🎯SCANNING

🧰 Module 4: Scanning & Enumeration (Full Expanded Version)

🎯 Objective:

To equip learners with the skills to **actively interact with a target network**, identify **open ports**, **running services**, **OS details**, and extract **critical technical information** using specialized tools.

🔷 Lesson 4.1 – What is Scanning?

🔍 Definition:

Scanning is the process of **actively probing a system** or network to identify:

- Live hosts (computers, routers, servers)
- Open ports (entry points)
- Services running (e.g., FTP, HTTP, SSH)
- Operating systems (Windows, Linux, etc.)
- Possible vulnerabilities

🔁 Purpose:

Think of scanning as a **digital knock** on each door of a building to check:

- Which doors are open?
- What's behind those doors?
- Are there any weak doors (vulnerabilities)?

🔷 Lesson 4.2 – Types of Scanning

1. **Ping Sweep (Host Discovery)**

- **Purpose:** Identify which systems are online in a network.
- **How:** Sends ICMP echo requests (ping) to all IPs in a subnet.
- **Tool:** `nmap -sn 192.168.1.0/24`

2. **Port Scanning**

- **Purpose:** Find which ports are open on a system.
- Each port represents a **specific service** (e.g., 80 = HTTP).
- **Tools:** Nmap, Masscan

3. **Service Version Detection**

- **Purpose:** Identify software and version behind an open port.
- Why? Old versions = exploitable.
- `nmap -sV target.com`

4. **OS Fingerprinting**

- **Purpose:** Identify target's OS by analyzing packet responses.
- `nmap -O target.com`

5. **Stealth Scan (SYN Scan)**

- Sends partial connection requests to avoid detection by firewalls.
- `nmap -sS target.com`

Scan Type	Description	Detectable?
TCP Connect	Full connection to target port	Yes
SYN Scan	Half-open connection (stealth)	No/Low
UDP Scan	For non-TCP services	Sometimes
Xmas/FIN Scan	Obscure techniques for evasion	Rarely

🔷 Lesson 4.3 – Mastering Nmap

Nmap (Network Mapper) is the hacker's go-to tool for scanning and reconnaissance.

🔧 Common Nmap Commands:

Command	Purpose
`nmap -sn 192.168.1.0/24`	Ping sweep
`nmap -sS target.com`	SYN stealth scan
`nmap -sV target.com`	Service version detection
`nmap -O target.com`	OS fingerprinting
`nmap -A target.com`	Aggressive scan (OS + services + traceroute)
`nmap -p- target.com`	Scan all 65535 ports

🧠 Pro Tip:

Use `-T4` for faster scans and `--script vuln` to detect vulnerabilities:

```
bash
CopyEdit
nmap -A -T4 --script vuln target.com
```

⚙️ 3. Essential Scanning Tools

✅ Nmap (Network Mapper)

Most powerful & flexible scanner.

Common Nmap commands:

```
bash
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nmap -sS 192.168.1.1        # Stealth SYN Scan
nmap -sV 192.168.1.1        # Service version detection
nmap -O 192.168.1.1         # OS detection
nmap -T4 -A 192.168.1.1      # Aggressive scan
```

⚡ Masscan

Faster than Nmap. Useful for scanning large IP ranges.

```
bash
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```

```
masscan -p1-65535 192.168.1.0/24 --rate=1000
```

🧙‍♂️ Unicornscan

Advanced alternative to Nmap for stealthy scanning.

🐱 Netcat

Useful for manual testing and banner grabbing.

