Information Assurance and Auditing

4th Year, 1st Semester

2020

ASSIGNMENT - 01

Student Name - W.A.D.D. Wickramasinghe

Registration Number - IT16092716

In partial fulfillment of the requirements for the

Bachelor of Science Special Honors Degree in Information Technology

Specialized in

Computer Systems and Network Engineering

08.05.2020

1. Abstract

Nowadays we are following a pathway which has almost everything is online. It is easy to access and use those goods and services around the world. Along with this convenience, we have gained both pros and cons. Now we have to take care of those online available systems. In order to take care of them, we should check whether they are actually secured. That's the moment when "Information Systems Auditing" takes place. We do an audit to check the current situation of the information systems, their exposures to risks, to clarify how to mitigate risks, and to fulfil proper maintenance.

Being protected in the online world is very important for every organization and everyone. Since the risk of sensitive data being revealed is much higher. Therefore, the following best security precautions are a must for any organization. They should be capable of identifying and determining the ways of stealing or making fraud their customer data. Or else they may lose their everything including reputation.

Contents

2. Introduction

Today, the most popular way of connecting with the world is websites. There are billions of websites on the Internet. Some of them may be audited and performed at a very good level. But, there may some other websites which are not really taking care of, they are being hacked by unethical parties every day. To stop that behavior, we need to check whether the website is having good performance, whether the tools are used is up to date, should be touched with the digital certificate which is obtained. So, auditing should be done to fulfil those requirements.

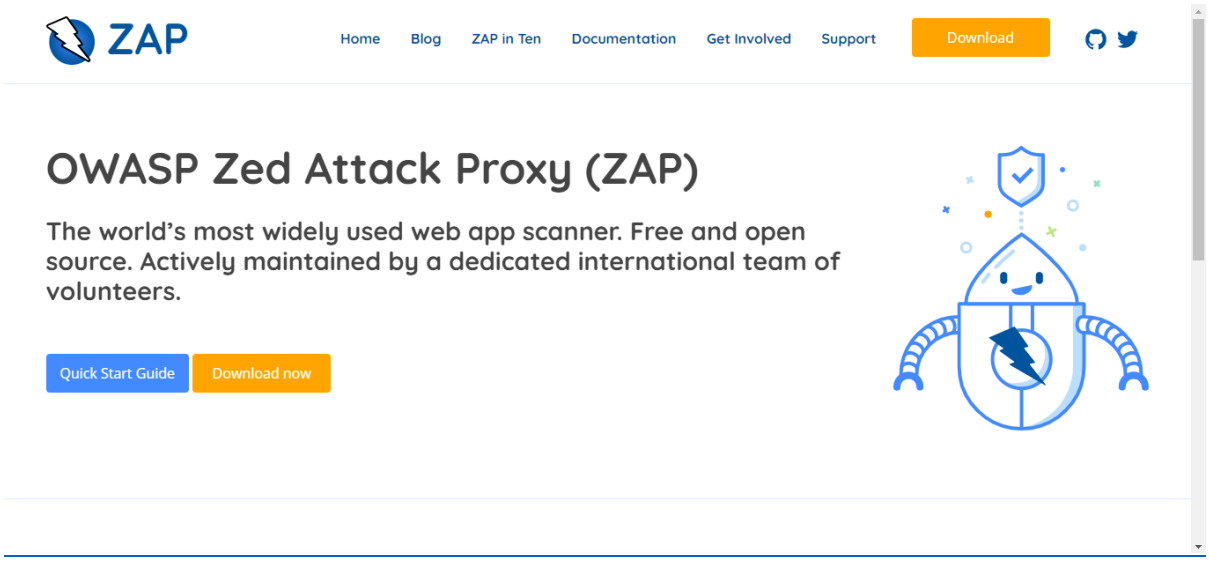
When it comes to business, the owner of it should do audits in a timely manner. It gives them more benefits. The auditing gives an idea about how the user experience with the website. It shows what are the aspects should be improved. It shows, what are the solutions which can be applied to make the website secured and more efficient.

To do so, there should be a checklist, it should follow Advanced Content Audit, User Experience audit, SEO audit, Vulnerability, and security scans. If we properly follow these steps, it will provide a more detailed report regarding the particular website.

3. ZAP

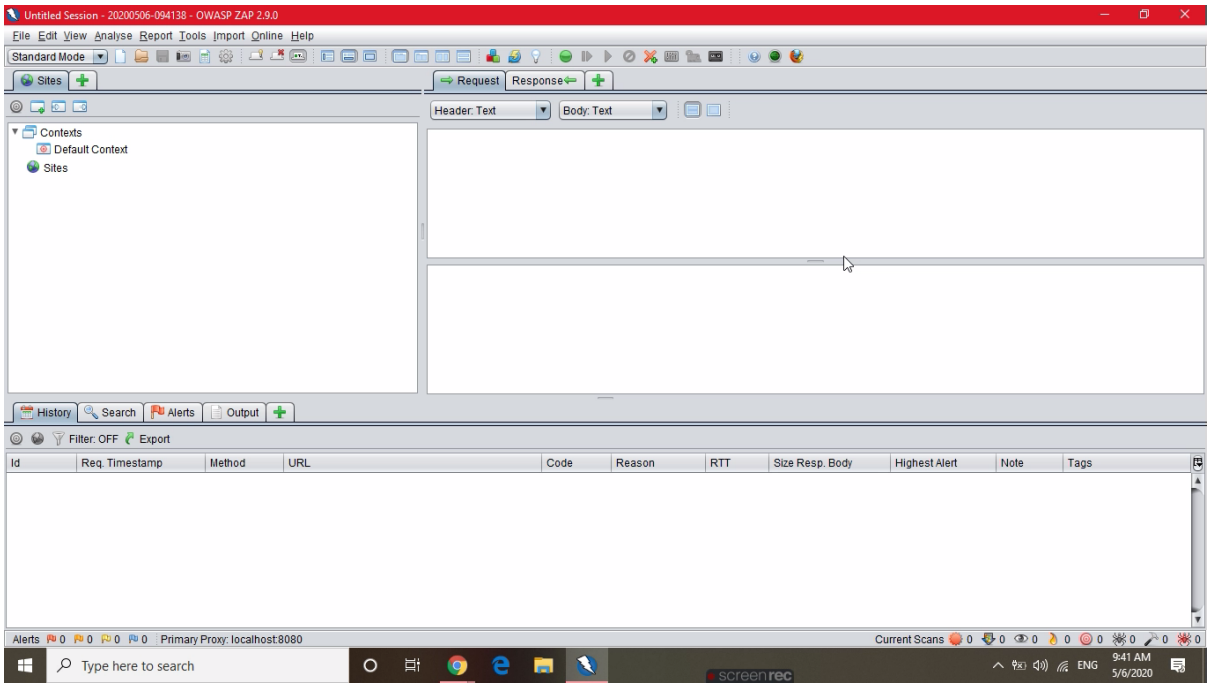
This is the main tool I'm going to use to do this audit. It is a free and open source software which is developed by OWASP.[1]

It can be downloaded by this link, https://owasp.org/www-project-zap/

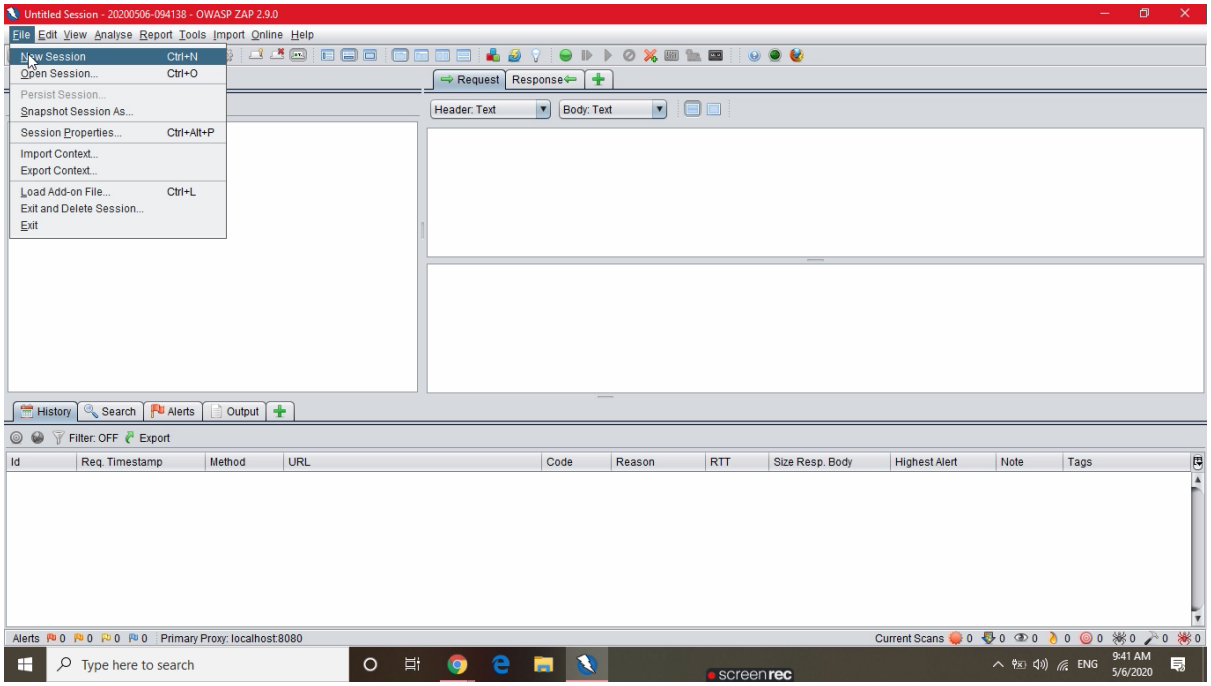


Open the tool.

