Technical Assignment #1

CS 6573 – Penetration Testing and Vulnerability Analysis

Rules:

Submit by the deadline listed on the assignment page. After this time, your homework will not be accepted. Keep your answers as short as possible. This assignment is based on Modules 1-4. Do cite your sources if you use other than the lecture slides, including templates. You may not work with anyone else. Both of these are considered cheating. Cheating will result with at a minimum: a zero for this assignment and could result in expulsion from NYU.

[100 pts] All questions in this section are regarding Indeed.

You are looking for public vulnerabilities for a website which participates in a bug bounty program.

Target: Indeed (https://www.indeed.com/)

Permission: https://bugcrowd.com/indeed

========== **STOP AND READ PERMISSION DETAILS BEFORE CONTINUING** ==========

Scope: All authorized URLS that end in .com. No need to enumerate TLDs other than .com (e.g. *.indeed.co.in). See permission page on Bugcrowd for specifics.

Perform recon to figure out the following details. If you use a tool, explain commands, arguments, and modules. Do not use any intrusive, aggressive, overly active, load-testing, or DoS-risking techniques. Do not use any automated vulnerability port-scanning tools or exploitation frameworks (e.g. Metasploit, Nessus, Retina, Qualys, Nexpose, OpenVAS). Recon-ng, Amass are okay.

1. [10 pts] What subdomain is out of scope regarding open redirects?
   indeed.co.uk
2. [15 pts] Using passive methods only, what subdomains can you find for indeed.com?
   25 Subdomains listed here, see more in the attached spreadsheet. Please note, as many of the discovered subdomains came from the internet archive, not all may be valid.

Subdomains		
br.indeed.com	go.indeed.com	ph.indeed.com
ca.indeed.com	in.indeed.com	pt.indeed.com
employers.indeed.com	malaysia.indeed.com	support.indeed.com
es.indeed.com	mx.indeed.com	uk.indeed.com
fr.indeed.com	myjobs.indeed.com	www.indeed.com
cts.indeed.com	apply.indeed.com	paynow.indeed.com
engage.indeed.com	partnerships.indeed.com	resumebuilder.indeed.com
hire.indeed.com	partners.indeed.com	wiki.indeed.com
thevirus.aggtest.indeed.com		

3. [15 pts] From those subdomains, what unique IPs can you find?
   Must have at least 25 IP addresses

Subdomains	IP Addresses			
br.indeed.com	162.159.129.67	162.159.130.67		
ca.indeed.com	162.159.129.67	162.159.130.67		
employers.indeed.com	18.116.0.135	3.141.60.172	3.131.4.75	
es.indeed.com	162.159.129.67	162.159.130.67		
fr.indeed.com	162.159.129.67	162.159.130.67		
go.indeed.com	3.130.123.174	3.131.108.23	18.189.52.126	3.19.195.73
in.indeed.com	162.159.129.67	162.159.130.67		
malaysia.indeed.com	162.159.129.67	162.159.130.67		
mx.indeed.com	162.159.129.67	162.159.130.67		
myjobs.indeed.com	3.128.222.240	18.218.184.174	18.119.36.85	
ph.indeed.com	162.159.129.67	162.159.130.67		
pt.indeed.com	162.159.129.67	162.159.130.67		
support.indeed.com	104.16.51.111	104.16.53.111		
uk.indeed.com	162.159.129.67	162.159.130.67		
www.indeed.com	162.159.129.67	162.159.130.67		
cts.indeed.com	3.130.25.196			
engage.indeed.com	18.155.181.43			
hire.indeed.com	108.156.211.94			
apply.indeed.com	162.159.130.67			
partnerships.indeed.com	18.119.36.85			
partners.indeed.com	3.19.195.73			
paynow.indeed.com	3.19.195.73			
resumebuilder.indeed.com	3.19.195.73			
wiki.indeed.com	76.77.155.130			
thevirus.aggtest.indeed.com	198.58.75.28			