```
bash
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nc -nv 192.168.1.1 80
```

🔍 Definition:

Enumeration is the phase where an ethical hacker **extracts structured and detailed information** from the discovered systems **after scanning** confirms the system is live.

> If scanning is “checking doors”, enumeration is peeking inside to see what’s stored inside.

📦 Information Gathered:

- Active user accounts
- Shared folders
- Network shares
- System uptime
- Software/OS version
- Printer and drive details

🔷 Lesson 4.5 – Enumeration Protocols & Targets

Protocol	Enumeration Details	Tool
SMB/NetBIOS	Users, groups, shares	Enum4linux

Protocol	Enumeration Details	Tool
SNMP	Network devices, config	SNMPwalk
LDAP	Directory services	ldapsearch
DNS	Zone transfers, subdomains	dig, host
FTP	Banner grabbing, anonymous login	telnet, netcat
SMTP	Valid email accounts	Telnet, Nmap scripts
HTTP	Directory structure, headers	Dirb, Gobuster, Nikto

🔷 Lesson 4.6 – Tools for Scanning & Enumeration

🔧 Scanning Tools:

- **Nmap** – Full-featured scanner
- **Masscan** – Super fast port scanner
- **Netdiscover** – LAN discovery tool
- **Angry IP Scanner** – GUI-based ping sweep

🔍 Enumeration Tools:

Tool	Description
`Enum4linux`	NetBIOS & SMB enumeration
`SNMPwalk`	SNMP data extraction
`Dirb`, `Gobuster`	Discover hidden web directories
`Nikto`	Web vulnerability scanner
`Hydra`	Brute-force login services
`WhatWeb`, `Wappalyzer`	Identify web technologies

🔷 Lesson 4.7 – Real Hacking Scenario

🕵️ Example Flow:

1. You scan `192.168.1.100` using `nmap -sS -sV -O`.
2. Port 21 (FTP), 80 (HTTP), 445 (SMB) are open.
3. Use `enum4linux` → find users: `admin`, `guest`

4. Try SMB login with default creds → access `\\192.168.1.100\public`
5. Inside: find a text file with database credentials 🧨

You now have a valid entry point!

🧪 Practical Lab Suggestion:

Set up a vulnerable VM (like **Metasploitable 2** or **TryHackMe Room**) and practice:

- Scanning with Nmap
- Enumerating SMB with Enum4linux
- Using `dirb` on exposed web server

📚 Summary Chart:

Phase	Description	Example Tool
Host Discovery	Identify live systems	Nmap, Netdiscover
Port Scanning	Find open ports	Nmap, Masscan
Service Detection	Identify services & versions	Nmap `-sV`
OS Fingerprinting	Detect OS type	Nmap `-O`