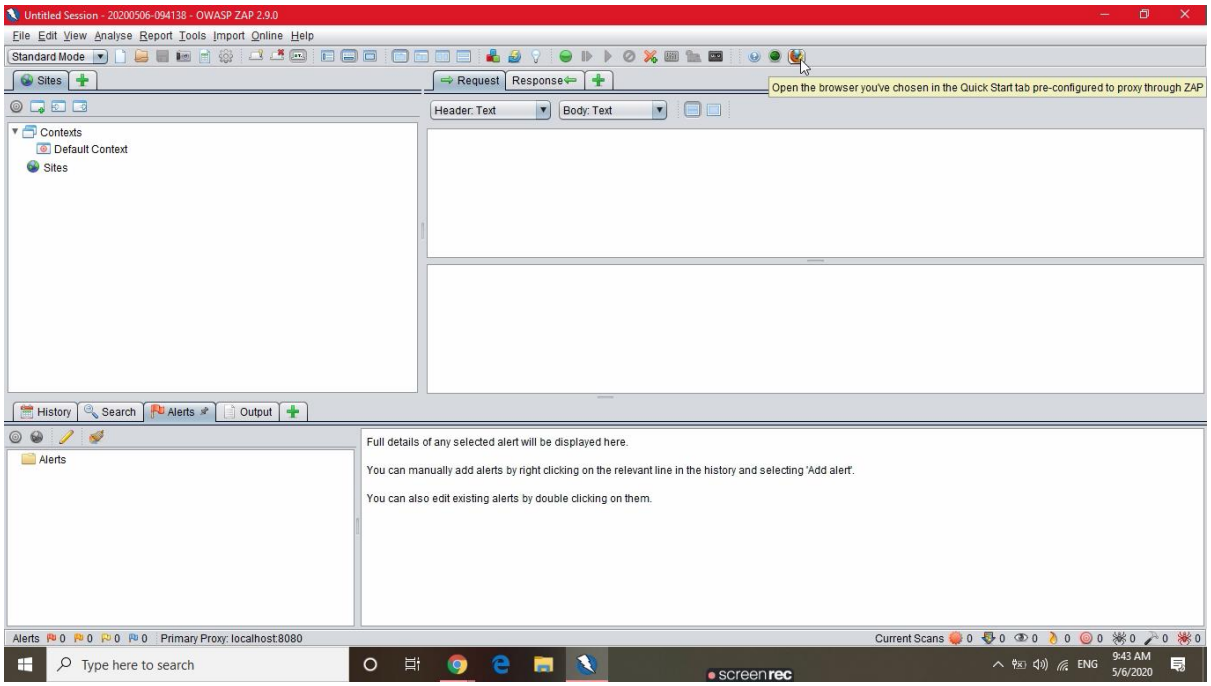
Home screen of ZAP.



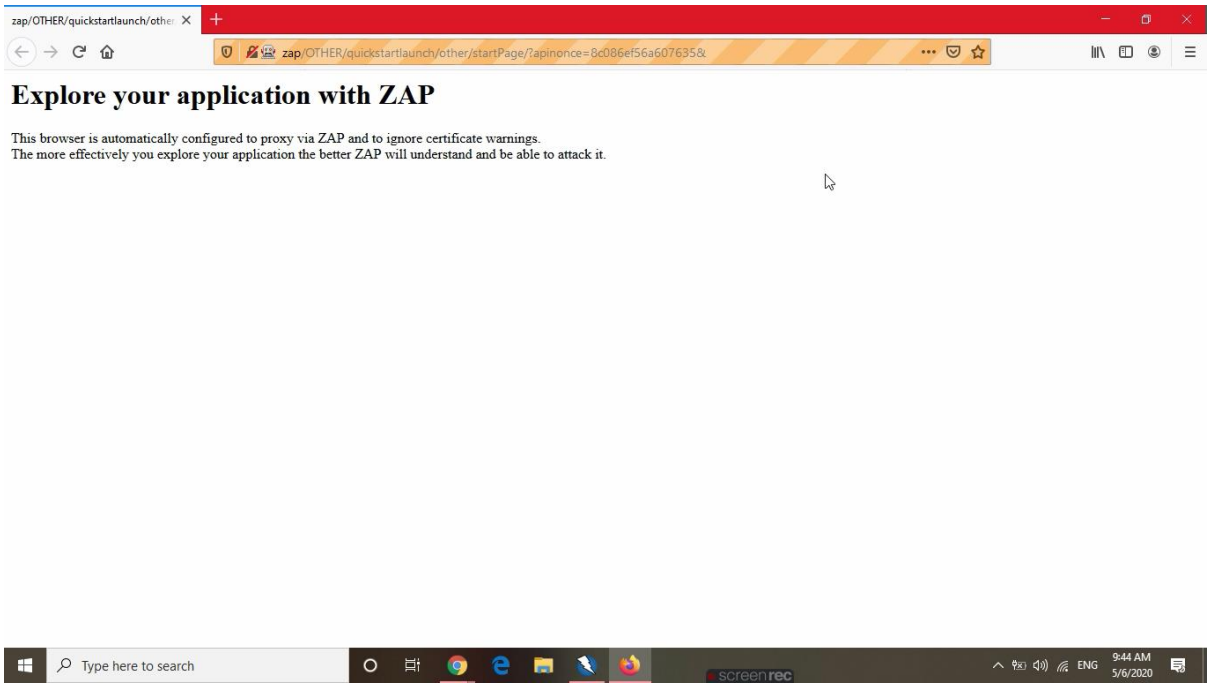
We should start a new session to scan a website.



The supporting web browser should be opened by the ZAP. I have configured firefox as the supporting browser. To do so, we should configure a manual HTTP proxy as “localhost” for port “8080”.

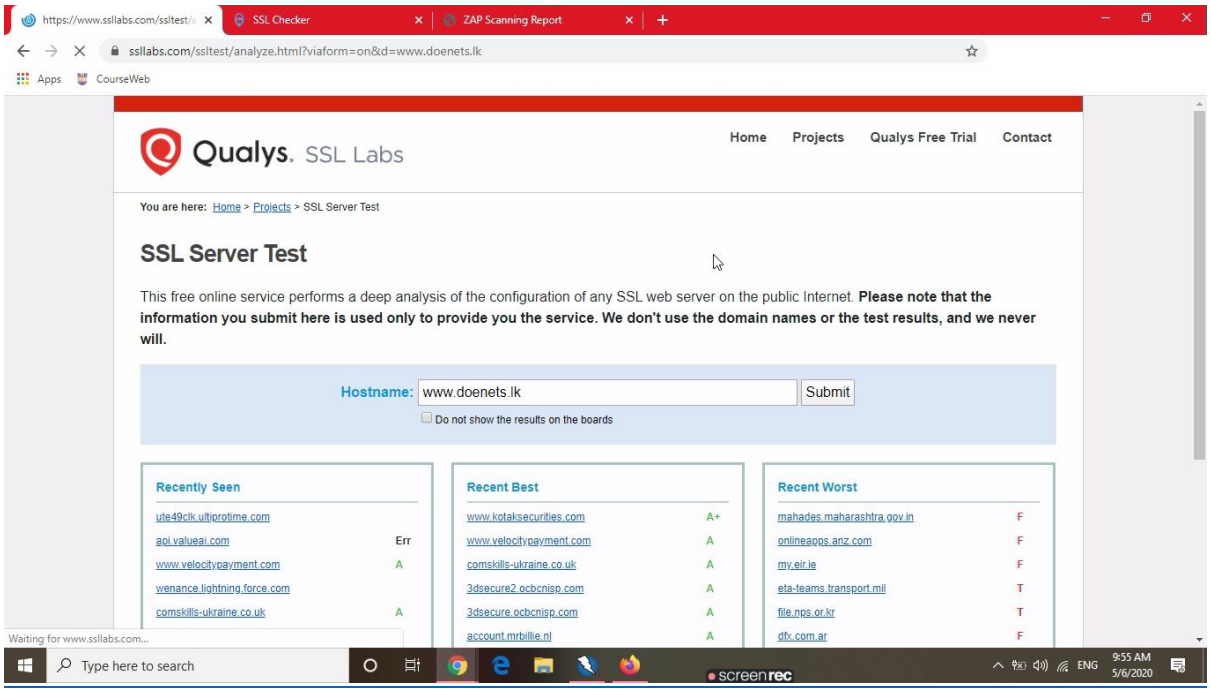


You can see the difference of address bar in regular firefox page and a page which is supporting to this tool.