4. [15 pts] What netblocks are granted to or associated with the company, and who owns them?
   Must have at least 4 netblocks

Netblock	Owner
162.158.0.0/15	Cloud Flare
18.32.0.0 - 18.255.255.255	Amazon
3.128.0.0/9	Amazon
104.16.0.0/12	Cloud Flare
76.77.144.0/20	Cyrus One
198.58.72.0/21	Cyrus One
108.156.0.0/14	Amazon

5. [20 pts] What employee email addresses can you find?
   Must have at least 6 email addresses

First	Last	Email

Joe	Esposito	joe@indeed.com
Kelsey	Byrne	kbyrne@indeed.com
Shannon	Rubes	rshannon@indeed.com
Shannon	Rubes	srubes@indeed.com
Vince	Gambo	vgambo@indeed.com
Will	Balistrieri	wbalistrieri@indeed.com

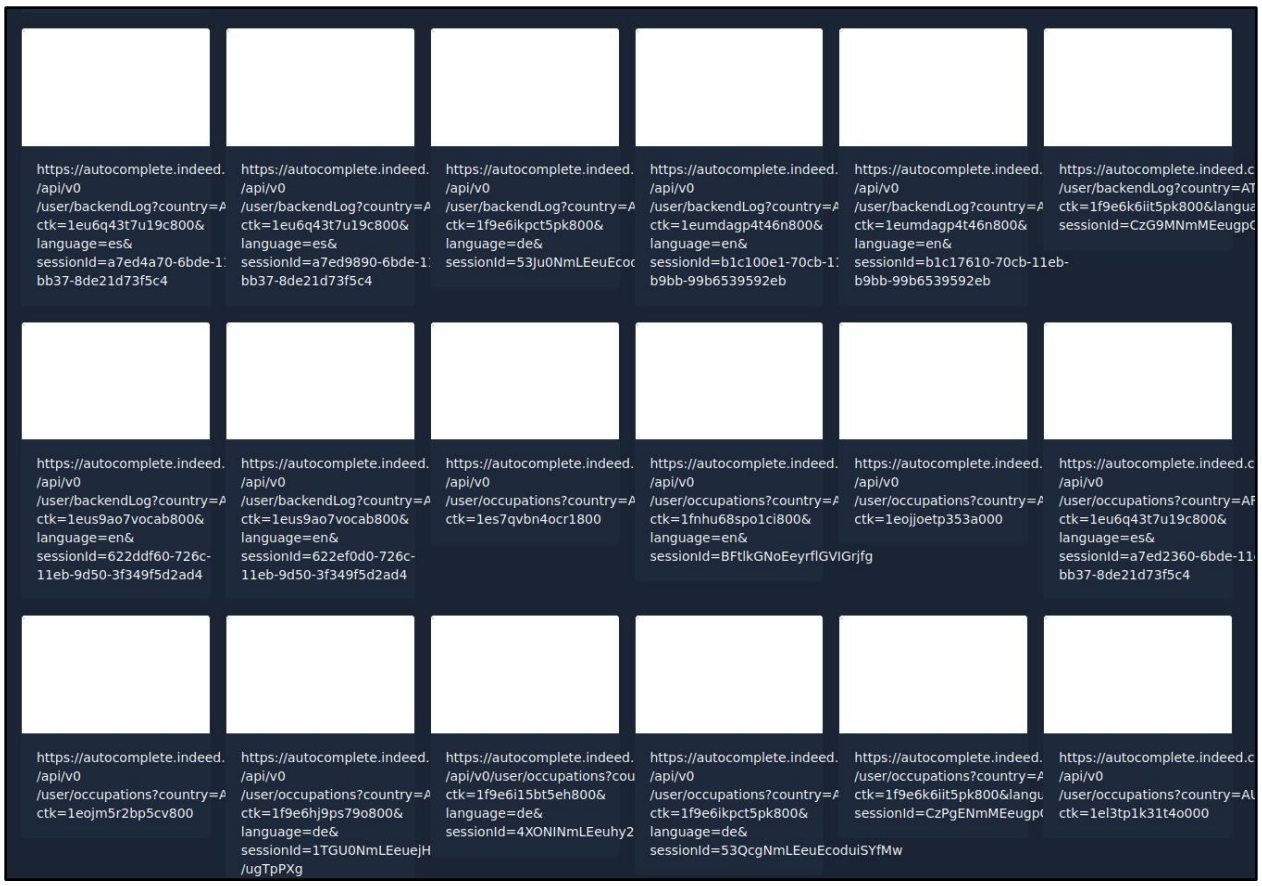
6. [25 pts] Using a non-aggressive method we covered in class, such as Google dorking, polite recon-ng modules, or Eyewitness, find at least one endpoint, service, or exposure which could be used for future research or testing. For example, an API that doesn't require a key/token, an interesting file, error page, service, etc. It does not have to be a proven vulnerability, just something that should be researched more as we enumerate the attack surface. Provide the method and the findings.