Enumeration	Extract system data via services	Enum4linux, SNMPwalk, Dirb

Port Scanning and Recon with nmap, Part 02: The nmap scripts (nse)

First introduced by Fyodor in 1998 in Phrack magazine, nmap has been a staple of every hacker/pentester's toolbox for over 20 years. The nmap tool is mature, well-documented, and robust, but the NSE (Nmap Scripting Engine) takes nmap to a whole other level!

NSE transforms the functionality of nmap from a classic, port-scanning tool to a tool capable of vulnerability scanning, network discovery, fuzzing, password cracker and even exploitation. Presently, there are 603 scripts built into Kali but there are new scripts and capabilities being developed almost daily by an active and dedicated open-source community. These scripts are partitioned into a few categories, including;

1. auth
2. broadcast

3. brute
4. default
5. discovery
6. dos (denial of service)
7. exploit
8. external
9. fuzzer
10. intrusive
11. malware
12. safe
13. version
14. vuln (vulnerability)

NSE is a fully developed scripting language with scripts utilizing the Lua scripting language.

Basic Syntax

The syntax for using nmap scripts is similar to that of the basic nmap command with the exception of the keyword "–script=". To invoke an NSE, you can use the keyword –script= followed by the name of the script or the category of the script and finally followed by the IP address of the target system such as;

kali > nmap –script vuln 192.168.1.101

This command will run a series of scripts in the "vuln" category and only output data if a vulnerability if found.

Let's take a closer look at nmap scripts (NSE) in our Kali 2020 system.

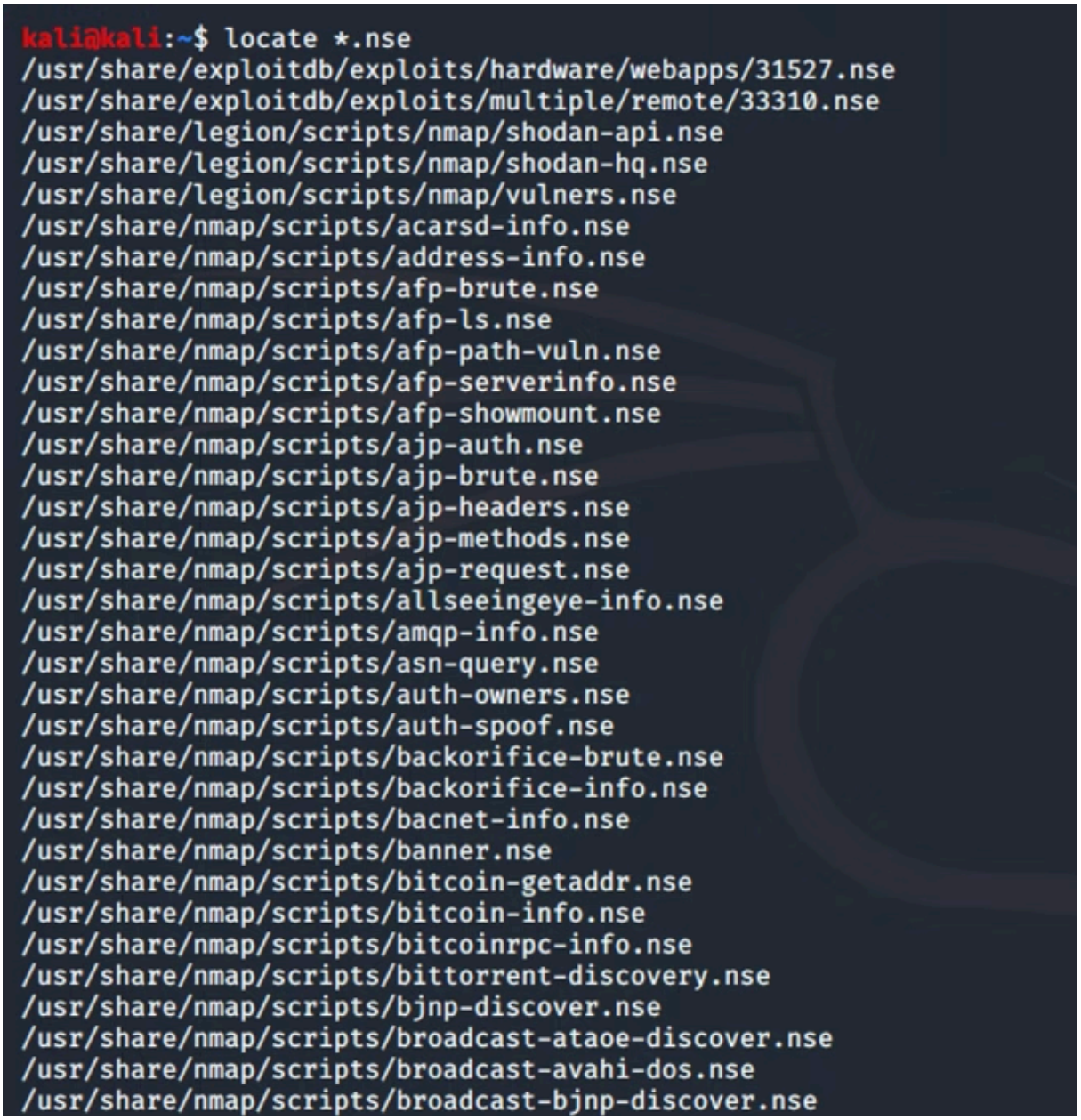
Step #1: Fire up Kali and Open a terminal

Let's begin by firing up our Kali Linux 2020 and opening a terminal as seen below.

Step #2: Search for NSE Scripts

There are a number of NSE scripts built into our Kali 2020. To find them, we can use the Linux command locate, followed by the wildcard * and then the extension of every nmap scripts ".nse". This should locate all files with that extension which should all include all nmap scripts.

kali > locate *.nse



As you can see there are quite a few nmap scripts. To save the list to a file, simply enter;

kali > locate *.nse >nmapscripts