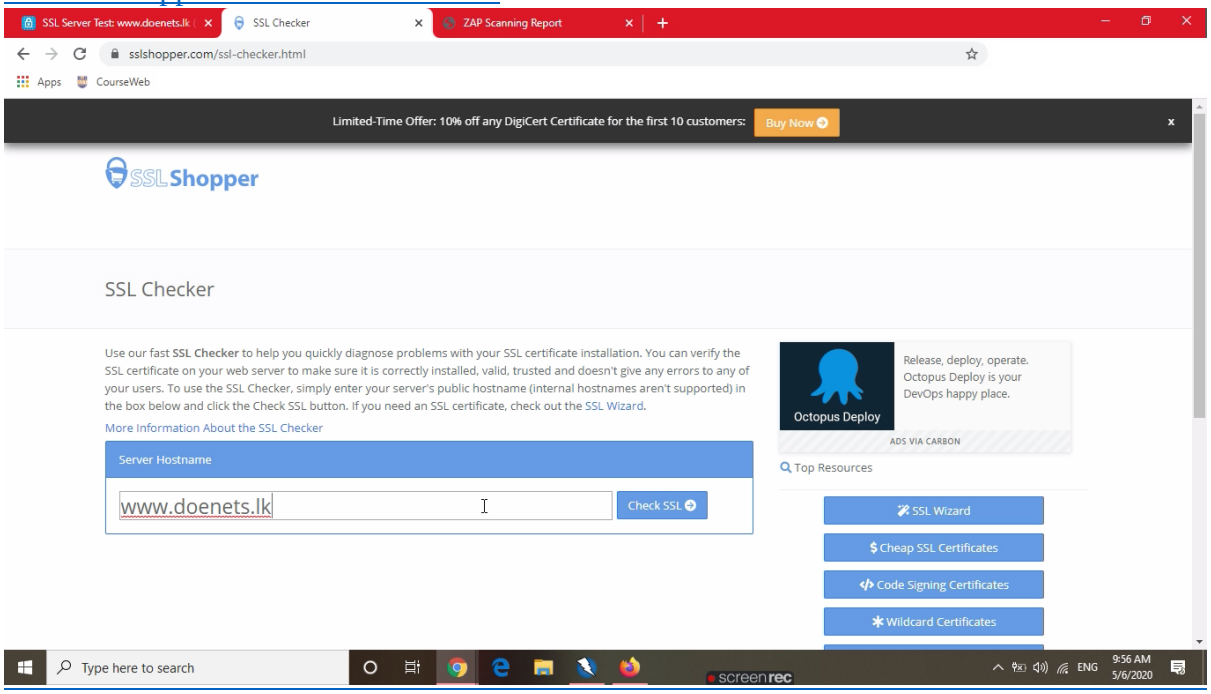
4. Qualys SSL Labs

For the scoring of websites, I'm using SSL Labs website. It provides website scoring for free.[4] https://www.ssllabs.com/ssltest/



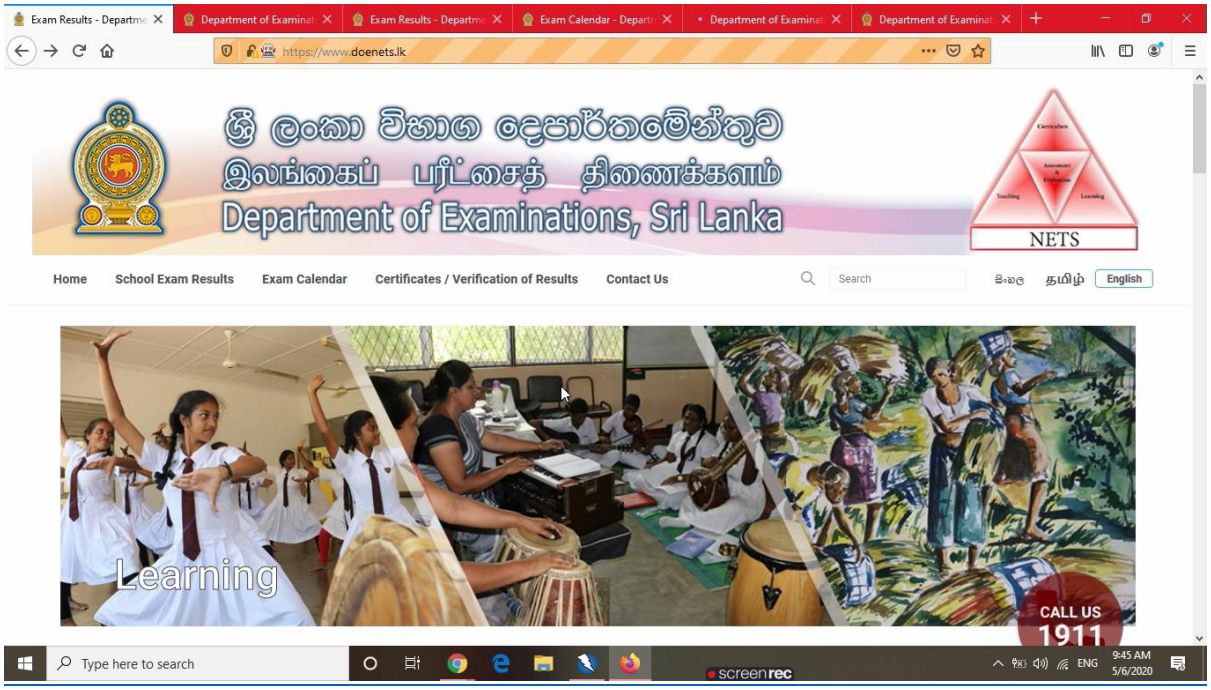
5. SSL Hopper

I'm using SSL Hopper for testing the situations regarding the Certificate of the website.[5] www.sslshopper.com/ssl-checker.html



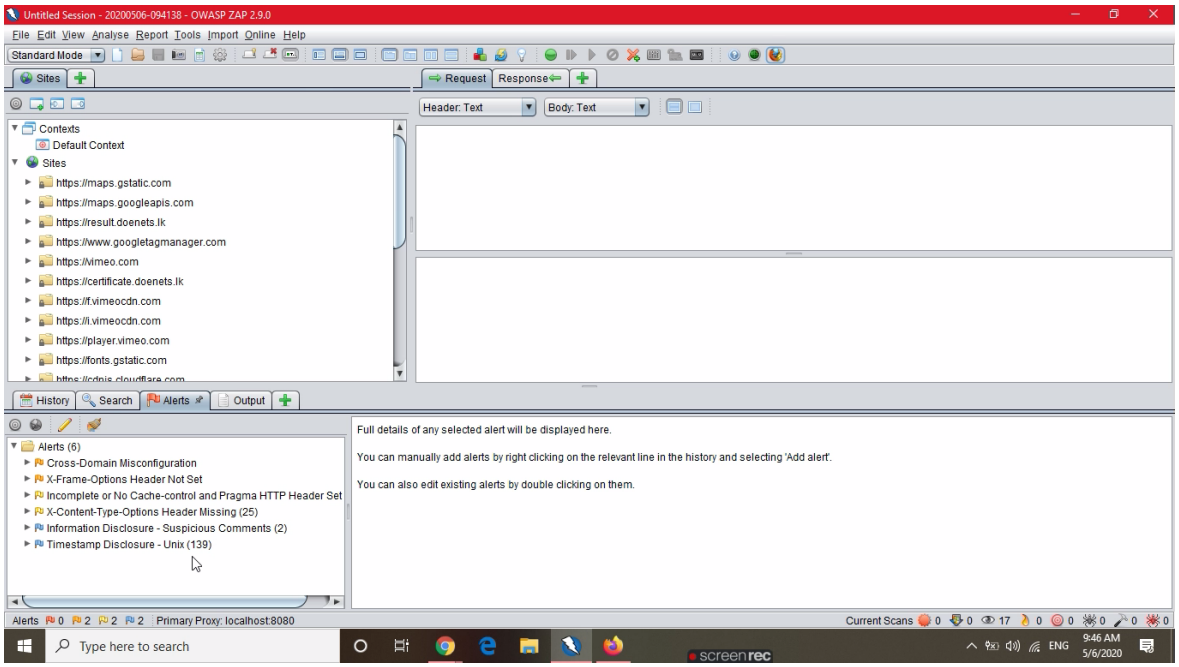
6. Auditing the Department of Examinations website

I'm going to audit the website of Examination Department, Sri Lanka.[2] Which is a popular website among everyone when the GCE O/L and A/L exam result releasing time.
https://doenets.lk/