Note: If you find something that you think could lead to a bounty, remember that this is an open and active paying program. Anything you submit will be visible to the TA(s) and the professor. If you discover anything you would like to research more or that you think may lead to a bounty, I encourage you to continue your recon and enumeration, and find something else to submit for this answer that you are okay with sharing.

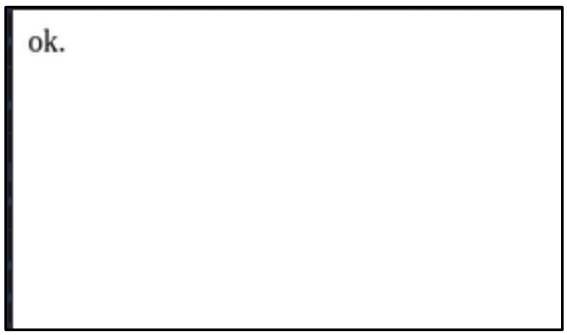
After grepping through my GAU output, I discovered an interesting subdomain at `autocomplete.indeed.com`.

```
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=.fcy3E1w3Ti4G1i.dJD85k
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=.W_kF1dD3Tma9C57Ow.KJ.
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=6H3UVE1w3TiuU8Lx7kX7Rk
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=7VpKVE1s3Tiijayv0PYtKV
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=9P.ScE1s3TiLGc4L.D.0j.
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=9S8J.B_X3TiZzdRW15pnZF
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=aA3YVBPs3TiEA9wWZkkUUk
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=ahUv7BPs3TiiCEpQYtnW6F
https://autocomplete.indeed.com/api/v0/user/occupations?country=US&ctk=null&language=en&sessionId=aoa0cBPs3TiN6oo_xDTcAF
```

The majority of saved URLs seemed to be user searches of some sort. I used GoWitness to screenshot many of the URLs hoping that I could see some sensitive information. Unfortunately, the returned screenshots were all blank.



The root directory of the web application responds to a simple HTTP GET request with “ok.”



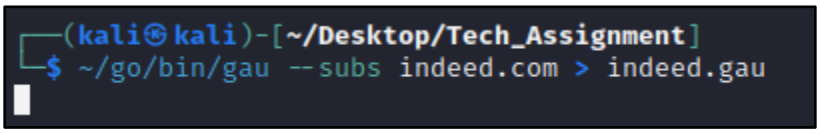
In an attempt to get more information, I requested the /log directory on the site. The application responded with a 405 Error request and a message that Get requests were not supported.

Because I found this site through archive.org and many of the stored URLs are not responding, it seems like this API stored user information, but is no longer in use. I believe that more in-depth fuzzing could reveal sensitive information stored in the API.