```
kali@kali:~$ locate *.nse > nmapscripts
kali@kali:~$ cat -n nmapscripts
     1  /usr/share/exploitdb/exploits/hardware/webapps/31527.nse
     2  /usr/share/exploitdb/exploits/multiple/remote/33310.nse
     3  /usr/share/legion/scripts/nmap/shodan-api.nse
     4  /usr/share/legion/scripts/nmap/shodan-hq.nse
     5  /usr/share/legion/scripts/nmap/vulners.nse
     6  /usr/share/nmap/scripts/acarsd-info.nse
     7  /usr/share/nmap/scripts/address-info.nse
     8  /usr/share/nmap/scripts/afp-brute.nse
     9  /usr/share/nmap/scripts/afp-ls.nse
    10  /usr/share/nmap/scripts/afp-path-vuln.nse
    11  /usr/share/nmap/scripts/afp-serverinfo.nse
    12  /usr/share/nmap/scripts/afp-showmount.nse
    13  /usr/share/nmap/scripts/ajp-auth.nse
    14  /usr/share/nmap/scripts/ajp-brute.nse
    15  /usr/share/nmap/scripts/ajp-headers.nse
    16  /usr/share/nmap/scripts/ajp-methods.nse
    17  /usr/share/nmap/scripts/ajp-request.nse
    18  /usr/share/nmap/scripts/allseeingeye-info.nse
    19  /usr/share/nmap/scripts/amqp-info.nse
    20  /usr/share/nmap/scripts/asn-query.nse
    21  /usr/share/nmap/scripts/auth-owners.nse
    22  /usr/share/nmap/scripts/auth-spoof.nse
    23  /usr/share/nmap/scripts/backorifice-brute.nse
```

Then, to see the total number of scripts, simply use the cat command followed by the -n option and the name of the file such as;

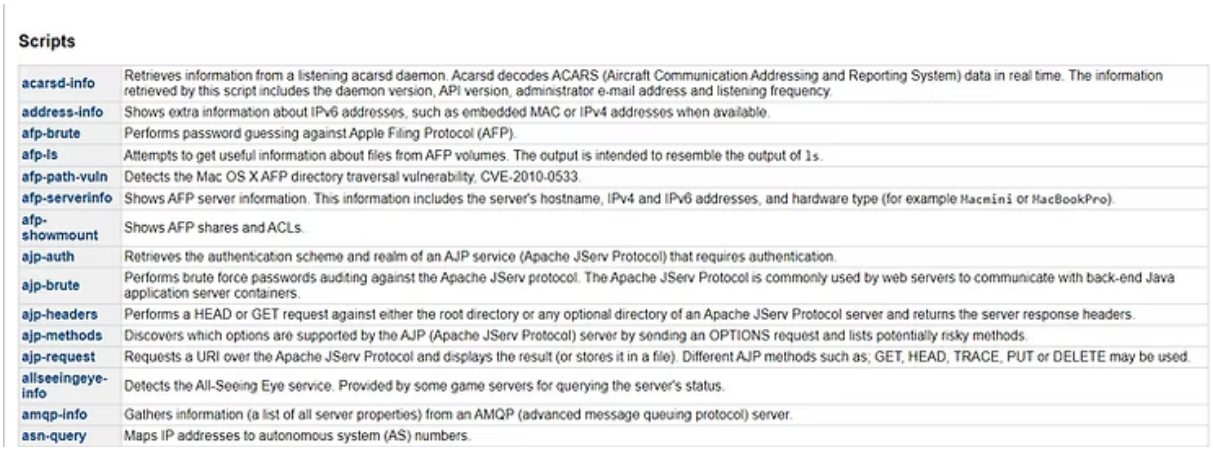
kali > cat -n nmapscripts

