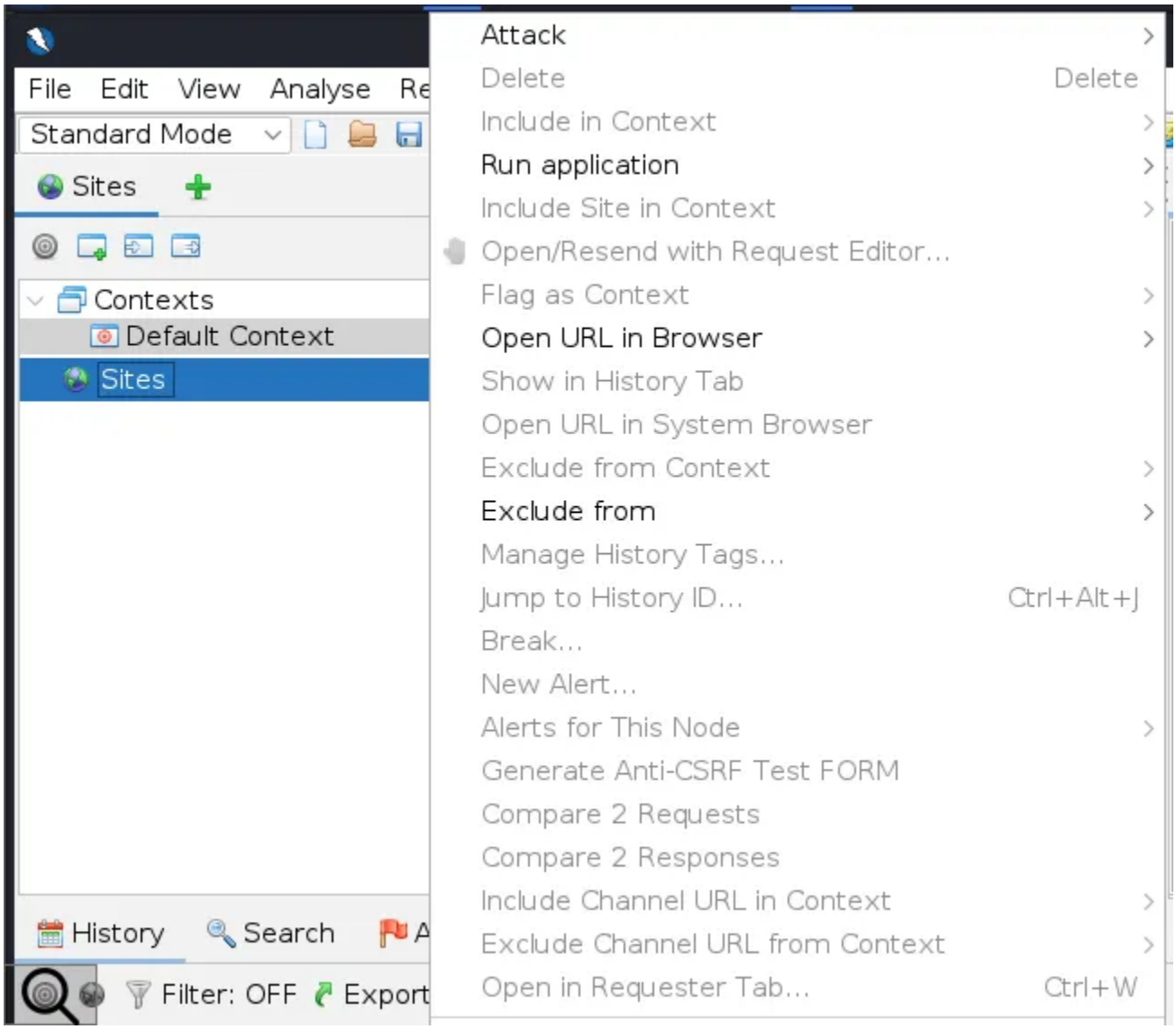
Select any extension and "Update All" to start the update.



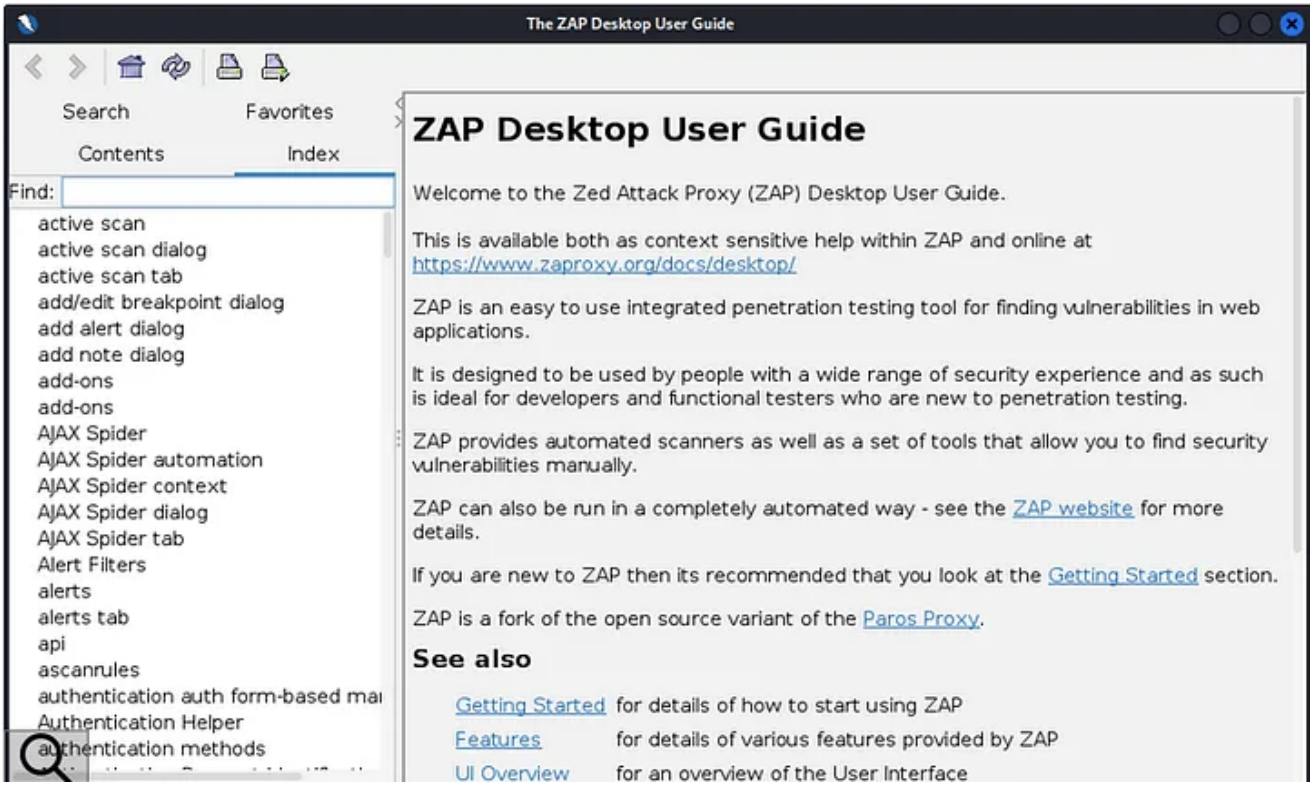
Tips for ZAP

Before we get started, here are some tips to keep in mind when using ZAP.