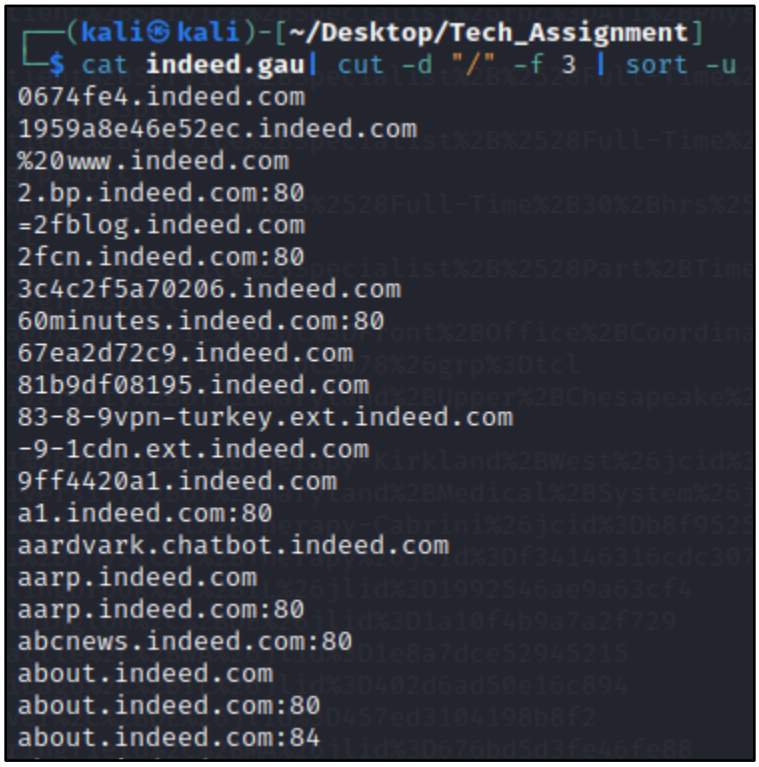
Please see the following documentation for a walkthrough of this investigation.

Subdomain Enumeration

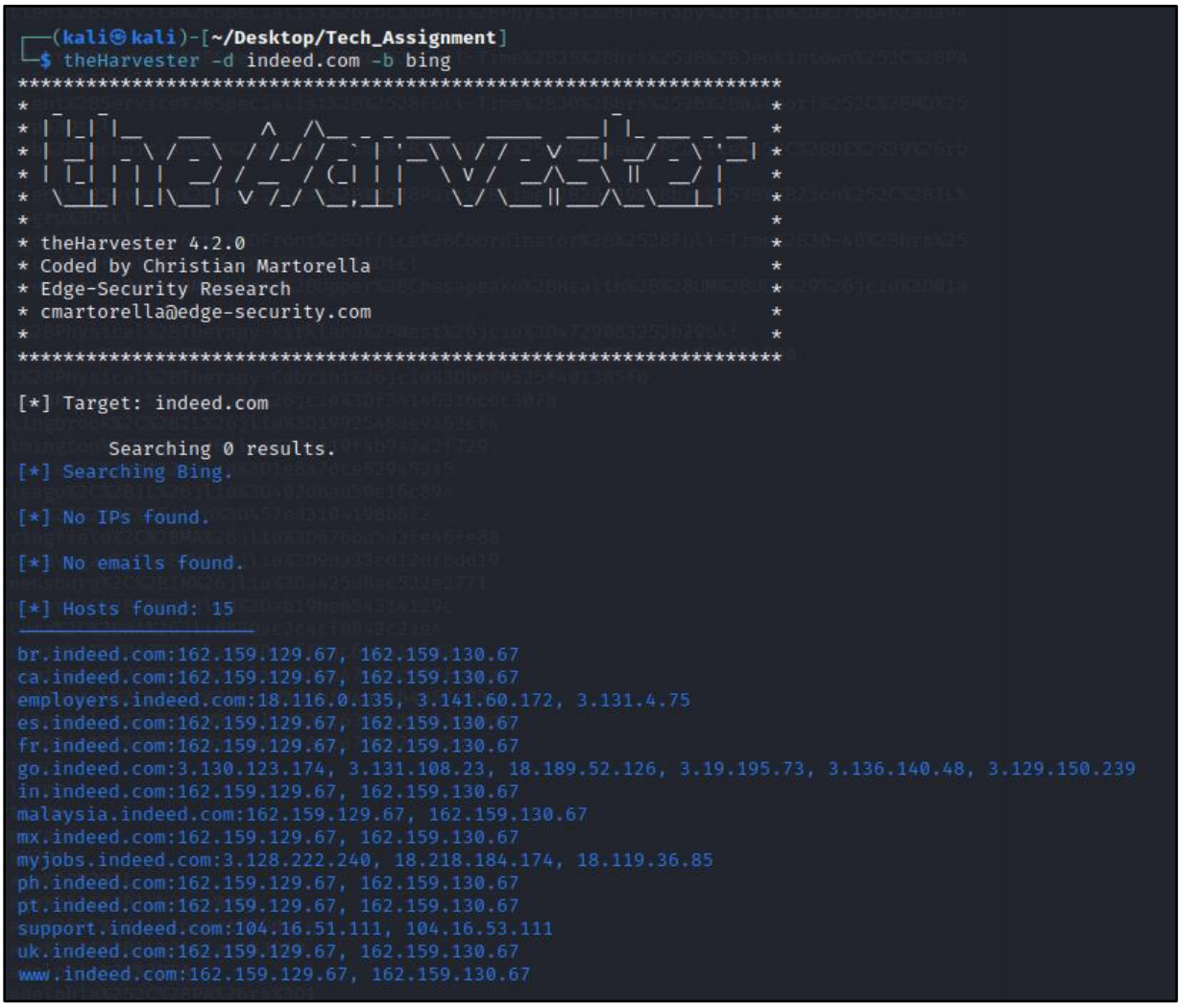
I began by using GAU (Get All URLs). GAU is an open-source tool written in Go that queries `archive.org` for archived URLs for a domain and it's subdomains.