```
   589  /usr/share/nmap/scripts/vnc-title.nse
   590  /usr/share/nmap/scripts/voldemort-info.nse
   591  /usr/share/nmap/scripts/vtam-enum.nse
   592  /usr/share/nmap/scripts/vulners.nse
   593  /usr/share/nmap/scripts/vuze-dht-info.nse
   594  /usr/share/nmap/scripts/wdb-version.nse
   595  /usr/share/nmap/scripts/weblogic-t3-info.nse
   596  /usr/share/nmap/scripts/whois-domain.nse
   597  /usr/share/nmap/scripts/whois-ip.nse
   598  /usr/share/nmap/scripts/wsdd-discover.nse
   599  /usr/share/nmap/scripts/x11-access.nse
   600  /usr/share/nmap/scripts/xdmcp-discover.nse
   601  /usr/share/nmap/scripts/xmlrpc-methods.nse
   602  /usr/share/nmap/scripts/xmpp-brute.nse
   603  /usr/share/nmap/scripts/xmpp-info.nse
kali@kali:~$
```

As you can see, there are 603 nmap scripts installed on Kali Linux 2020. For further information on these scripts, you can refer to the nmap scripts website at;

https://nmap.org/nsedoc/

As you can see below, each script has an explanation of its function on this page.



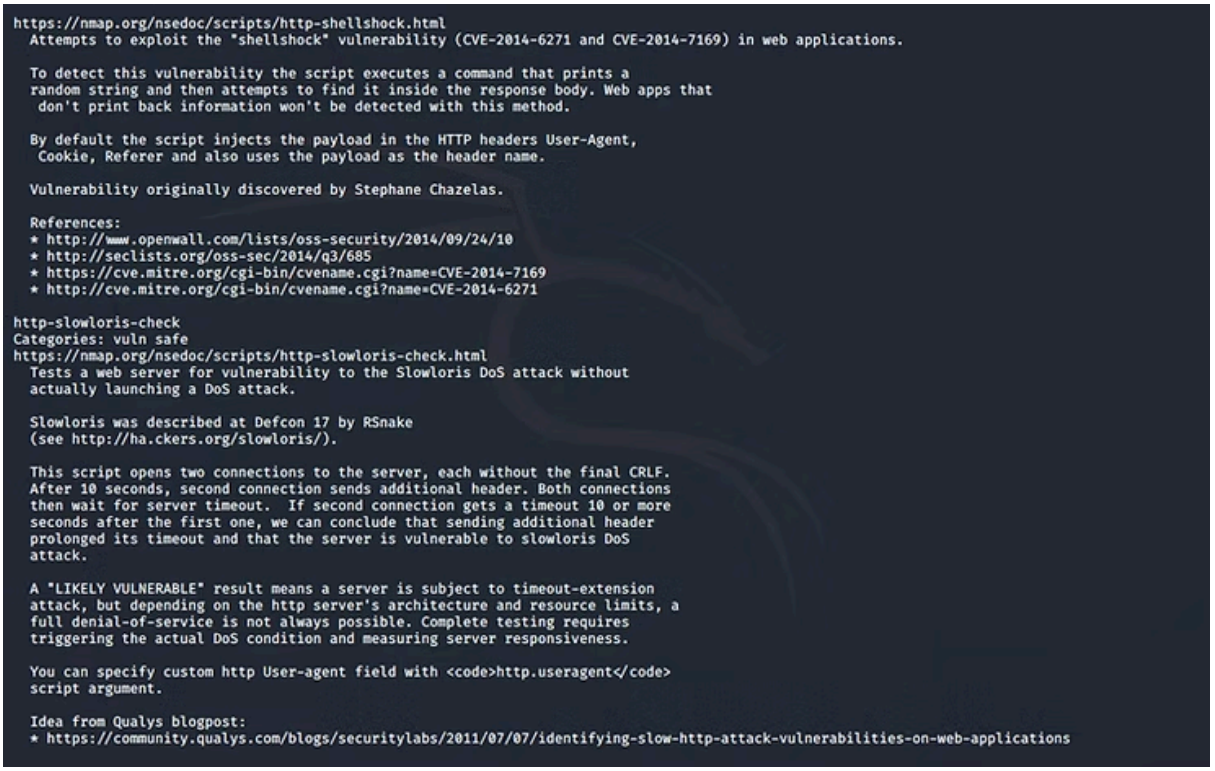
Scripts

acarsd-info	Retrieves information from a listening acarsd daemon. Acarsd decodes ACARS (Aircraft Communication Addressing and Reporting System) data in real time. The information retrieved by this script includes the daemon version, API version, administrator e-mail address and listening frequency.
address-info	Shows extra information about IPv6 addresses, such as embedded MAC or IPv4 addresses when available.
afp-brute	Performs password guessing against Apple Filing Protocol (AFP).
afp-ls	Attempts to get useful information about files from AFP volumes. The output is intended to resemble the output of `ls`.
afp-path-vuln	Detects the Mac OS X AFP directory traversal vulnerability, CVE-2010-0533.