- Right-click everywhere and anywhere to see what options are available to you.



- If you need help, you can use the detailed ZAP user guide found by pressing F1.



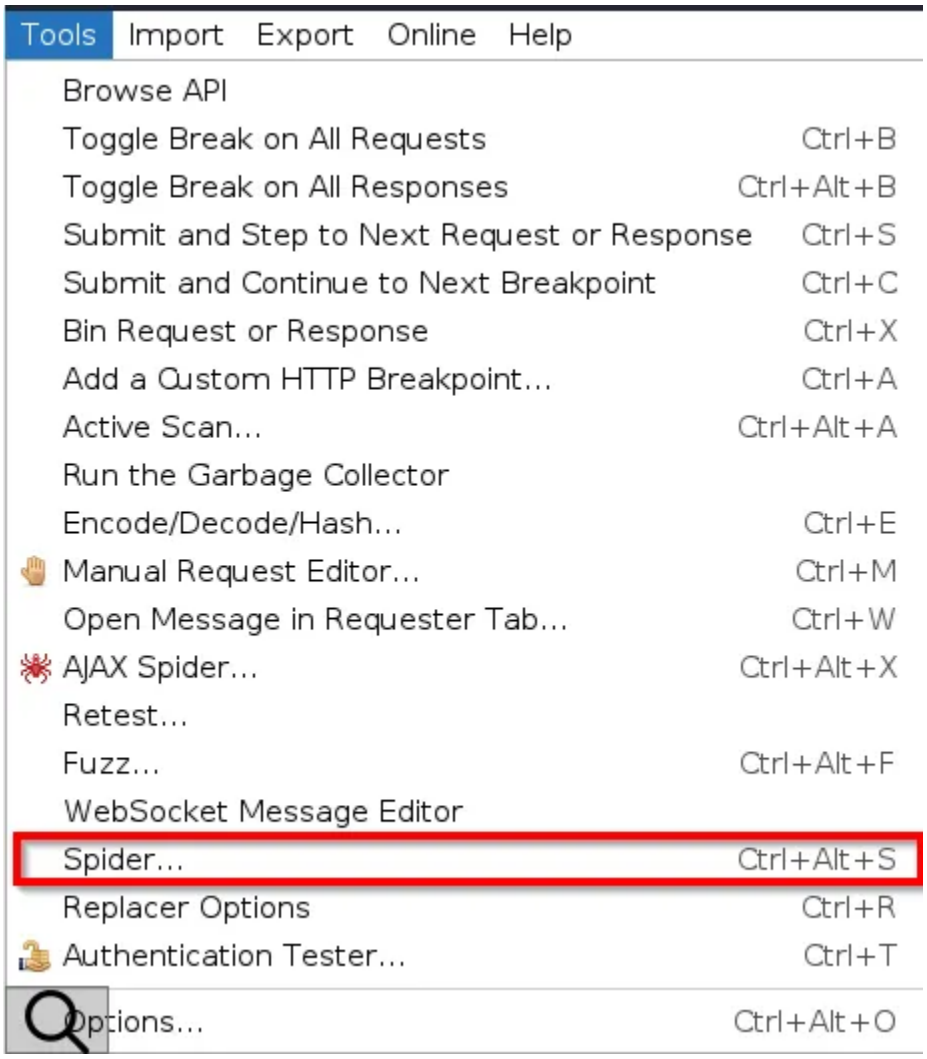
Spidering with ZAP

The first tool we'll show you is the standard ZAP spider. This spider requests web pages and analyzes them for links to other pages within the same web application. This recursive process continues as new links are discovered.

The spider builds the website tree, showing you all the pages found.

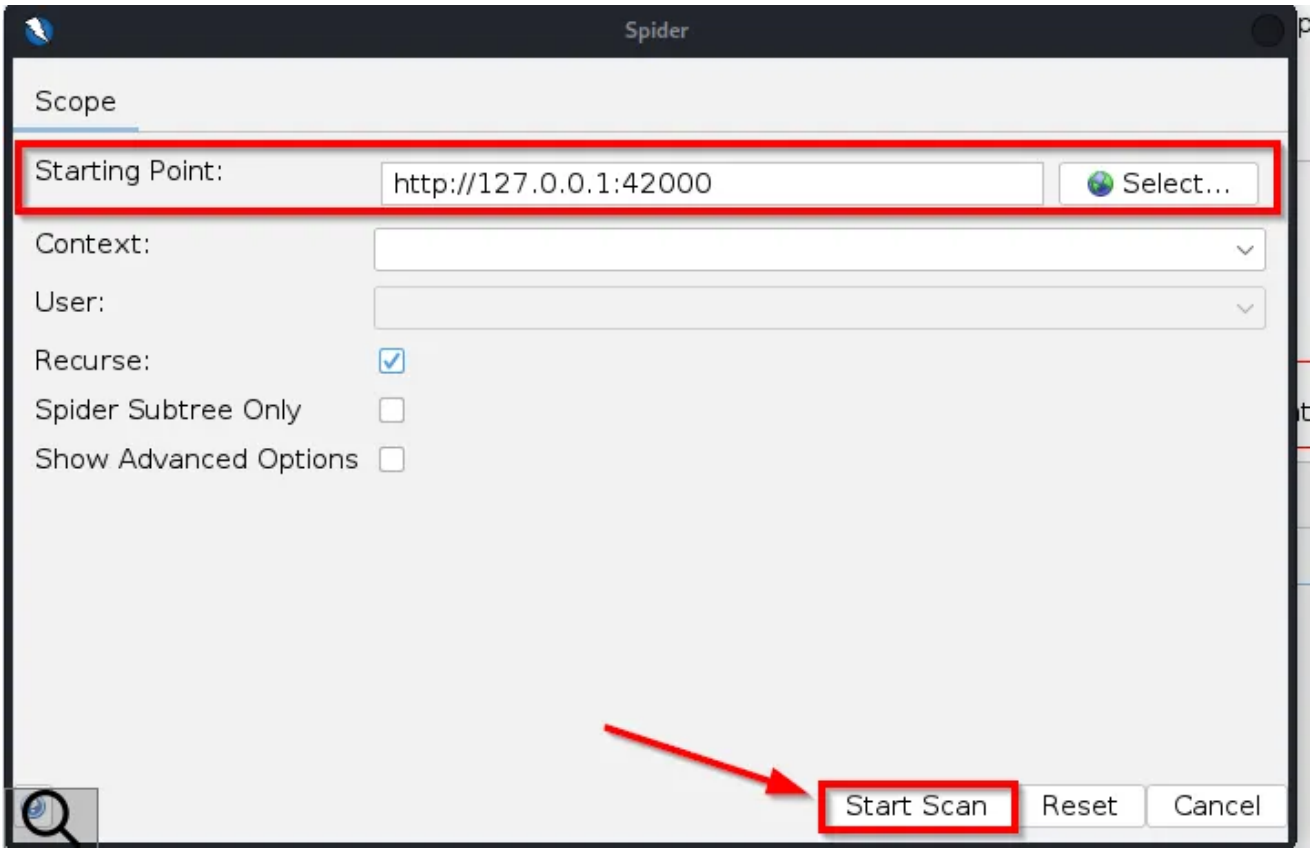
This spider is quite fast and can be used for typical applications. However, you should consider using this spider in conjunction with the AJAX spider for more modern applications.

