



# \$ whoami



- Software Engineer & Researcher at CyberForge Academy
- Final year, B. Tech. CSE @ LPU
- Engaged in Research, Creating course content/setups
- Developing SaaS software and open source tools
- Interned with Web3verse Academy, a Singapore-based startup focused on Web3 education and Namekart, a domain name brokerage firm.
- Interested in Art and craft





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# What is Nmap?



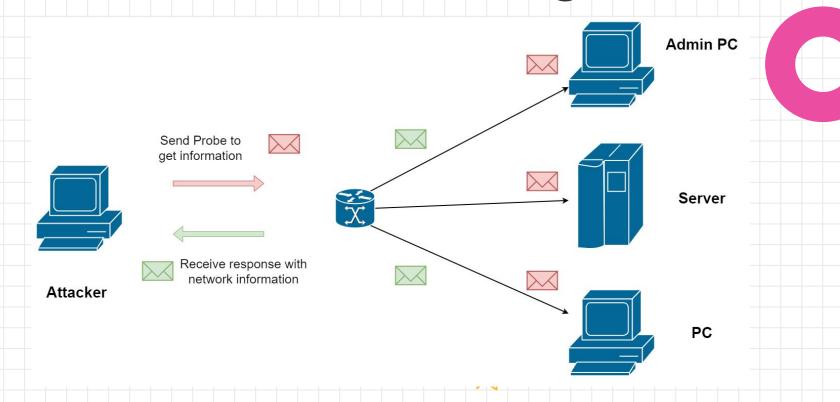
Image :Nmap: the Network Mapper-Free Security Scanner

- Nmap ( Network Mapper)
- Used to discover hosts and services on a target by sending packets and analyzing the responses.
- Released in September 1997 by Gordon Lyon
- Cross-platform (Windows/Linux/MacOS)





# **Network Scanning**





# Why Network Scanning?

- Monitoring network health and performance.
- Managing assets effectively.
- Detecting and mitigating security threats efficiently.









student@cyberforgeacademy:~\$ nmap -h Nmap 7.80 (https://nmap.org) Usage: nmap [Scan Type(s)] [Options] {target specification} TARGET SPECIFICATION: Can pass hostnames, IP addresses, networks, etc. Ex: scanme.nmap.org, microsoft.com/24, 192.168.0.1; 10.0.0-255.1 -iL <inputfilename>: Input from list of hosts/networks -iR <num hosts>: Choose random targets --exclude <host1[,host2][,host3],...>: Exclude hosts/networks --excludefile <exclude file>: Exclude list from file HOST DISCOVERY: -sL: List Scan - simply list targets to scan

-sn: Ping Scan - disable port scan

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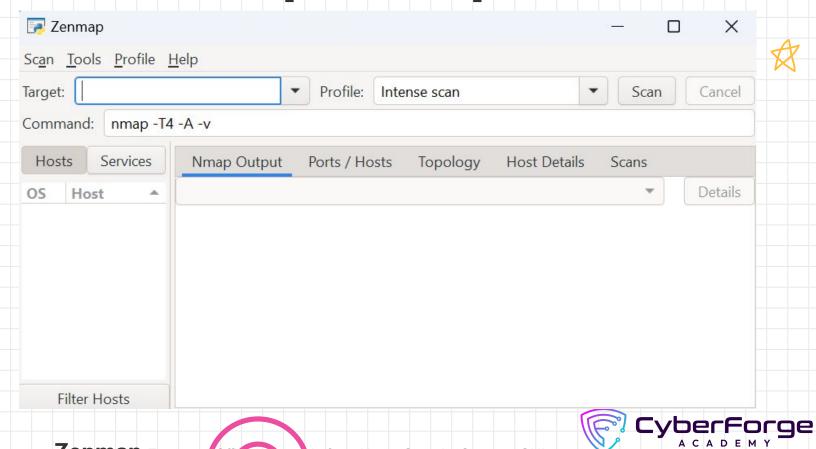
```
Command: nmap <target_ip>
```

student@cyberforgeacademy:~\$ nmap 172.17.0.2 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 07:02 IST Nmap scan report for 172.17.0.2 Host is up (0.00018s latency). Not shown: 993 closed ports PORT STATE SERVICE 21/tcp open ftp 22/tcp open ssh 25/tcp open smtp 80/tcp open http 139/tcp open netbios-ssn 445/tcp open microsoft-ds 3306/tcp open mysql

Nmap done: 1 IP address (1 host up) scanned in 0.12 seconds



# Zenmap - Nmap GUI









# Scanning Network by Zenmap



## **Basic Functionalities**

#### 1) Host Discovery

- Determines which hosts are available & responsive
- -sn is used for ping scan to only perform host discovery
- Starting Nmap 7.80 (https://nmap.org) at 2024-02-25 06:19 IST Nmap scan report for cyberforgeacademy (172.17.0.1) Host is up (0.00013s latency).
  Nmap scan report for 172.17.0.2
  Host is up (0.00087s latency).
  Nmap done: 10 IP addresses (2 hosts up) scanned in 1.47 seconds



