Offensive Security Tactics for Linux Professionals

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# Introduction

The contents of this course are to inform, train and improve the skills of IT professionals learning the methodologies of offensive security and having the knowledge of tools and approaches in order to effectively compromise a secure network. As a result, finding in depth and niche vulnerabilities which can otherwise be exploited by a real adversary with malicious intent.

This course is intended for experienced IT professionals who are familiar with the Linux operating system. Basic knowledge of basic penetration testing or external certifications such as OSCP are advantageous.

# Syllabus

## OSINT (Open Source Intelligence)

### Email harvesting with theHarvester

### Google Dorking

### BGP ASN/Host enumeration with Netcraft

### The Wayback Machine

## Active reconnaissance

### Shodan

### Ping

### NMAP/Netcat

### Censys

## External perimeter testing

### Offensive Python

### Firewall enumeration

### Host enumeration with pings

### Client-side attacks with Malicious RPM Packages

## Internal perimeter testing

This section focuses on internal penetration testing, you would reach this stage via phishing or infiltration from the external perimeter by leveraging a public exploit on a vulnerable service which is internet facing.

### Internal firewalking

### Living Off the Land (LOTL) Techniques

### Exposing the internal network with SOCKS

### Reverse proxies and transferring files

### Payload weaponization with MSFVENOM

### Breaching SSH with Hydra

### Discovering IPv6 Hosts

### SNMP enumeration/exploitation

### User enumeration with SMTP

### Null Bind LDAP reconnaissance

### Port scanning tactics without NMAP/Netcat

### VLAN Hopping with IPv6

### /dev/shm as workspace

### Hiding command history

### X11 Session Keylogging

### Lack of GRUB Encryption

## Privilege escalation

### Sudo rules

### Cronjobs

### SUID binaries

### NFS Mounts

### Internal services

## Defence Evasion

### Evading SSH Defences

### Evading Port Based Defences

### Evading IPv4 Defences with IPv6

### Evading Egress Filters using ICMP

### Erasing evidence of attack

## Anti-Forensics

### Rootkits

### /dev/shm

### Erasing the evidence

### Hiding command history

## Persistence/Data Exfiltration

### Planting SSH keys

### Persistent system services

### Poisoning the package manager

### Data Exfiltration with Web Cookies in Python

## File transfer methods

### Curl

### Python

### Perl

### WGET

### Netcat/Nc

### OpenSSL

### Bash

## Data exfiltration

### Web cookies

### ICMP Covert Channels

### Encrypted Network Sockets

Linux client side attacks

Linux Reverse shells

## Bonus: Attacking Dell OS10

Local privilege escalation to establish internal foothold

# Scoping/Ethics

Before the penetration test begins it is very important the lead penetration tester, supervising parties and the client have meetings

# OSINT

OSINT (Open Source Intelligence) consists of fully passive reconnaissance where the attack begins with starting to gain information on an organisation using the methods & resources explained below. OSINT is the initial stage of the penetration test in which there is no direct interaction with the target services which could alert them of any signs of attack such as port scanning or vulnerability scanning using online scanners.

`theHarvester -d (Target domain) -b all`

This usage of theHarvester allows us to be able to scrape the internet against the target domain giving us all known domains which are hosted by the target on the internet. Using the “all” option we are able to query all search engines available from theHarvester. This can help us to be able to perform further searches against domains which are internet facing to get further information. The tool also gives us a scrape of target emails which have been registered with the target domain which can aid in phishing campaigns or spear phishing attacks.

Information on internet facing target devices can be gained from three primary sources which can help us to perform passive reconnaissance in which direct contact is not made with our target to maintain anonymity and prevention of being blocked by any potential defences.

## Google Dorks

Google dorking is the use of the google engine to filter information based upon certain keywords. This can be done with quotation marks surrounding email addresses. If the email address is included in any specific pages on Google this filtered result will help us to see these pages. The operator for seeing such information would be quotation marks surrounding the email address as follows: [target-email@organisation.com](mailto:target-email@organisation.com)

A live example can be the use of my Durham email address on the Google search engine. Using quotation marks I can see which pages my email address may be hosted, some of these pages can be a result of leakage from servers requiring authorisation.

Figure 1 will show the use of quotation marks around my email address, this points to a staff list hosted by Department of Physics on a server which requires authentication.

Graphical user interface, text, application

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Figure 1: Google dorking of target email

Upon further investigation as seen in figure 2 and figure 3, this server is designed to be accessible only for authorised staff (https://www.physics.dur.ac.uk). The use of Google dorking an email address can be a hit/miss process; in some cases of OSINT the email address can be a breakthrough to provide a lot more information which can be helpful to the engagement.