You can select "Spider" from the "Tools" menu or use the shortcut CTRL + ALT + S to launch it.

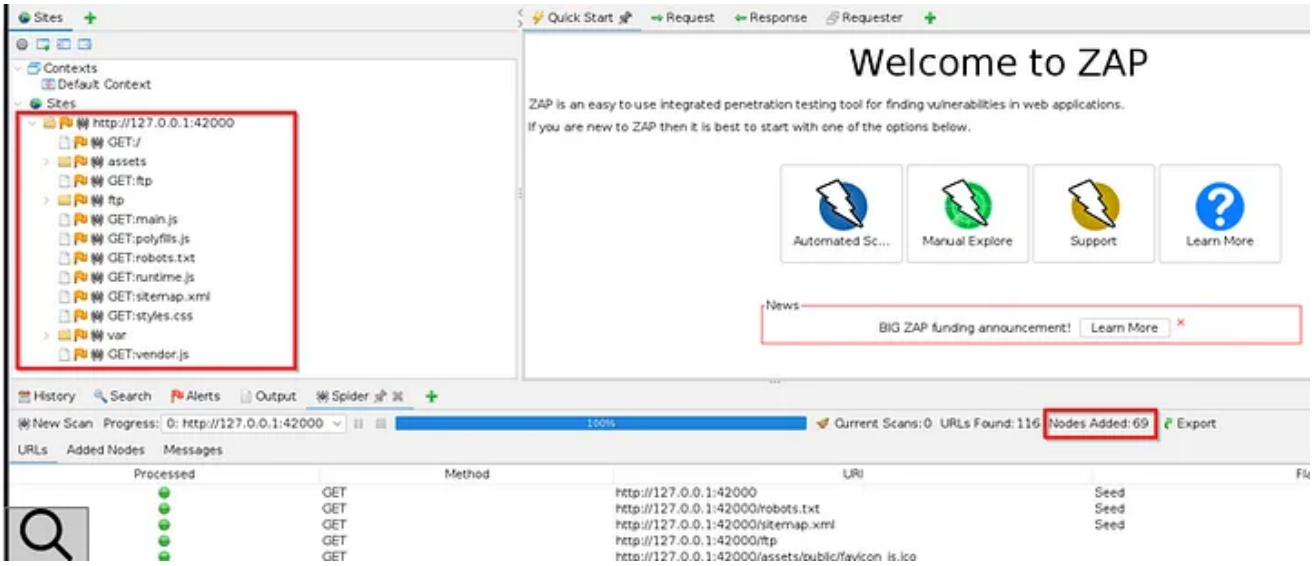


In the window that appears, enter the URL of the web application you are scanning and select “Recurse.” This tells ZAP to scan all URLs or directories from the original URL.

Once you are ready, select “Start Scan.”



Once the scan is complete, you will see all the items found for the web app. The lower right corner indicates “Nodes Added: 69,” which tells us the number of new items Spider has found and added to the Site Tree during the scan.



AJAX Spidering

Most modern applications use JavaScript, and the traditional ZAP spider doesn’t really understand how to crawl those properly.

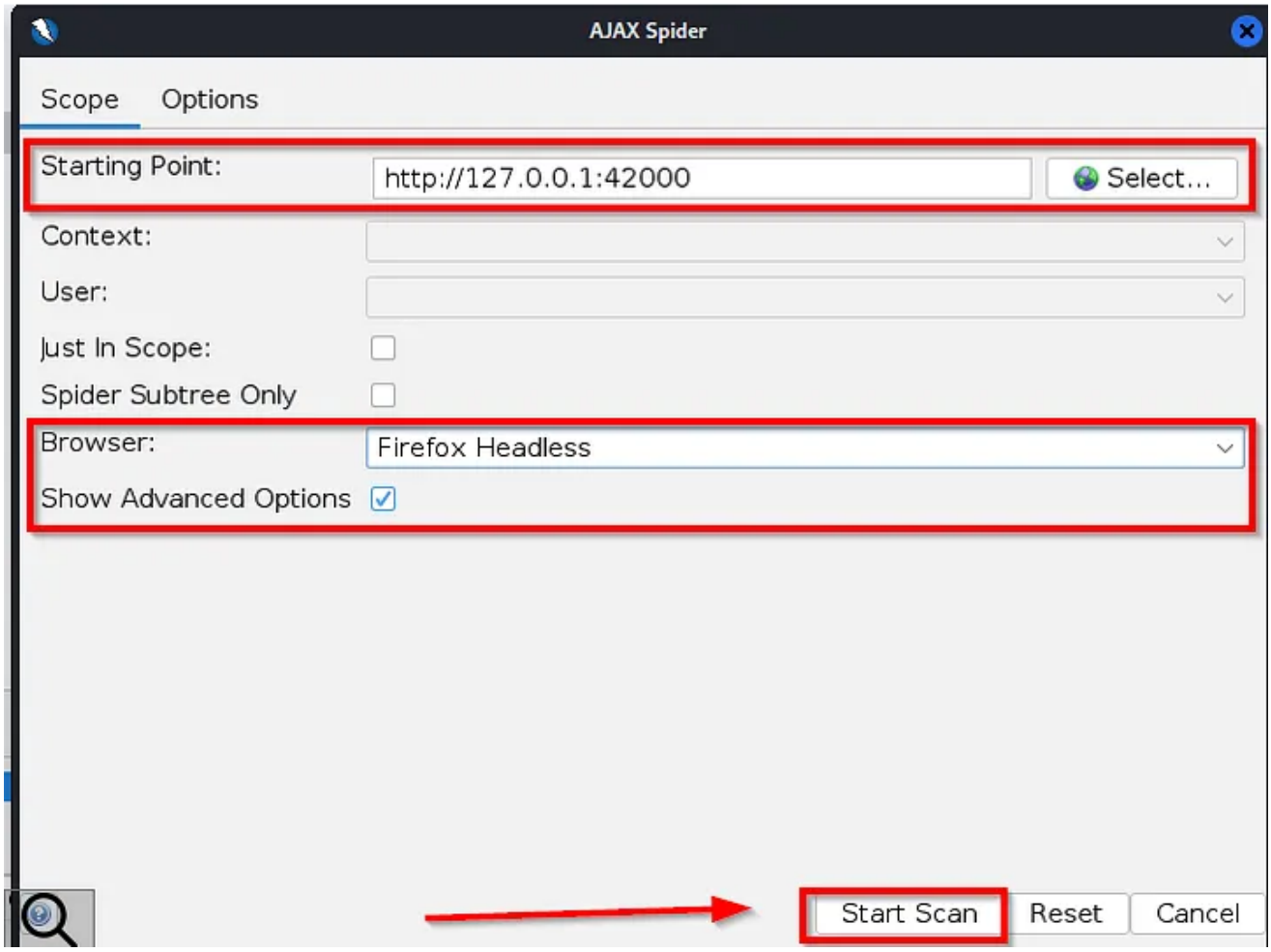
This is where the AJAX spider comes in. This spider launches a browser, clicks things, and even fills out forms, giving you a more complete overview of your web application. It tries to mimic the behavior of a user while interacting with the application.

This spider is much slower than the standard one, but works much better with today's modern applications.