afp-serverinfo	Shows AFP server information. This information includes the server's hostname, IPv4 and IPv6 addresses, and hardware type (for example `Macmini` or `MacBookPro`).
afp-showmount	Shows AFP shares and ACLs.
ajp-auth	Retrieves the authentication scheme and realm of an AJP service (Apache JServ Protocol) that requires authentication.
ajp-brute	Performs brute force passwords auditing against the Apache JServ protocol. The Apache JServ Protocol is commonly used by web servers to communicate with back-end Java application server containers.
ajp-headers	Performs a HEAD or GET request against either the root directory or any optional directory of an Apache JServ Protocol server and returns the server response headers.
ajp-methods	Discovers which options are supported by the AJP (Apache JServ Protocol) server by sending an OPTIONS request and lists potentially risky methods.
ajp-request	Requests a URI over the Apache JServ Protocol and displays the result (or stores it in a file). Different AJP methods such as; GET, HEAD, TRACE, PUT or DELETE may be used.
allseeingeye-info	Detects the All-Seeing Eye service. Provided by some game servers for querying the server's status.
amqp-info	Gathers information (a list of all server properties) from an AMQP (advanced message queuing protocol) server.
asn-query	Maps IP addresses to autonomous system (AS) numbers.

Step #3: NSE Help

Although there are rudimentary explanations of each script on the nmap web site, if you need more information on a script, you can use the "–script-help=" switch followed by the name of the script or script category. For instance, if I wanted more information on the script category "vuln", I could simply enter;

kali > nmap -scripts-help=vuln