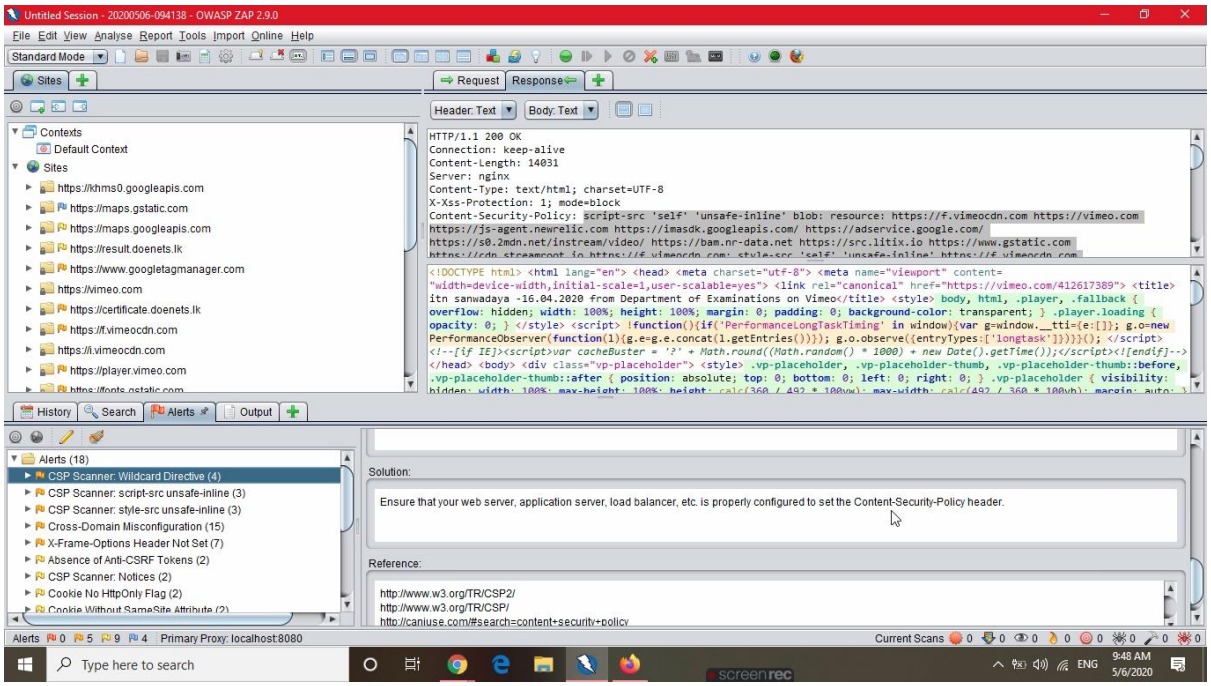


6.1. Auditing with ZAP

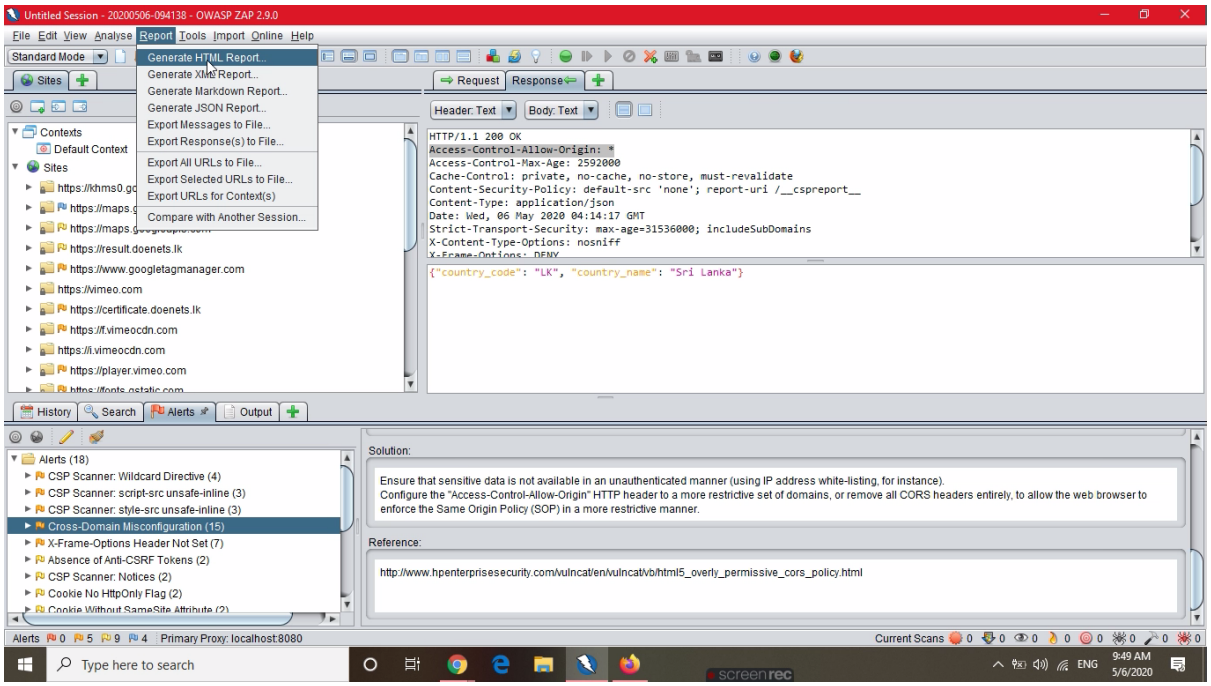
After browsing using the supporting browser the tool will automatically start the scanning.



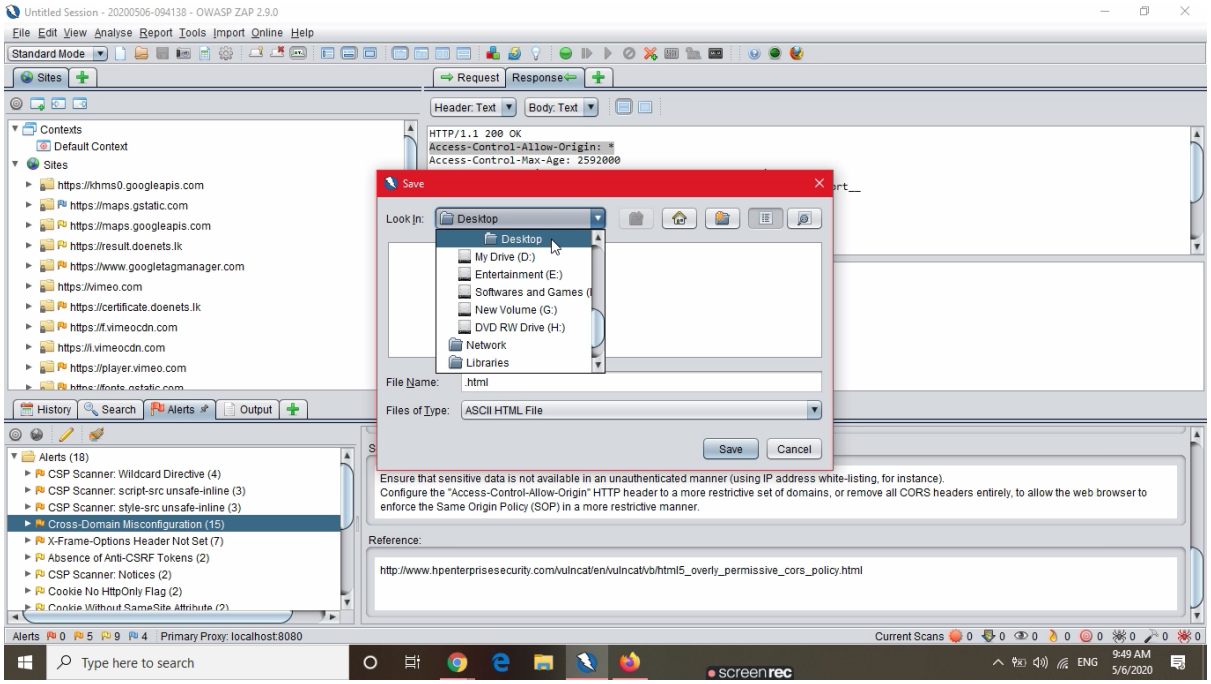
The amount of alerts regarding vulnerabilities can be seen in the alerts tab at the bottom of the tool. By clicking in the generated alerts we can find the place which the vulnerability exists, reason for that and the solution proposed.



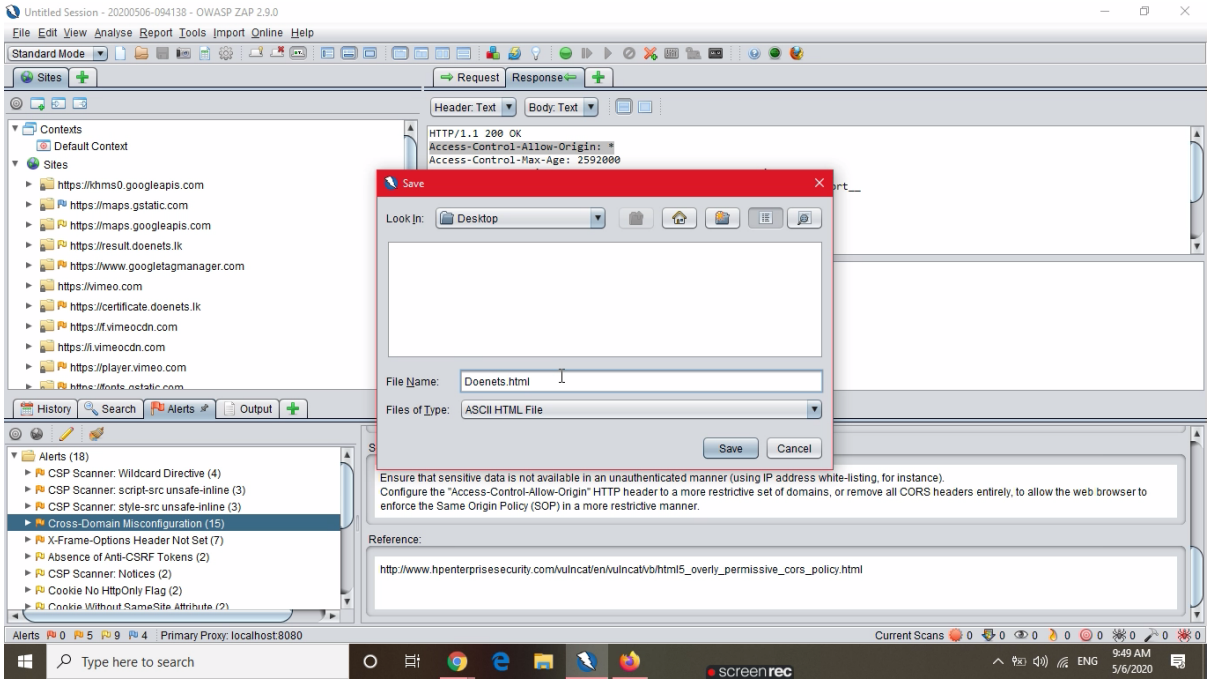
Then we can generate a report regarding the detected vulnerabilities. It gives further more clear idea about things we found.