After getting a whopping 172,223,419 results, I combed through them and used `cut` to pull out the individual subdomains.



During this time, I also used `TheHarvester` to pull additional information about `indeed.com` subdomains and ip addresses.



Netblock Enumeration

After identifying 25 valid-looking subdomains, I performed dns lookups to get the IP addresses associated with each subdomain. From there, I used `whois` to get information about the Ip address owners and the netblocks owned by each.

```
┌──(kali㉿kali)-[~/Desktop/Tech_Assignment]
└─$ nslookup indeed.com
Server:         192.168.254.254
Address:        192.168.254.254#53

Non-authoritative answer:
Name:   indeed.com
Address: 162.159.129.67
Name:   indeed.com
Address: 162.159.130.67

┌──(kali㉿kali)-[~/Desktop/Tech_Assignment]
└─$ whois 162.159.129.67

#
# ARIN WHOIS data and services are subject to the Terms of Use
# available at: https://www.arin.net/resources/registry/whois/tou/
#
# If you see inaccuracies in the results, please report at
# https://www.arin.net/resources/registry/whois/inaccuracy_reporting/
#
# Copyright 1997-2023, American Registry for Internet Numbers, Ltd.
#

NetRange:       162.158.0.0 - 162.159.255.255
CIDR:           162.158.0.0/15
NetName:        CLOUDFLARENET
NetHandle:      NET-162-158-0-0-1
Parent:         NET162 (NET-162-0-0-0-0)
NetType:        Direct Allocation
OriginAS:       AS13335
Organization:   Cloudflare, Inc. (CLOUD14)
RegDate:        2013-05-23
Updated:        2021-05-26
Comment:        All Cloudflare abuse reporting can be done via https://
Ref:            https://rdap.arin.net/registry/ip/162.158.0.0
```

Employee Email Enumeration

I initially intended to use `TheHarvester` to pull employee email addresses for indeed.com. However, recent updates to Google's captcha program mean that `TheHarvester` is now blocked from retrieving information through those sources. Instead, I used the `whois_pcos` module from `recon-ng`.