Note above that nmap returns each script in the category with a detailed explanation.

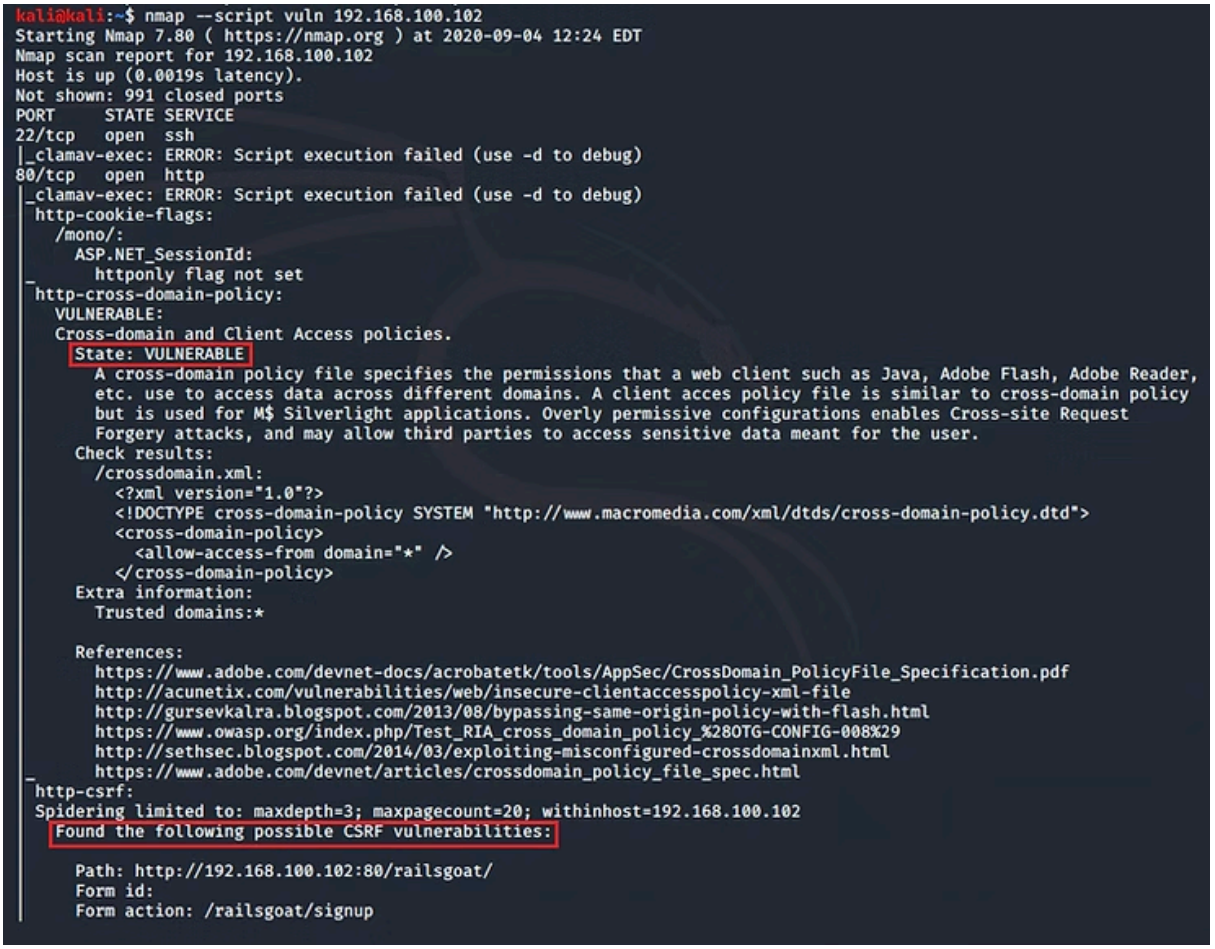
Step #4: Test vuln scripts category against OWASP-BWA Linux Server

Let’s try using an entire category of nmap scripts against the OWASP BWA server. With nmap scripts, you can run every script in the category (see the categories above) by simply using the –script

switch followed by the name of the category, such as “vuln”.

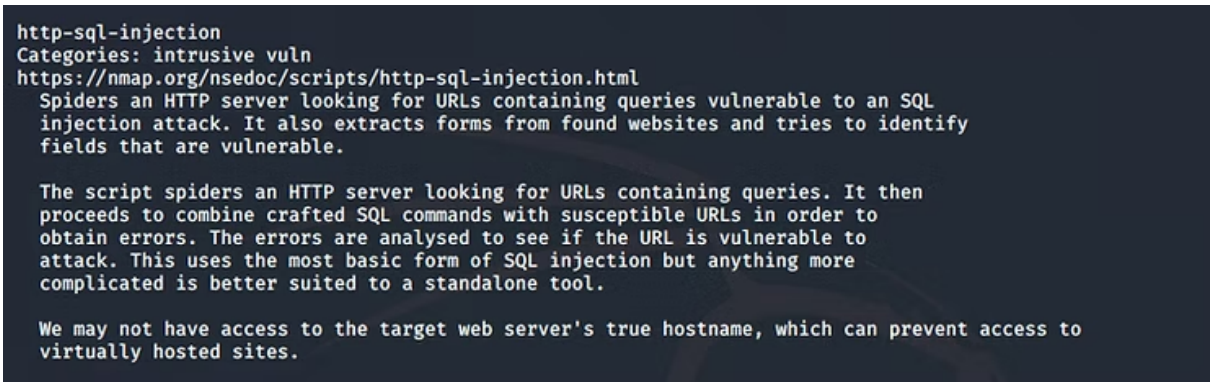
The vuln category includes scripts to test for known vulnerabilities in a target. To run the entire vuln category against our target system, we can simply enter;

kali > nmap –script vuln 192.168.100.102



We can be more specific and look for SQL Injection vulnerabilities by using the “http-sql-injection” script. First, let’s take a look at its help screen.

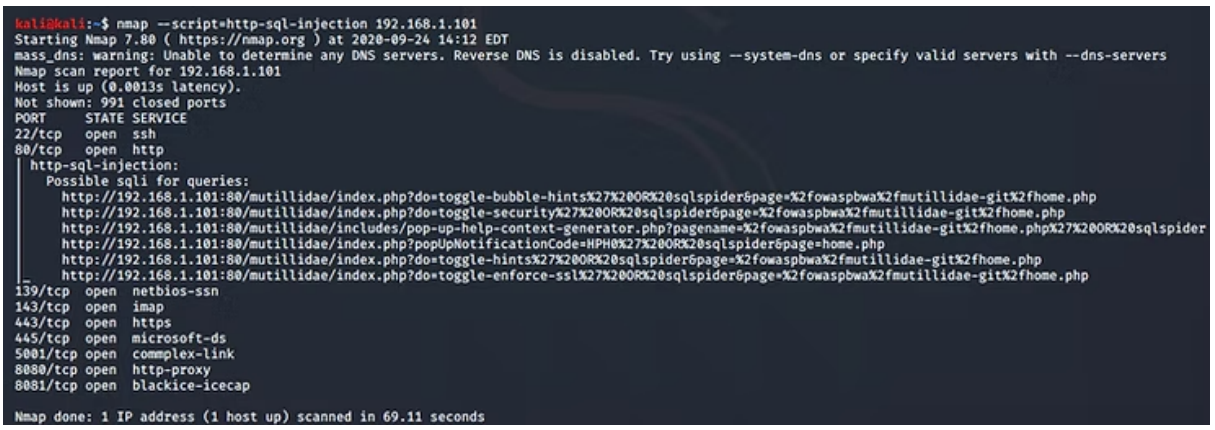
kali > nmap –scripts-help=http-sql-injection



nmap provides a detailed explanation of this script after you hit enter. This help screen explains that this script spiders an HTTP server for URLs vulnerable to SQL injection attack.

Now let’s try executing this script against our OWASP BWA server.

kali >nmap –script=http-sql-injection 192.168.1.101

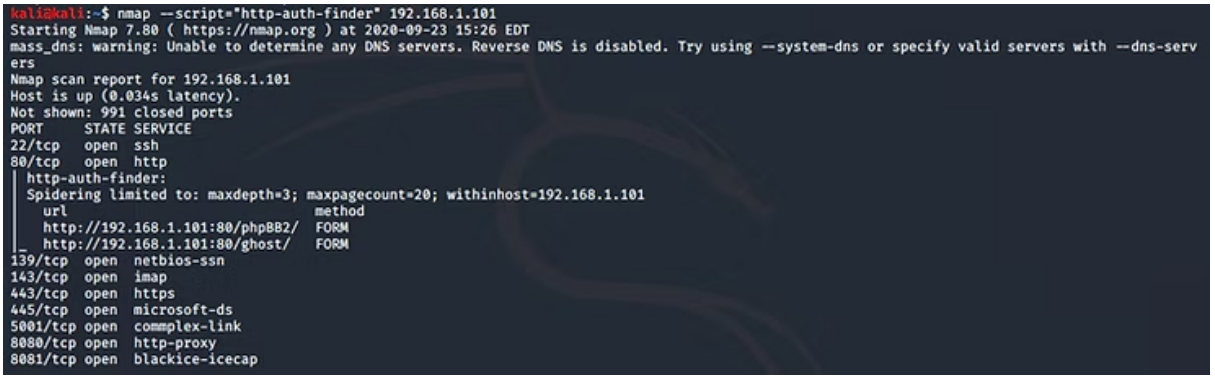


As you can see above, this script located 6 potential SQL injection vulnerabilities in that website.

Step 5: Test Other nmap Scripts within the http Category

Let’s try some another script in the ‘http’ category. What if we were looking for login forms to brute force the username and password? We could find each of these using a script called “http-auth-finder”. Let’s run it against our OWASP BWA server and see whether it can locate the authentication forms.

kali > nmap –script=”http-auth-finder” 192.168.1.101