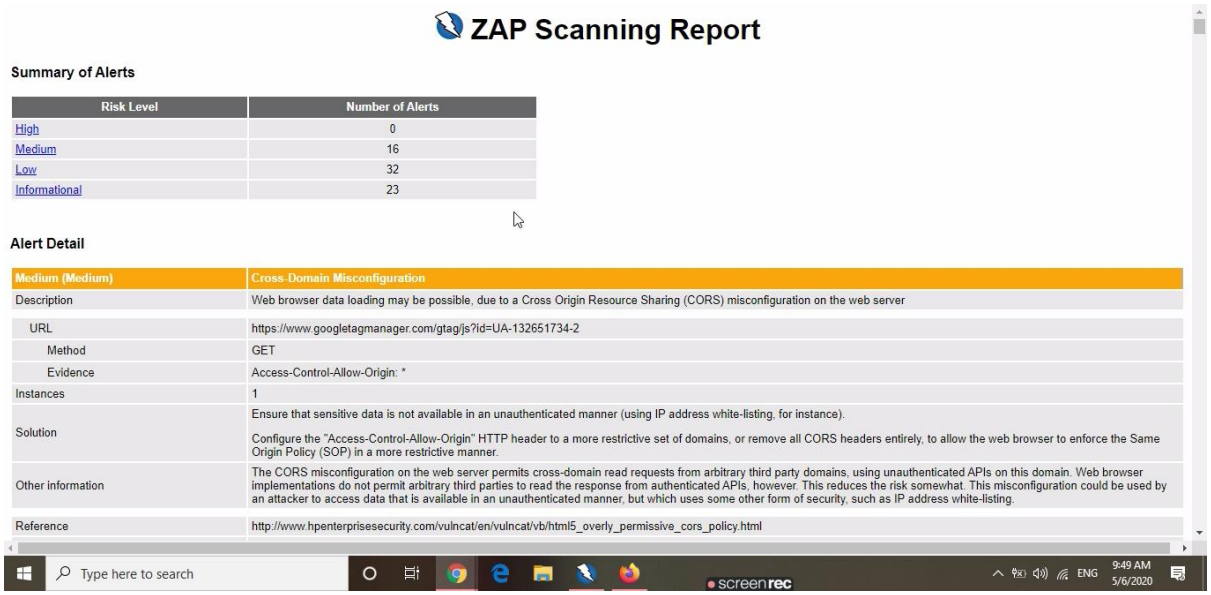
A file location should be selected.



A name should be given.



This is the report generated.



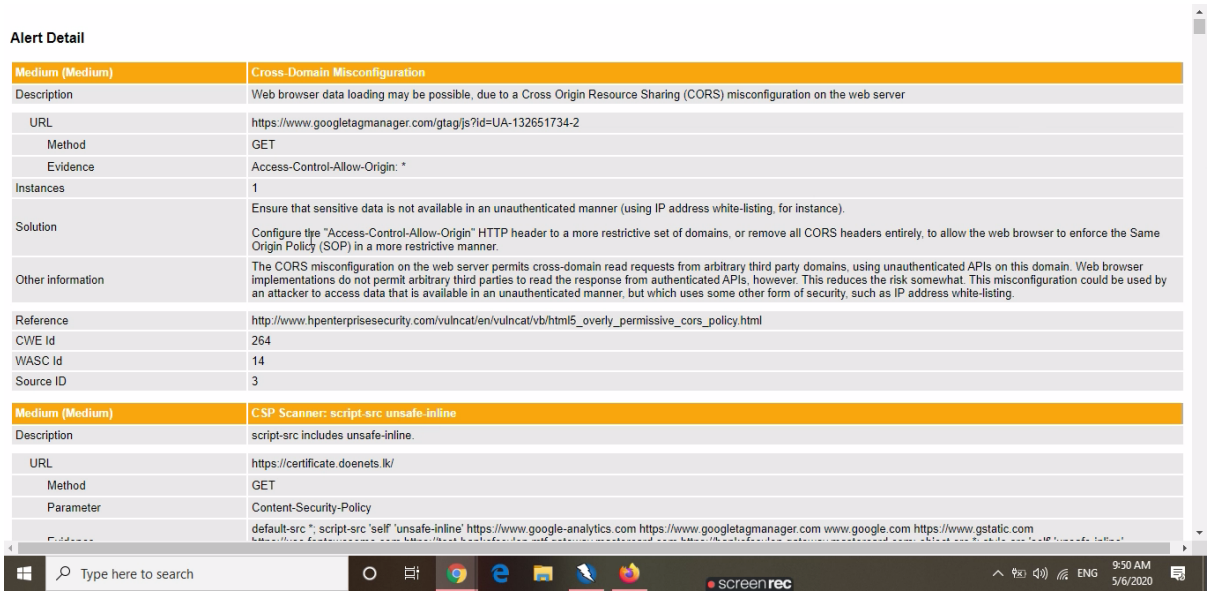
ZAP Scanning Report

Summary of Alerts

Risk Level	Number of Alerts
High	0
Medium	16
Low	32
Informational	23

Alert Detail

Medium (Medium)	Cross-Domain Misconfiguration
Description	Web browser data loading may be possible, due to a Cross Origin Resource Sharing (CORS) misconfiguration on the web server
URL	https://www.googletagmanager.com/gtag/js?id=UA-132651734-2
Method	GET
Evidence	Access-Control-Allow-Origin: *
Instances	1
Solution	Ensure that sensitive data is not available in an unauthenticated manner (using IP address white-listing, for instance). Configure the "Access-Control-Allow-Origin" HTTP header to a more restrictive set of domains, or remove all CORS headers entirely, to allow the web browser to enforce the Same Origin Policy (SOP) in a more restrictive manner.
Other information	The CORS misconfiguration on the web server permits cross-domain read requests from arbitrary third party domains, using unauthenticated APIs on this domain. Web browser implementations do not permit arbitrary third parties to read the response from authenticated APIs, however. This reduces the risk somewhat. This misconfiguration could be used by an attacker to access data that is available in an unauthenticated manner, but which uses some other form of security, such as IP address white-listing.
Reference	http://www.hpenterprisesecurity.com/vulncat/en/vulncat/vb/html5_overly_permissive_cors_policy.html