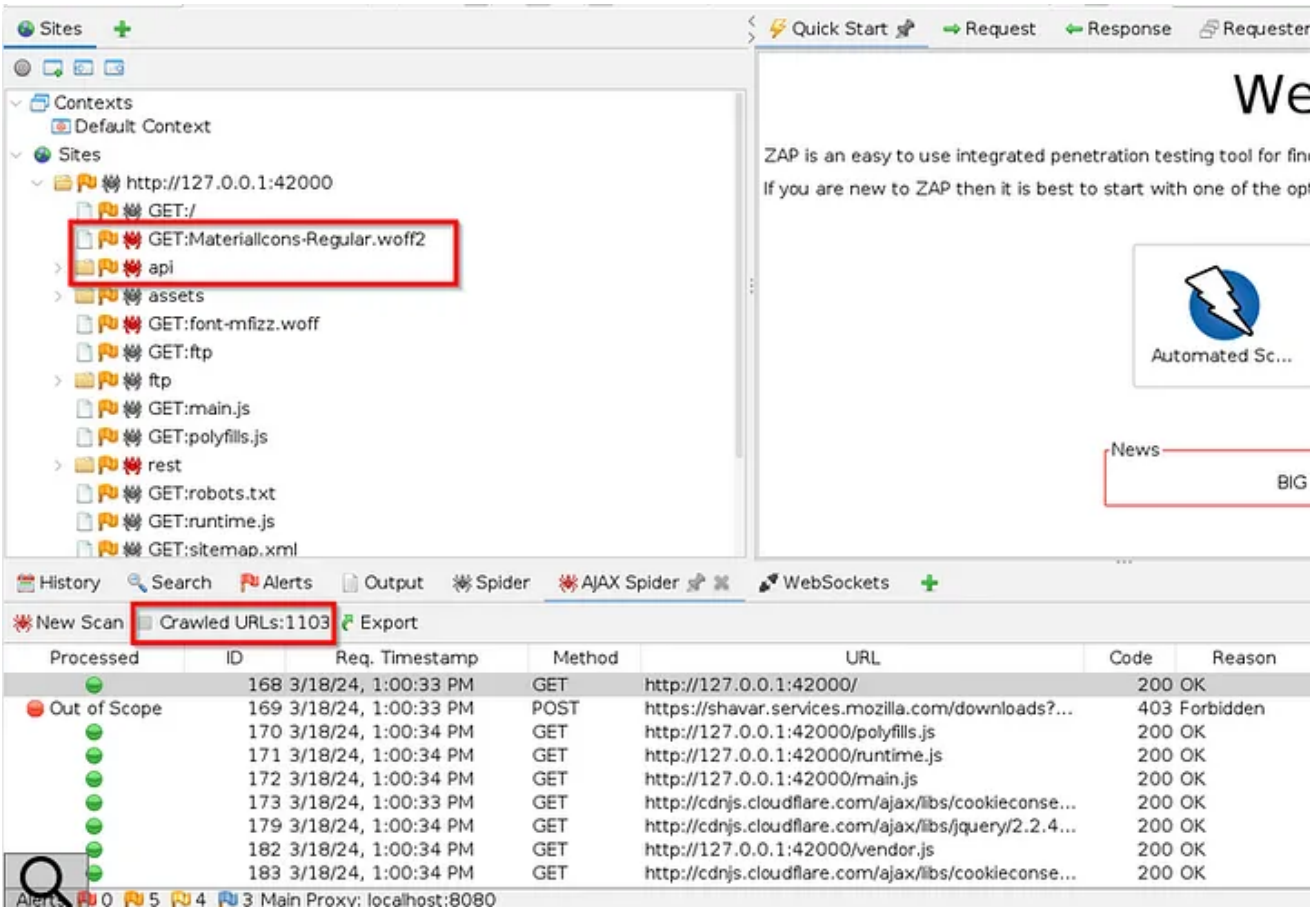
To open the AJAX spider, use the "Tools" menu or the shortcut CTRL + ALT + X.

Here, you'll set the URL of the application you want to test and the browser the spider will use. Options include Firefox, Chrome and Safari.

You can also set advanced options. When you are ready, select "Start Scan."



Once the scan is complete, all items found will appear in the site tree area with a red spider next to them. The AJAX spider crawled 1103 URLs compared to 116 for the standard spider.



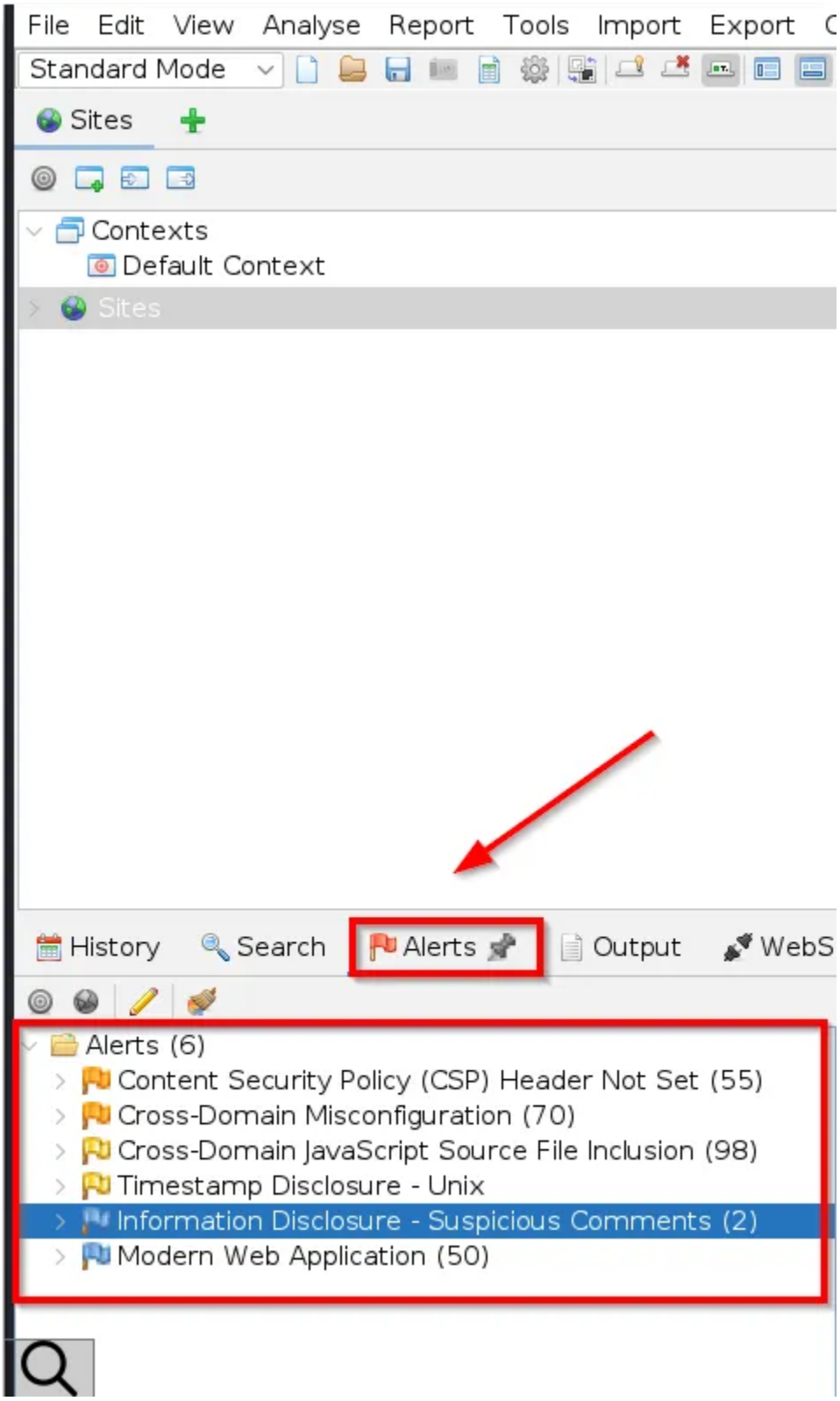
Scan with ZAP

Before we show you ZAP's scanning features, remember that you should always use active method scanning only to attack an application that you have explicit permission to test.