As you can see above, this script found two forms for authentication to this system. Now that we know where they are, we can use tools such as BurpSuite or THC-Hydra to brute force the authentication.

Step #6: Test nmap scripts against Windows 7 for EternalBlue vulnerability

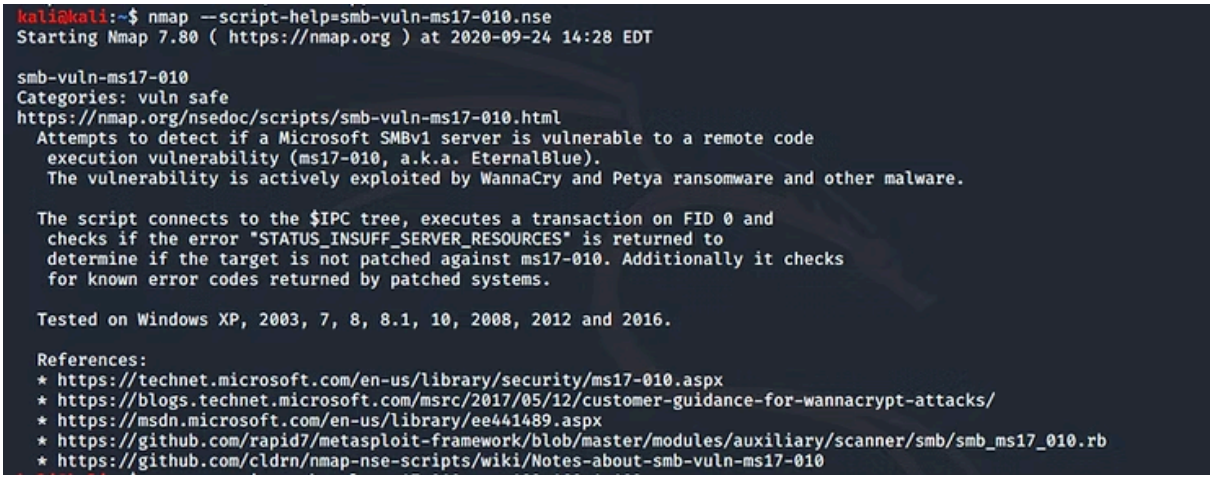
Next, let's try using nmap scripts against an unpatched Windows 7 Professional system. These unpatched Windows 7 systems are often vulnerable to the EternalBlue exploit developed by the US NSA and released by the Shadowbrokers in 2017.

Let's first take a look at the help screen for the EternalBlue vulnerability scanner script in nmap scripts. We can find it by searching for it by its Microsoft designated vulnerability number "ms17-010" and entering;

kali > locate *.nse | grep ms17-010

Now that we have located the appropriate script for this task, let's view its help screen.

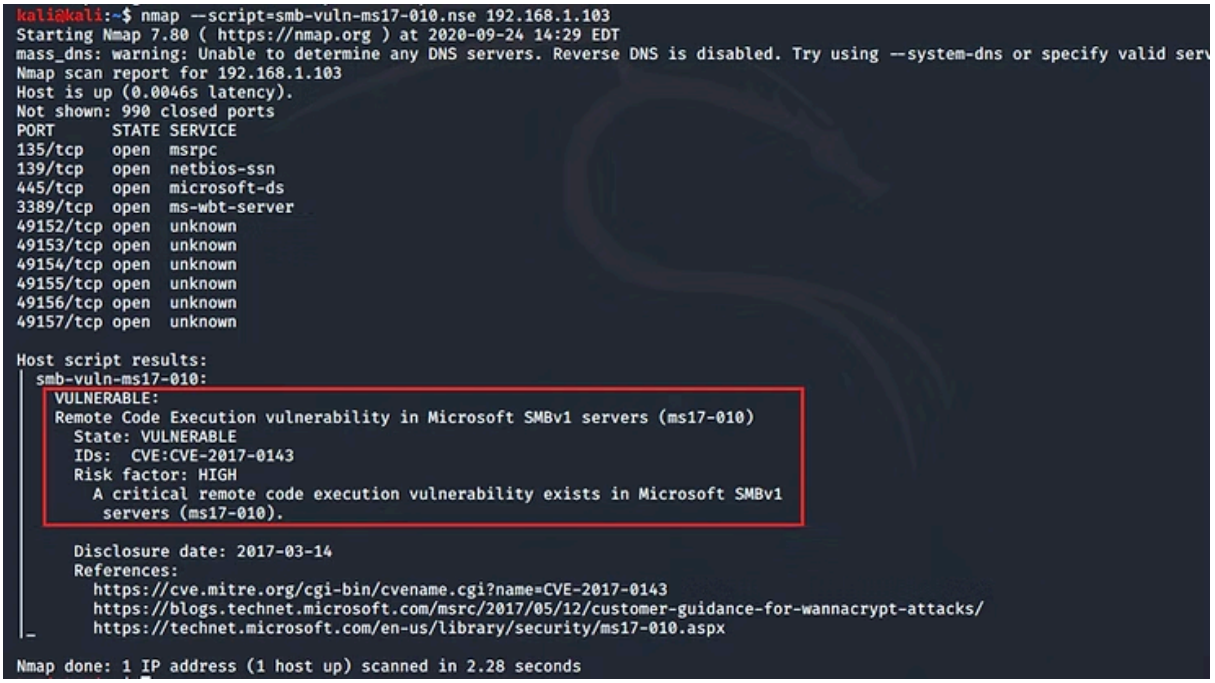
kali > nmap –script-help=smb-vuln-ms17-0101.nse



As you can see above, this script "attempts to detect if a Microsoft SMBv1 server is vulnerable". It also points out that this vulnerability is actively exploited by WannaCry and Petya ransomware. For more information on EternalBlue, **click here**.

Finally, let's run this script against our Windows 7 system and see whether its vulnerable to this malicious malware.

kali >nmap –script=smb-vuln-ms17-010.nse 192.168.1.103



Summary

nmap is a great tool for any pentester/hacker and should be in everyone's toolbox. When the NSE scripts are added to nmap, it becomes a versatile tool for vulnerability testing, fuzzing, brute forcing and even exploitation! With all this capability at the hacker/pentester's fingertips, nmap and nmap scripts can supplant a number of tools in your toolbox.