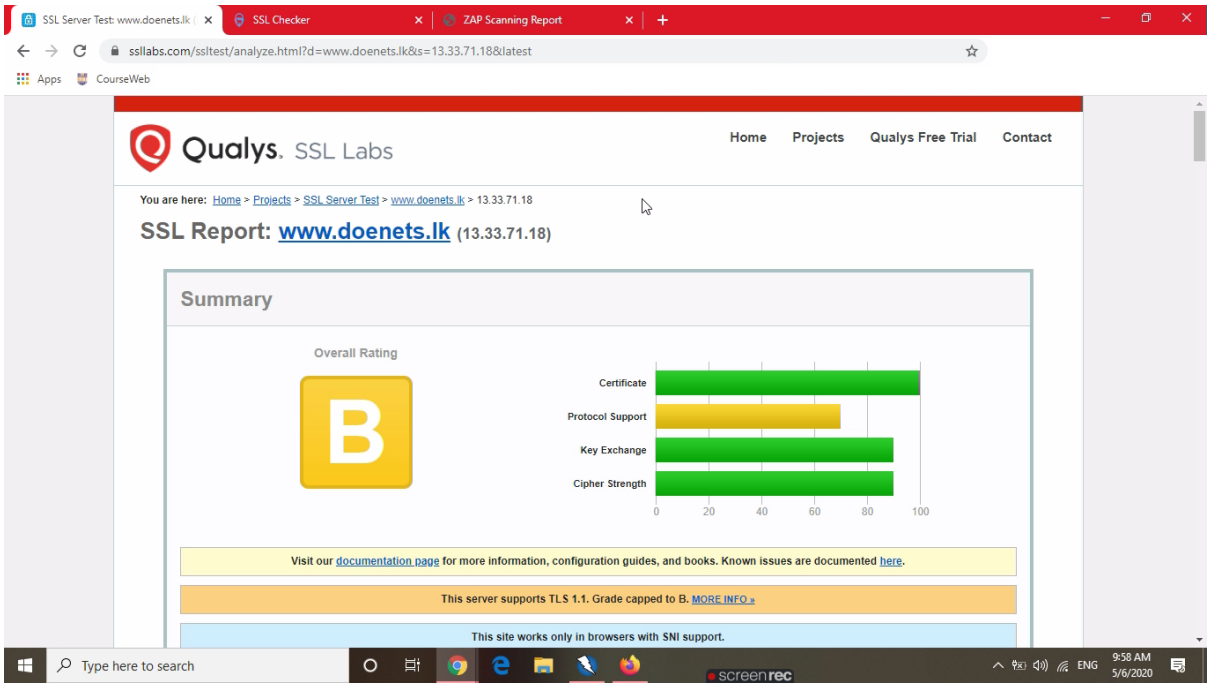
Alert Detail

Medium (Medium)	Cross-Domain Misconfiguration
Description	Web browser data loading may be possible, due to a Cross Origin Resource Sharing (CORS) misconfiguration on the web server
URL	https://www.googletagmanager.com/gtag/js?id=UA-132651734-2
Method	GET
Evidence	Access-Control-Allow-Origin: *
Instances	1
Solution	Ensure that sensitive data is not available in an unauthenticated manner (using IP address white-listing, for instance). Configure the "Access-Control-Allow-Origin" HTTP header to a more restrictive set of domains, or remove all CORS headers entirely, to allow the web browser to enforce the Same Origin Policy (SOP) in a more restrictive manner.
Other information	The CORS misconfiguration on the web server permits cross-domain read requests from arbitrary third party domains, using unauthenticated APIs on this domain. Web browser implementations do not permit arbitrary third parties to read the response from authenticated APIs, however. This reduces the risk somewhat. This misconfiguration could be used by an attacker to access data that is available in an unauthenticated manner, but which uses some other form of security, such as IP address white-listing.
Reference	http://www.hpenterprisesecurity.com/vulncat/en/vulncat/vb/html5_overly_permissive_cors_policy.html
CWE Id	264
WASC Id	14
Source ID	3

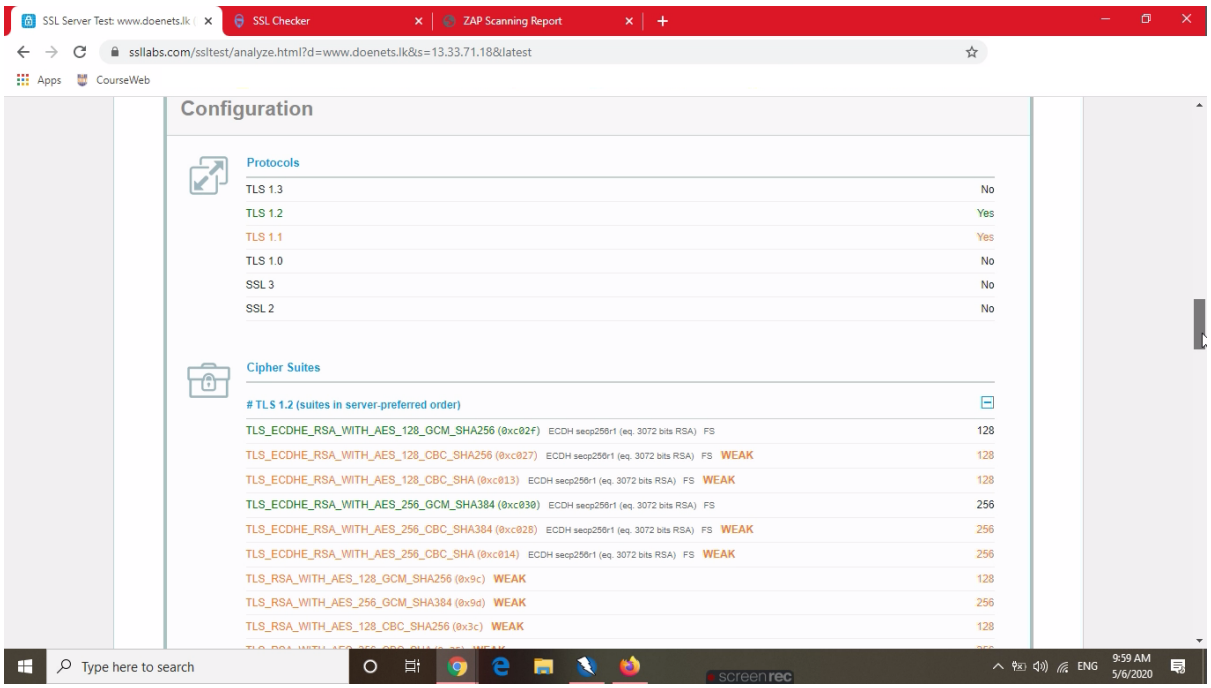
Medium (Medium)	CSP Scanner: script-src unsafe-inline
Description	script-src includes unsafe-inline.
URL	https://certificate.doenets.lk/
Method	GET
Parameter	Content-Security-Policy
Evidence	default-src *; script-src 'self' 'unsafe-inline' https://www.google-analytics.com https://www.googletagmanager.com www.google.com https://www.gstatic.com

6.2. Auditing with Qualys SSL Labs

Simply copy and paste the URL into the search bar of the SSL Labs web page. Then it will scan and rate it. The website has gained B class rating. You can see the reasons to obtain the particular class.