- **Passive Scanning:** Passive scanning simply involves looking at the raw requests and responses. ZAP doesn't do anything, it just monitors the traffic that goes through it. It analyzes this traffic to detect potential risks without sending new requests.

Passive scanning is safe to use in any web application.

When you scan a website, ZAP performs a passive scan and reports any alerts in the "Alerts." tab.



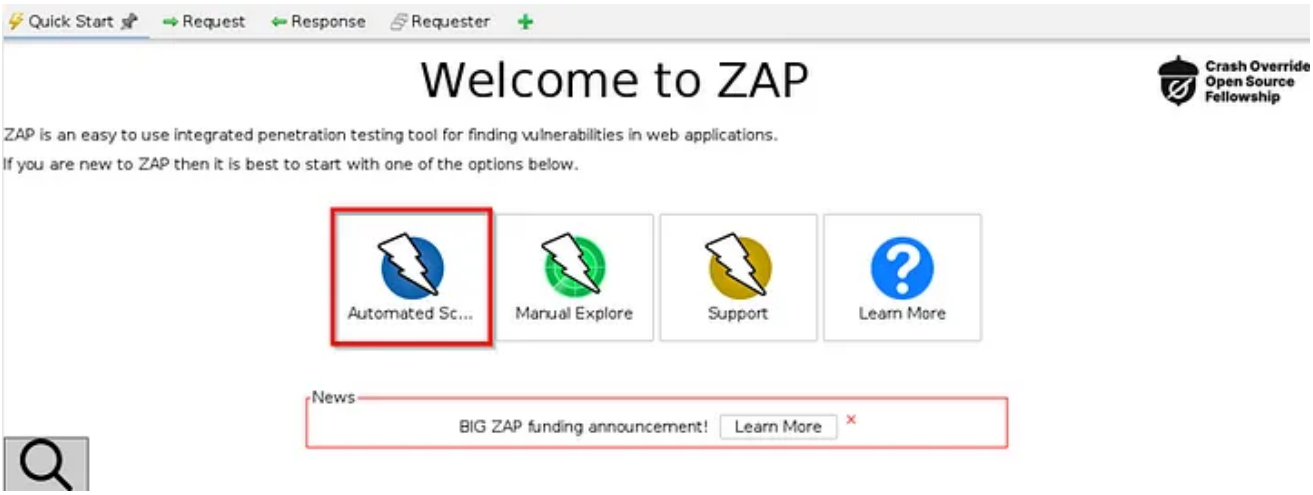
- **Active Scanning:** Active scanning tries to find other vulnerabilities using known attacks against the selected targets. It can find specific vulnerabilities such as XSS, SQL injection, buffer overflows, Log4Shell and remote file inclusion.

Active scanner cannot find logical vulnerabilities such as broken access control.

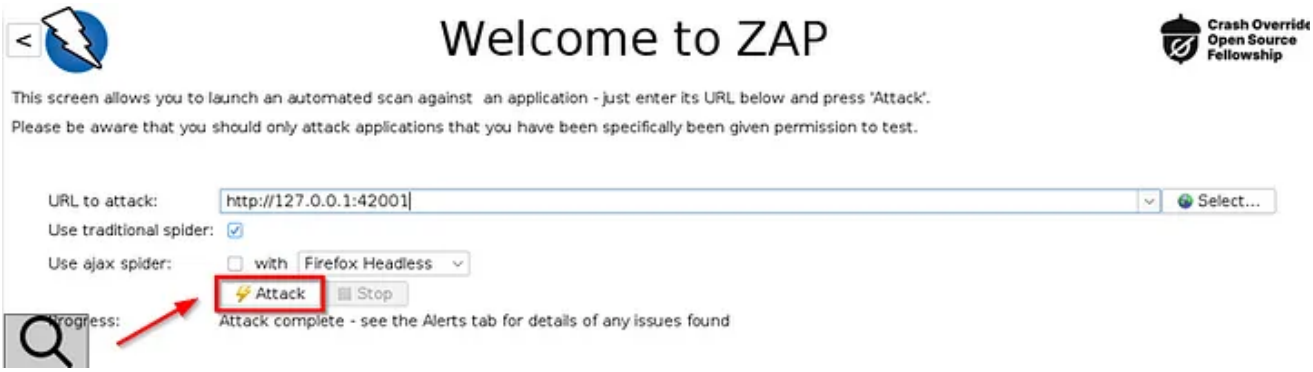
You can set policies for your scans, although we won't discuss that here. These policies allow you to set the threshold for the number of issues reported, and the strength options determine the number of attacks performed per parameter.

As with most tools in ZAP, you can set options for active scans. These include the number of guests being scanned simultaneously, the maximum scan duration, and whether to manage CSRF tokens.

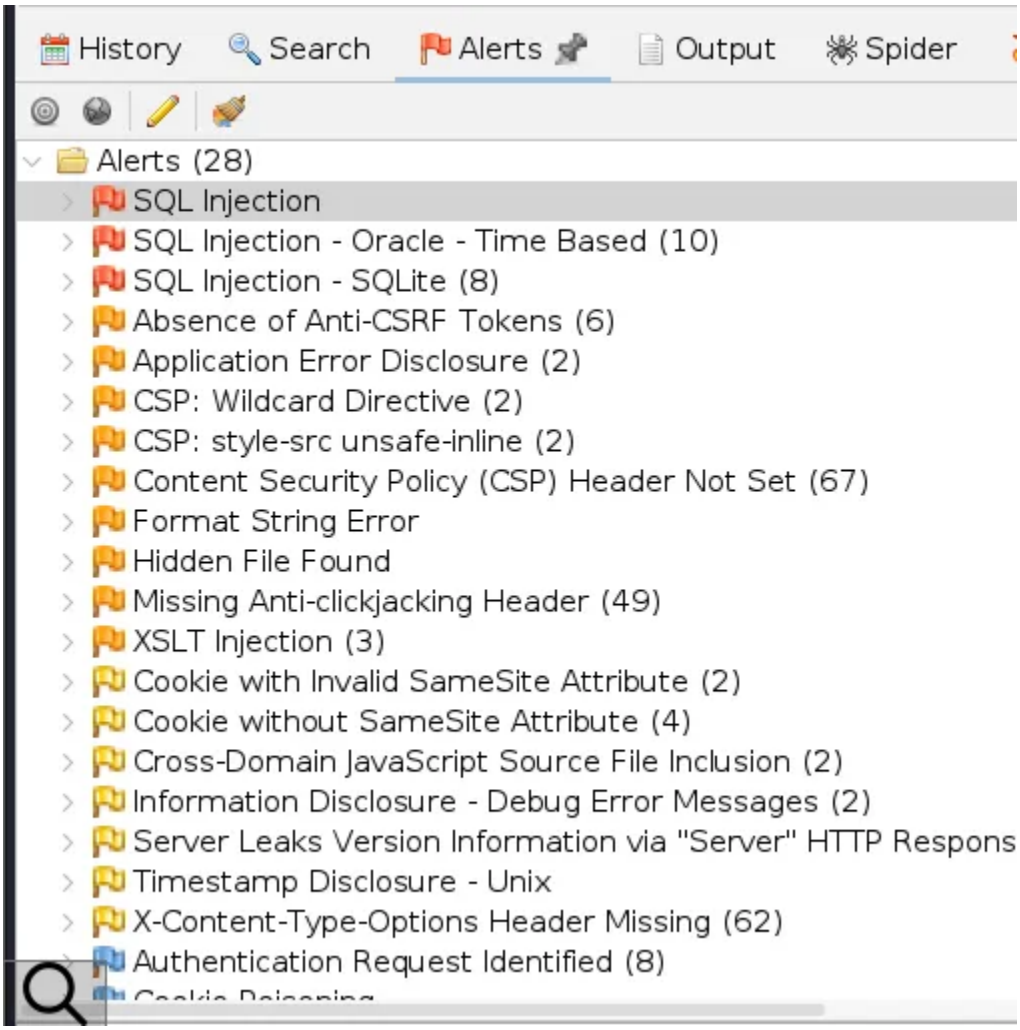
Select "Automated Scan" from the quick launch menu to begin.