Figure 2 is a screenshot of the login screen of the Physics database which requires a valid login before any login details can be accessed:

Graphical user interface, text, application

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Figure 2: Physics Database Login Screen

Figure 3 also showing one of the directories disallowing access to the directory involved in the information leakage here:

Graphical user interface, text, application, email

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Figure 3: Restricted directory for server

There can also be other uses of Google dorking such as identifying available login portals of the target organisation, this can also involve login portals of “iDRAC” devices which are commonly used within management VLANs. If these devices are found on the internet, this can be a method of leveraging a network with full management access provided the endpoint can be successfully brute forced or passwords are found during the OSINT search.

## Netcraft

Netcraft can be used for several purposes. As opposed to making use of vulnerability scanners such as Shodan/Censys which can be easily blocked by internet facing target devices with IPTables rules. One of the approaches which can be taken to gain information in a passive manner is to access a site called Netcraft. With this site it is possible to achieve information gathering of target organisation subnets.

With the knowledge of an internet facing device, the use of Netcraft can give further information about the ASN (Autonomous System Number) which is closely associated to BGP (Border Gateway Protocol) and is responsible for providing information such as allocated IP subnets. Allocated IP subnets which can then be used to map down which IP addresses belong to the target organisation as seen in figure 4.

Table

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Figure 4: IPv4 subnet enumeration

The exact subnets which have been delegated to the target organisation in addition to the IP address of the target device. From this point, it is possible to perform further searches of any devices which are hosted on the subnet as follows:

for i in {1..255}; do nslookup 193.60.196.$i | grep -v find 2>/dev/null; done > hosts.txt

This file would then need to be cleaned using: “sed -i '/^$/d' hosts.txt” allowing a reverse DNS lookup of the IP address to a hostname which can then be queried via “whois” in addition to netcraft which has given us IP delegation information. Netcraft is also capable to provide about information about the running operating system on the target with access to records of the hosting history. This can help to profile installed services on the target which can then be further queried for known public exploits.

Using the given banners such as Apache/2.4.6 CentOS it is possible to scope down the exact version of CentOS by firstly checking the changelog of the version of Apache seen in figure 5:

Text

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Figure : Release date of Apache package to map date of Linux version

Further checks of the Apache version on internet forums reveal the version of CentOS 7 alongside a closer version number: <https://forums.centos.org/viewtopic.php?t=69080>

This search can aid in the process of identifying kernel exploits in the operating system (Although this should be a last resort) in addition to identifying the exact type of system so that any further payloads which would be generated are using the correct commands for the correct version of Linux. In addition to operating system, the exposed banner can also apply to searching public facing exploits on the system such as local/remote privilege escalation opportunities for Apache/2.4.6 or Python/2.7.5.

Text

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## The Wayback Machine

The Wayback machine is a useful source of information which can help in profiling target domains further in the event of useful information which may have been changed. In the case of our target organisation, we are attempting to query their pages to find any records of key information such as exact version of systems they may be using but this information may no longer be existent at present. For example, figure 7 shows the present state of the front facing target page we are using for reconnaissance purposes.   
Graphical user interface, text, application, email

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We can see the web page is not giving away the exact version of Linux of the target systems we intend to infiltrate. However, as part of OSINT, we can query the Wayback machine to see if this page has previously mentioned OS versions which can help to build a profile of the target in a passive manner.

Accessing records from 2020 via the Wayback archives, it is possible to see previously advertised information which can be helpful in further steps.

Graphical user interface, text, application, email

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Since 2020, the systems used CentOS 7.6 which means if the systems have been updated they will either be present at this version number or higher but not lower. This information also opens up the possibility for a successful client side attack to enter the COSMA infrastructure. A potential attack can involve a malicious RPM package which will be discussed in later sections on how to build such a payload.

## Social Media/Data breaches

To obtain passwords on target users, access to data breaches and social media accounts may prove to be useful. These sources of information could give previously breached passwords and other valuable info such as target DOB and information which could be potential passwords such as names of pets, family members, important dates to the target. These could serve as potential passwords in addition to aiding the attacker in attempts of resetting passwords via security questions. Depending on the rules of engagement you may/may not be permitted to conduct such activity.

# Active reconnaissance

Once the phase of passive reconnaissance has been exhausted and information has been gathered without interacting with the target, it is then time to move onto performing active recon. Active reconnaissance involves direct interaction with the target where your presence can be detected by target organisational defences.