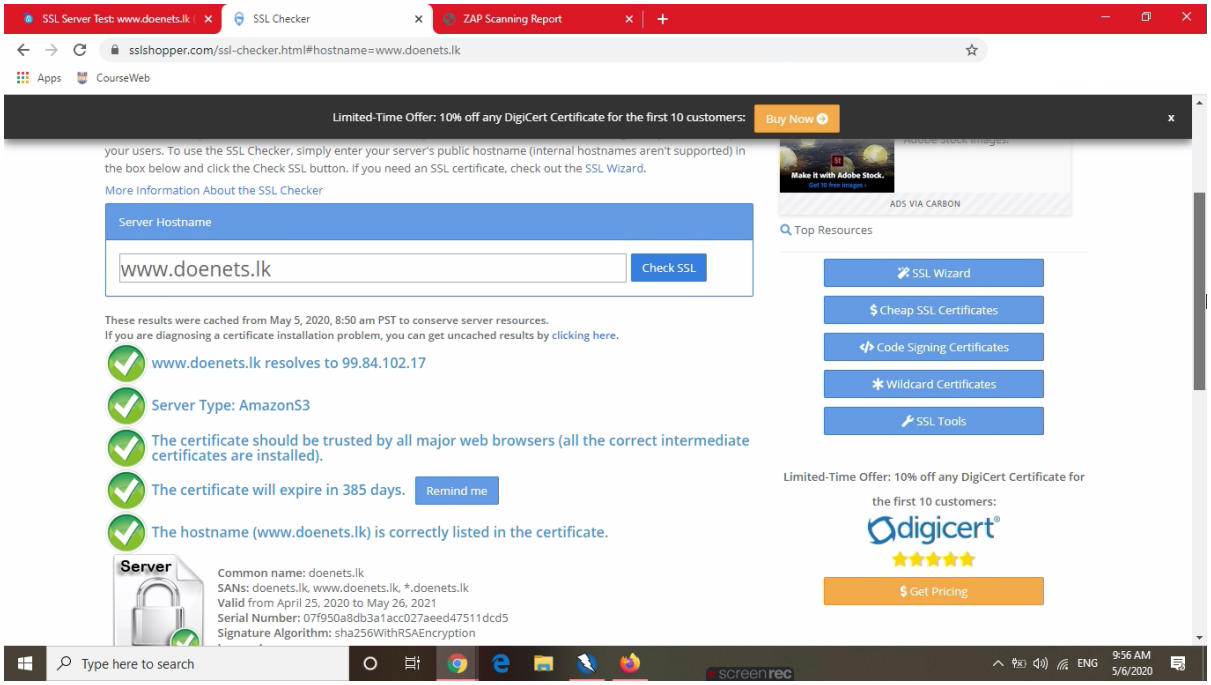


You can see it is supporting some outdated protocols such as TLS 1.1



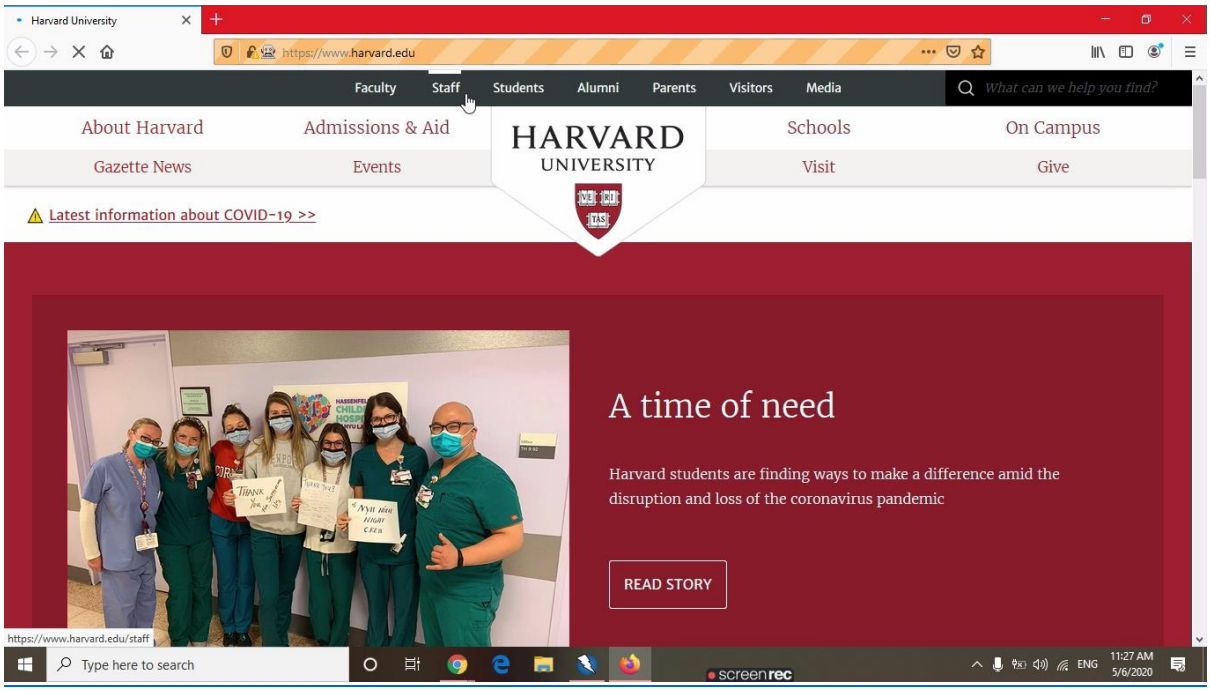
6.3. Auditing with SSL Hopper

Again copy and paste the URL into the search bar of the SSL Hopper web page. Then it will show the certificate details.



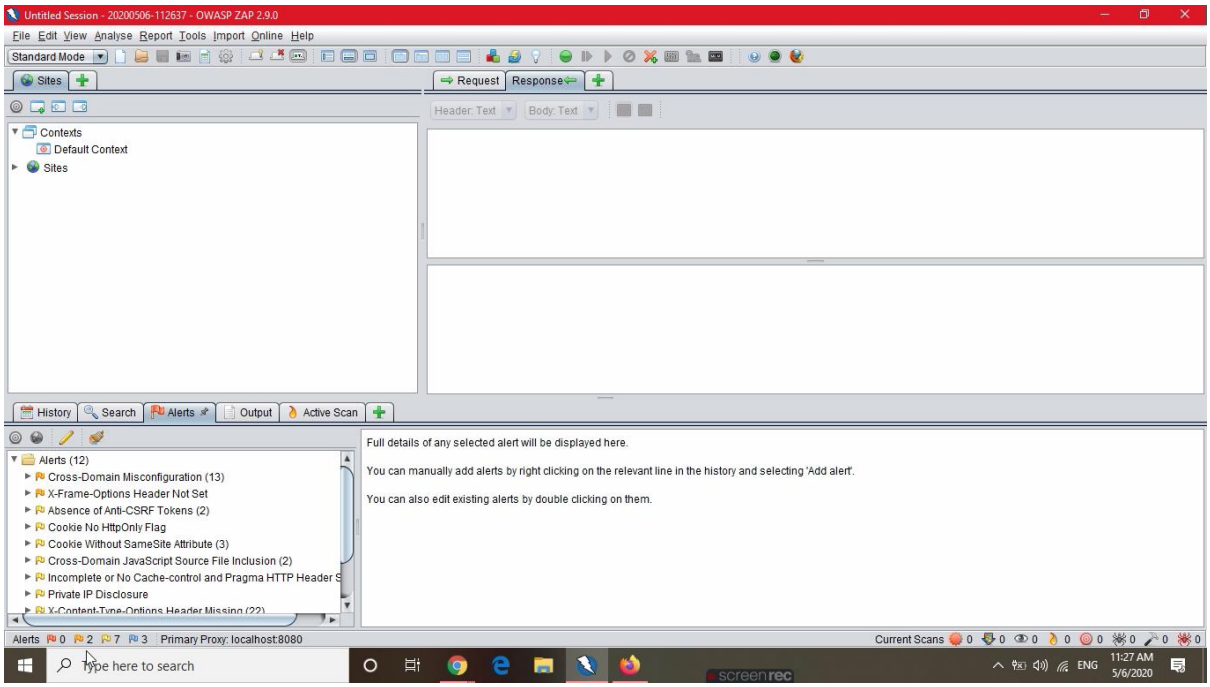
7. Auditing the Harvard University website

As a comparison to have a better idea, I did the auditing with another website. It is the website of the Harvard University.[3] https://www.harvard.edu/

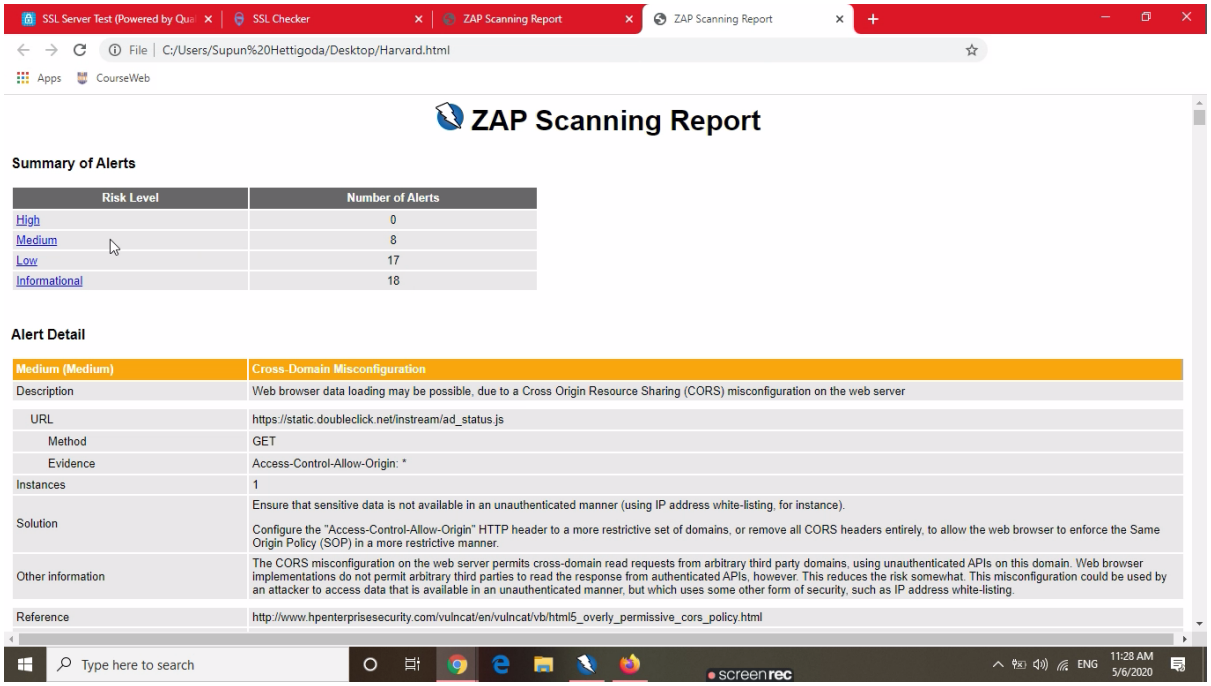


7.1. Auditing with ZAP

Again I used ZAP and did the scan.

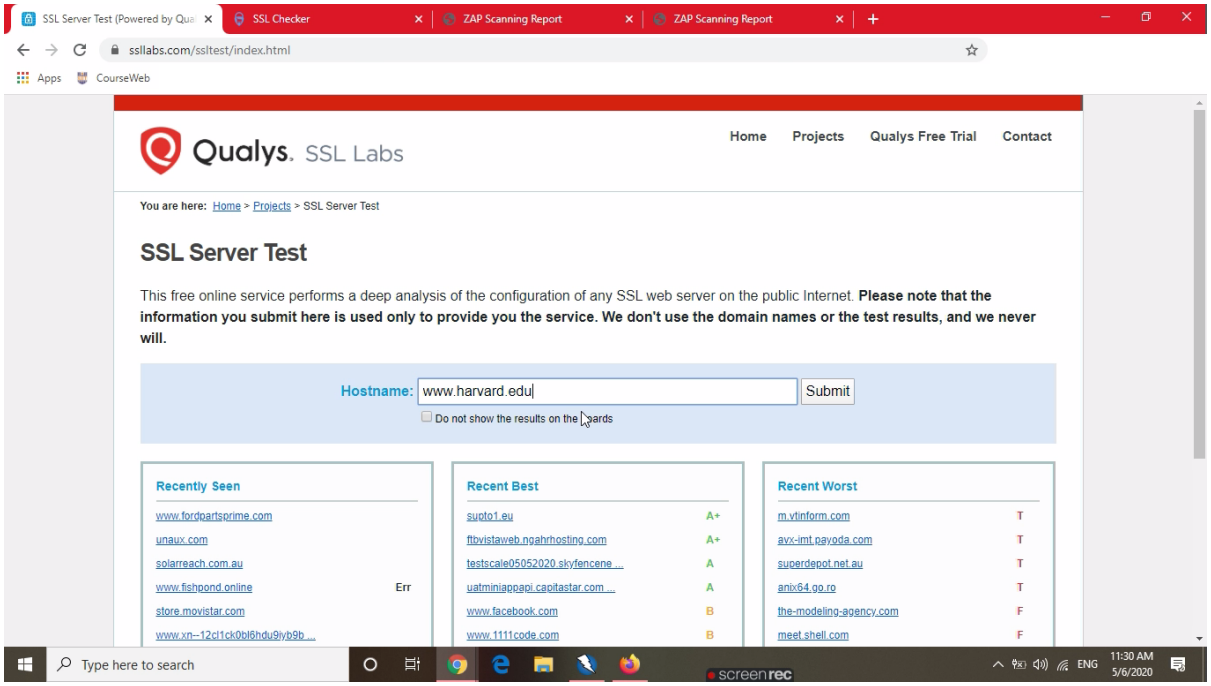


Here is the report regarding the Harvard University website.