This will open the auto scan startup screen. Here, you'll set up the URL and spider and browser you want to use. When you're ready, select "Attack" to begin.

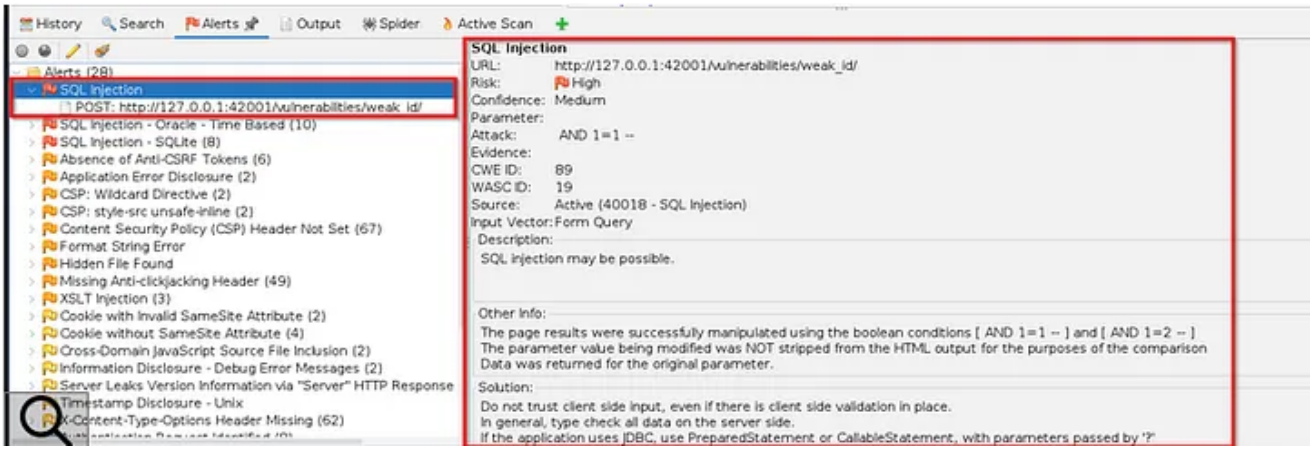


Once the scan is complete, you can find all the alerts reported by ZAP under the "Alerts." tab.



As you can see from the image above, ZAP found 28 vulnerabilities organized by severity: high (red), medium (orange), low (yellow), and informational (blue).

ZAP shows you the number of vulnerabilities it has found. Let's take a closer look at SQL injection. Select the arrow next to it to see where the problem was found in the application. Then select the URL to view detailed information about the notification.



ZAP provides quite a bit of information. In the right panel, you'll see the URL where the alert was found and its risk and confidence level. You will also see a CWE and WASC ID from common software vulnerability lists. Each vulnerability has its own ID number.

You will then see a description of the alert and how ZAP acknowledged this alert. Notes the attack method used ("AND 1=1 –"). You should confirm this to see if the vulnerability actually exists.

It also suggests a possible workaround: don't trust the client-supplied data and use server-side validation, such as prepared statements, to mitigate the risk.

Conclusions

In this ZAP tutorial, we've shown you how to get started with this powerful tool. We've given you an overview of some of its most popular features and shown you how to get started testing web apps.

You must be well prepared to explore more features of ZAP. Remember to update ZAP regularly to get the latest features and extensions. Keep practicing and experimenting with different settings to get the most out of the tool.

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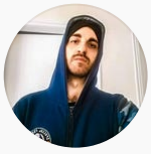

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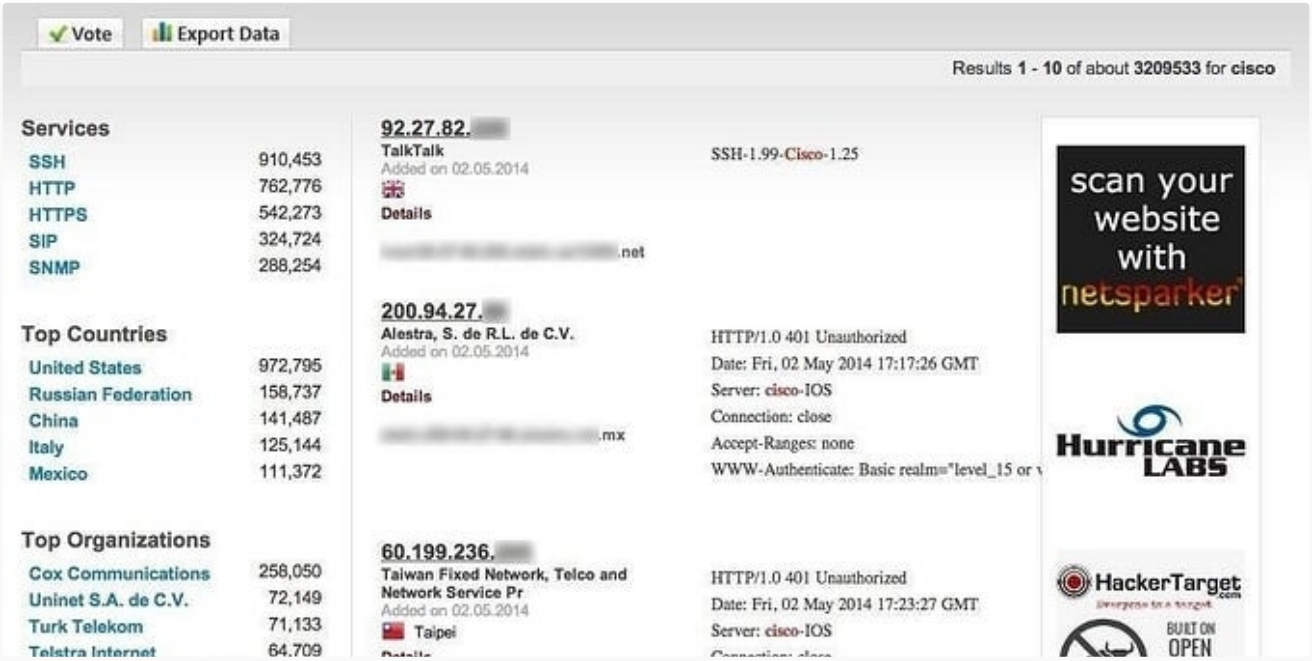