This process involves sending ICMP packets (If target is open to ICMP), scanning externally facing devices to scan ports and attempting vulnerability scans using scanners such as Shodan and Censys, followed by tools such as netcat to probe ports and attempt connecting to ports to query the target device by grabbing the service banner. This process is known as banner grabbing.

Before taking any steps, which involve active reconnaissance, steps should be taken to cover one’s tracks. One option can be to configure a VPN which does not reveal the direct IP address from which your requests are coming from, secondly you could make use of the TOR protocol which can be installed and configured onto your local machine.

## TOR

The first step to use TOR would be to install the required packages. This is achievable by contacting the appropriate package manager and installing the package named “tor” as seen in figure.

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After the installation is complete, TOR can then be configured with a toolset named Proxychains. Proxychains makes use of dynamic chains which will allow a seamless configuration of TOR before making direct contact with the target.

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Proxychains can also be installed similar to TOR from your appropriate package manager. Once both tools have been installed, ensure to start/enable TOR before beginning to configure TOR via Proxychains.

TOR needs to be configured via Proxychains. To ensure we can make use of TOR without problems, this needs to be configured by editing /etc/proxychains.conf with administrative privileges. The configuration required is to activate a random chain as seen in figure x.

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Figure : Configuration of proxychains (Part 1)

Followed by a random chain, we should also specify a SOCKS5 proxy upon which the TOR protocol will run on the port number of 9050 which is the port number of TOR, this can be seen in figure x.

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Figure : SOCKS 5 proxy to run TOR protocol

From this point, TOR can be verified if it is working by contacting “icanhazip.com”, this will be the newly assigned IP which will be seen by the target organisation in any captured communications as opposed to your actual ISP address. If your actual address is caught by the target organisation and perceived as an adversarial threat: This could result in being blocked which could burn the infiltration attempt. We can now contact the target with the new IP ensuring to route any contact through Proxychains to ensure TOR is active.

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## Ping/Traceroute

Sending a ping message to the target allows us to be able to gain base information of the operating system which is installed. If we want to confirm the information retrieved from our passive recon is accurate, we can make use of the ping command to be able to confirm this information by checking the value of the TTL packet. If the TTL packet is around 64, the target is using Linux, if the target value is around 128, the target is running Windows; if the TTL value is around 255, this is a network device.

Although, sending the ping packet could come back with an inaccurate value due to packet hop in between your device and the target. A manual analysis can involve simple arithmetic of taking a base value of either 64/128/255 decreasing this from the traceroute value to attempt working out the type of operating system being used.

With multiple hosts involved, automation would be encouraged to see which targets are reachable via ICMP in addition to attempting to finding which operating system is installed on these systems based upon the TTL, we can achieve this with the code in Appendix 1.

# Appendix

## Appendix 1: traceroute\_to\_os.py

#/usr/bin/python3

import sys

import subprocess

import re

def check\_ping(ping\_file):

f = open(ping\_file, "r")

lines = f.readlines()

traceroute\_value = []

trace\_ttl = []

for line in lines:

ip\_addr = line.strip()

ping\_proc = subprocess.Popen(['ping', '-c', '1', '{}'.format(ip\_addr)], stdout=subprocess.PIPE)

ping\_stdout, ping\_stderr = ping\_proc.communicate()

if ping\_proc.returncode == 0:

output = ping\_stdout.decode()

ttl = re.search('ttl=?\d+', output).group(0)

ttl\_value = re.search(r'\d+', ttl).group(0)

ttl\_value\_int = int(ttl\_value)

elif ping\_proc.returncode != 0:

print("{} is not responding to pings".format(ip\_addr))

continue

traceroute\_proc = subprocess.Popen(['traceroute', '{}'.format(ip\_addr)], stdout=subprocess.PIPE)

traceroute\_stdout, traceroute\_stderr = traceroute\_proc.communicate()

if traceroute\_proc.returncode == 0:

output = traceroute\_stdout.decode().split('\n')

traceroute\_value.append(output[-2][1])

ttl\_org = int(output[-2][1]) + ttl\_value\_int

print("IP address: {} has original TTL of {}".format(ip\_addr, ttl\_org))

trace\_ttl.append([ip\_addr, ttl\_org])

return trace\_ttl

def main():

filename = sys.argv[1]

alive\_hosts = check\_ping(filename)

for i in range(len(alive\_hosts)):

ttl\_values = alive\_hosts[i][1]

#print(ttl\_values)

if ttl\_values in range(50, 66):

print("{} is Linux".format(alive\_hosts[i][0]))

elif ttl\_values in range(120,129):

print("{} is Windows".format(alive\_hosts[i][0]))

main()