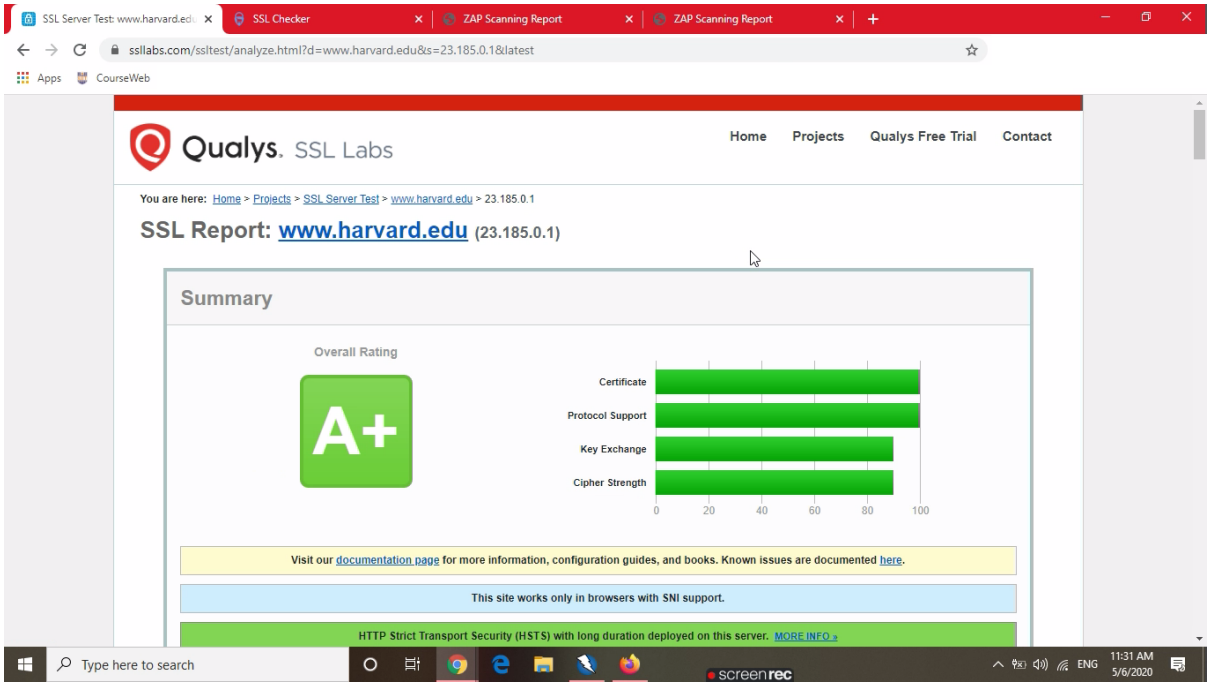


7.2. Auditing with Qualys SSL Labs

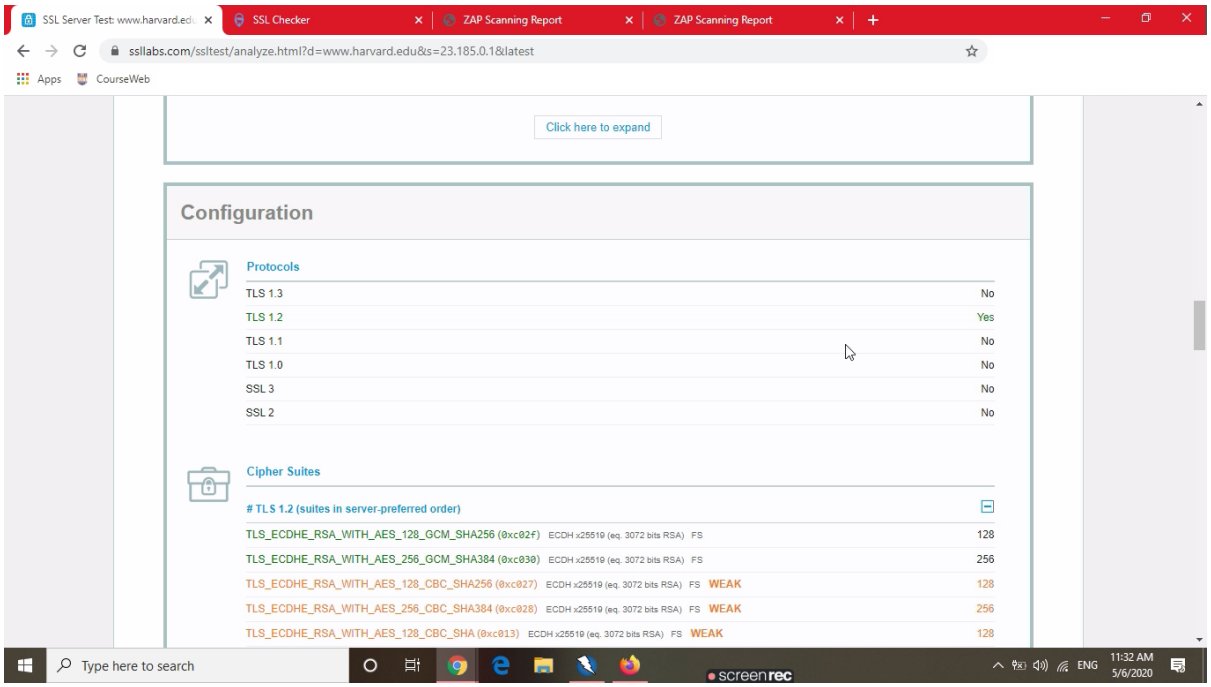
Then I used SSL Labs to gain the score.



Here is the result. It is “A+”, So you can see the reasons why it got an A+.



It supports modern TLS versions. No supporting for older versions such as TLS 1.1.



8. Comprehension

Examination Department’s website is having some issues and lower grading compared to the Harvard University website.

In the report of the Doenets, CORS Misconfiguration was mentioned. It will be a big deal for unethical parties. One of the most common CORS misconfigurations is incorrectly using wildcards such as (*) under which domains are allowed to request resources. It is the default behavior. But, it can be configured with safeguarding the website.

9. Conclusion and Recommendation

There are some issues to be addressed with good configuration and updates. Updating the Doenets website to support only TLS 1.2 or higher is a major update to be done. Because it is the technique of encrypting sensitive data.[7] Older TLS versions may be vulnerable. So, it must be up to date.

The other thing is X-frame header was not set. It defines whether a browser is allowed or not to render a page. If it is not set it is a reason for the “ClickJacking” attack. Which means, hijacking the click making a fraud button click by the victim. So, the X-frame header should be set.[8]

10. References

[1]"OWASP ZAP", Zaproxy.org, 2020. [Online]. Available: https://www.zaproxy.org/. [Accessed: 06- May- 2020].

[2]"Department of Examinations - Sri Lanka", Doenets.lk, 2020. [Online]. Available: https://doenets.lk/. [Accessed: 06- May- 2020].

[3]H. University, "Harvard University", Harvard University, 2020. [Online]. Available: https://www.harvard.edu/. [Accessed: 06- May- 2020].

[4]"SSL Server Test (Powered by Qualys SSL Labs)", Ssllabs.com, 2020. [Online]. Available: https://www.ssllabs.com/ssltest/index.html. [Accessed: 06- May- 2020].

[5]"SSL Checker", Sslshopper.com, 2020. [Online]. Available: https://www.sslshopper.com/ssl-checker.html. [Accessed: 06- May- 2020].

[6]P. J, "3 Ways to Exploit Misconfigured Cross-Origin Resource Sharing (CORS)", *We45.com*, 2020. [Online]. Available: https://www.we45.com/blog/3-ways-to-exploit-misconfigured-cross-origin-resource-sharing-cors. [Accessed: 06- May- 2020].

[7]"What is TLS & How Does it Work? | ISOC Internet Society", *Internet Society*, 2020. [Online]. Available: https://www.internetsociety.org/deploy360/tls/basics/?gclid=Cj0KCQjwhtT1BRCiARIsAGlY51LRwFqL_49HAMNZn82t5UqJTlEb-s4CIauccbYJCEkofcrCGs2mh_8aApajEALw_wcB. [Accessed: 06- May- 2020].

[8]"Clickjacking | OWASP", *Owasp.org*, 2020. [Online]. Available: https://owasp.org/www-community/attacks/Clickjacking. [Accessed: 06- May- 2020].