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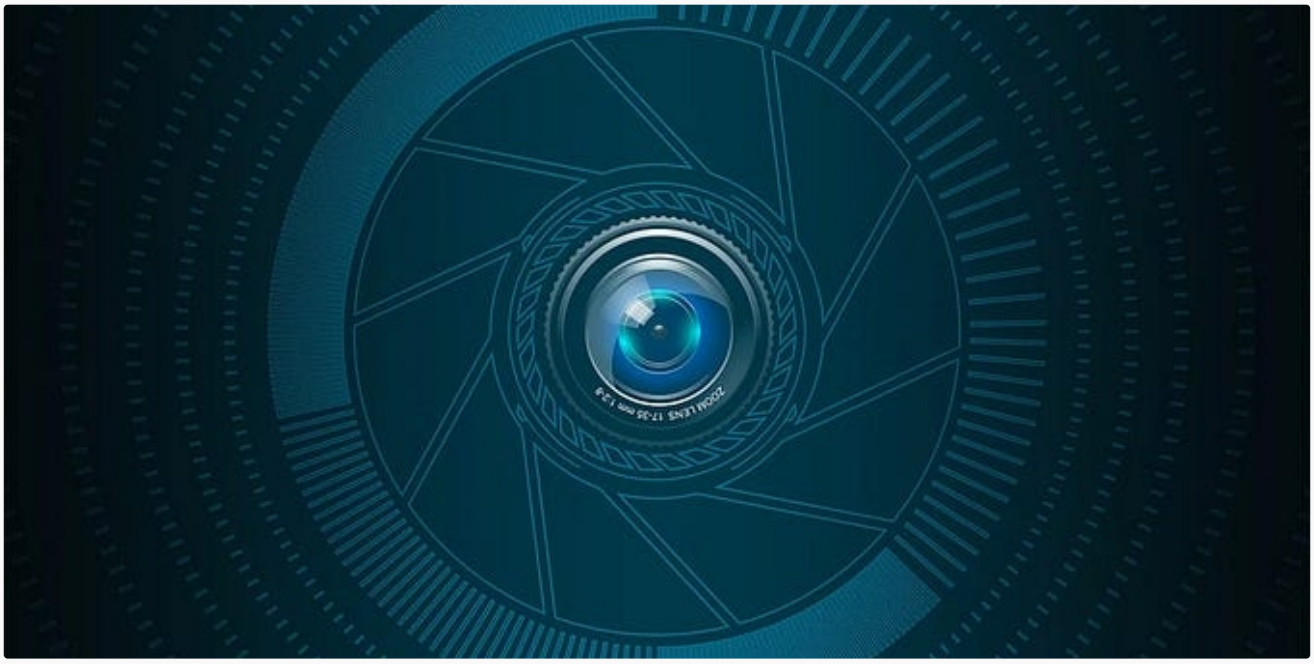

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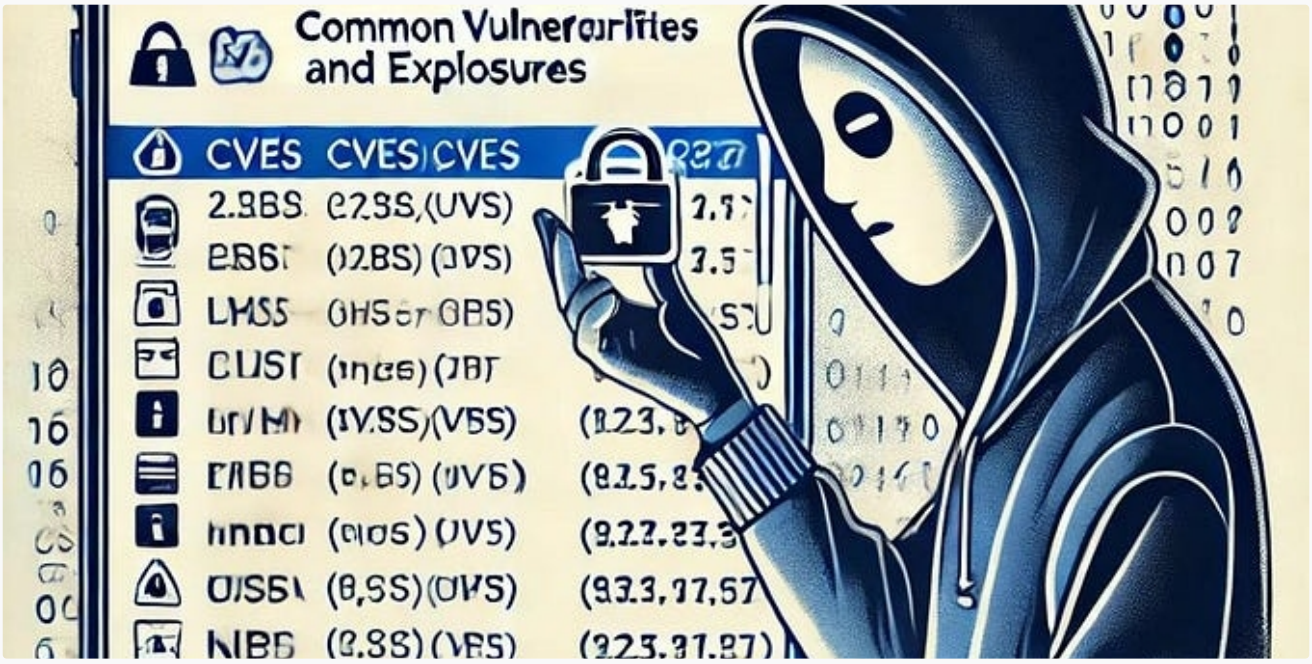

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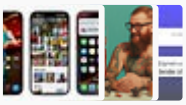

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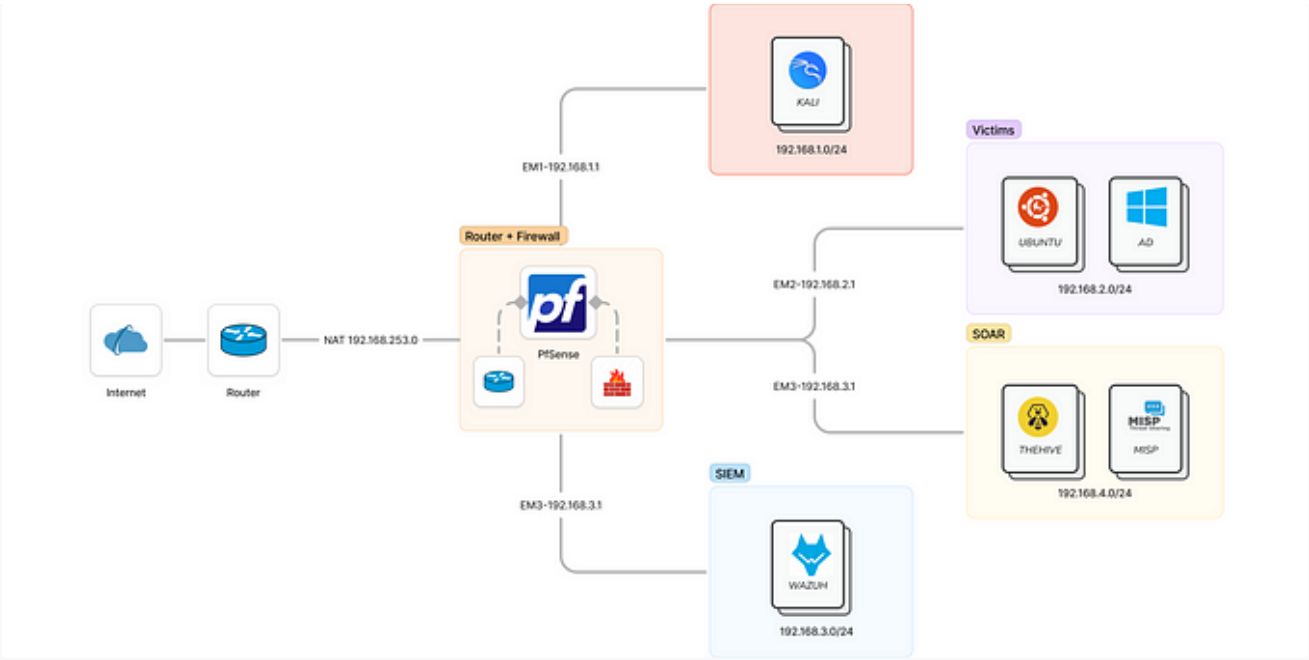

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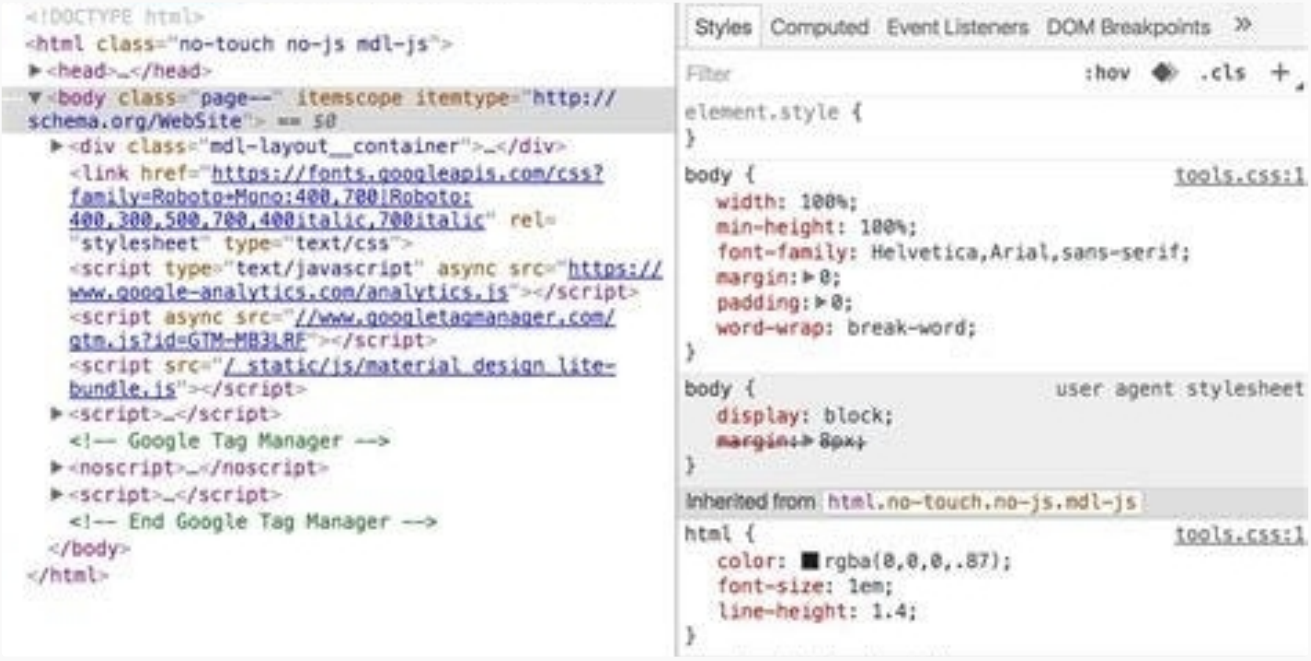

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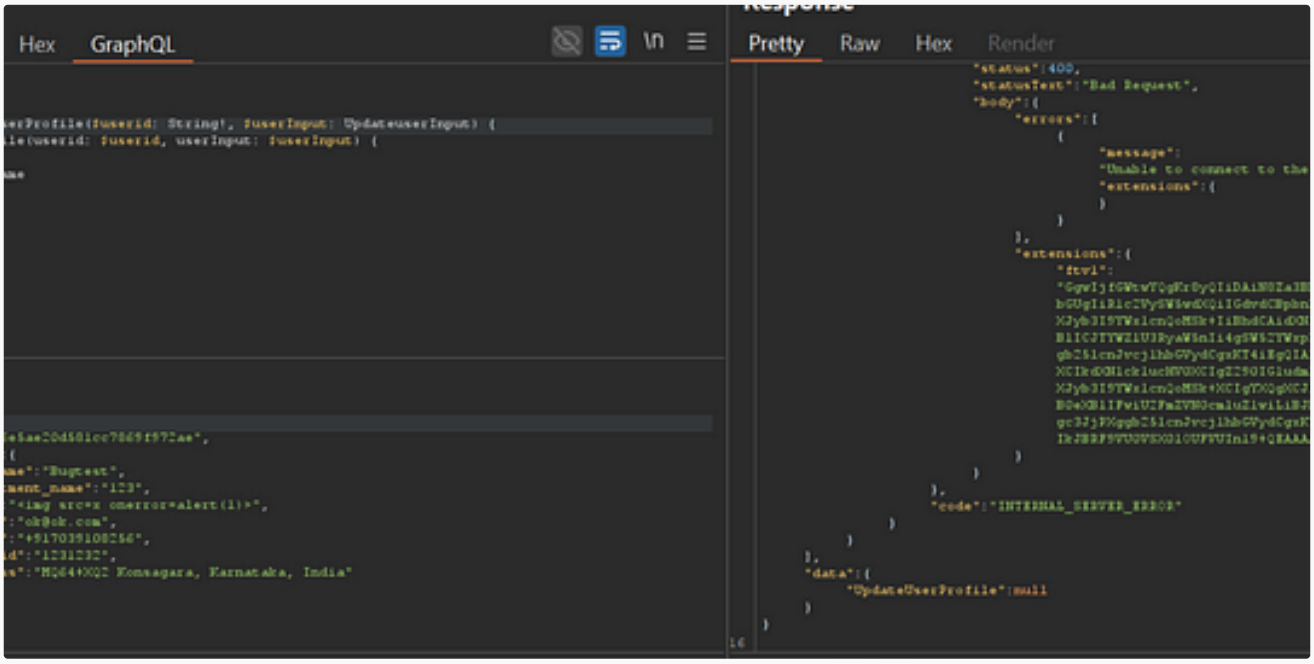

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