#### 2) Port Scanning

- Discovers open ports and running services on target devices
- -p- used to scan all 65535 ports on the target device

```
student@cyberforgeacademy:~$ nmap -p- 172.17.0.2
 Starting Nmap 7.80 (https://nmap.org) at 2024-02-25 06
 Nmap scan report for 172.17.0.2
 Host is up (0.00022s latency).
 Not shown: 65526 closed ports
 PORT
      STATE SERVICE
 21/tcp open ftp
 22/tcp open ssh
 25/tcp open smtp
 80/tcp open
               http
 139/tcp open netbios-ssn
 445/tcp open microsoft-ds
 3306/tcp open mysql
 11211/tcp open memcache
 33060/tcp open mysqlx
```



## 3) Service Fingerprinting:

- Attempts to determine the version of services running on the open ports
- -sV used for service fingerprinting

```
student@cyberforgeacademy:~$ nmap -sV 172.17.0.2
Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 06:35 IST
Nmap scan report for 172.17.0.2
Host is up (0.00026s latency).
Not shown: 993 closed ports
PORT STATE SERVICE
                        VERSION
21/tcp open ftp
                        vsftpd 3.0.5
22/tcp open ssh
                        OpenSSH 8.9p1 Ubuntu 3ubuntu0.6 (Ubuntu Linux; protocol
                       Postfix smtpd
25/tcp open smtp
              http Apache httpd 2.4.52 ((Ubuntu))
80/tcp open
139/tcp open netbios-ssn Samba smbd 4.6.2
445/tcp open netbios-ssn Samba smbd 4.6.2
3306/tcp open mysql
                         MySQL (unauthorized)
Service Info: Host: 185b11ded85d; OSs: Unix, Linux; CPE: cpe:/o:linux:linux kernel
```



## 4) OS Fingerprinting:

- Attempts to determine the operating system of a target
- O used for OS detection

```
student@cyberforgeacademy:~$ sudo nmap -0 172.17.0.2
 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 06:28 IST
 Nmap scan report for 172.17.0.2
 Host is up (0.00020s latency).
 Not shown: 993 closed ports
 PORT STATE SERVICE
 21/tcp open ftp
 22/tcp open ssh
 25/tcp open smtp
 80/tcp open http
 139/tcp open netbios-ssn
 445/tcp open microsoft-ds
 3306/tcp open mysql
 MAC Address: 02:42:AC:11:00:02 (Unknown)
 No exact OS matches for host (If you know what OS is running on it, see https://nmap.org/s
  TCP/IP fingerprint:
```

# **Nmap Switches**

- -v: Verbose mode for detailed output.
- -T: Timing template for scan speed.
- -T0 (Paranoid): Slow, stealthy scan.
- -T1 (Sneaky): Slightly faster, cautious scan.
- -T2 (Polite): Default balance of speed and stealth.
- -T3 (Normal): Faster scan with more network impact.
- -T4 (Aggressive): Rapid scan with higher risk of detection.



# **Type of Scans**

- 1) Intense Scan
- Packet uses: SYN-ACK,RST (2919 packets)
- Total Ports Scan: 1000 ports
- Command: "nmap -A <target>"



```
student@cyberforgeacademy:~$ nmap -A 172.17.0.2
 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 06:39 IST
 Nmap scan report for 172.17.0.2
 Host is up (0.00031s latency).
 Not shown: 993 closed ports
 PORT
         STATE SERVICE
                          VERSION
 21/tcp open ftp vsftpd 3.0.5
 22/tcp open ssh OpenSSH 8.9p1 Ubuntu 3ubuntu0.6 (Ubuntu L
 25/tcp open smtp Postfix smtpd
  smtp-commands: 185b11ded85d, PIPELINING, SIZE 10240000, VRFY, ETRN
   ssl-cert: Subject: commonName=185b11ded85d
   Subject Alternative Name: DNS:185b11ded85d
   Not valid before: 2024-02-20T10:20:07
   Not valid after: 2034-02-17T10:20:07
   ssl-date: TLS randomness does not represent time
 80/tcp open http Apache httpd 2.4.52 ((Ubuntu))
  http-server-header: Apache/2.4.52 (Ubuntu)
  http-title: Apache2 Ubuntu Default Page: It works
 139/tcp open netbios-ssn Samba smbd 4.6.2
 445/tcp open netbios-ssn Samba smbd 4.6.2
 3306/tcp open mysql MySQL (unauthorized)
```



## 2) Quick Scan

- Total Ports Scan: 100 Ports
- Packet uses: TCP SYN packet
- Command: "nmap -F <target>"
  - student@cyberforgeacademy:~\$ nmap -F 8.8.8.8
    Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 06:48
    IST
    Nmap scan report for dns.google (8.8.8.8)
    Host is up (0.037s latency).
    Not shown: 98 filtered ports
    PORT STATE SERVICE
    53/tcp open domain
    443/tcp open https

Nmap done: 1 IP address (1 host up) scanned in 2.09 seconds



## Did You Know This Exist?





Resolve

Enter a domain (like example.com) or IP address (like 8.8.8.8 or 2001:4860:4860::8844) here.



## 3) Ping Scan

- Focuses exclusively on host discovery
- Packet uses: ICMP Echo Request packet
- Total Ports Scan: 0
- Command: "nmap -sn <target>"
- Student@cyberforgeacademy:~\$ nmap -sn 172.17.0.1-10
  Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 06:19 IST
  Nmap scan report for cyberforgeacademy (172.17.0.1)
  Host is up (0.00013s latency).
  Nmap scan report for 172.17.0.2
  Host is up (0.00087s latency).
  Nmap done: 10 IP addresses (2 hosts up) scanned in 1.47 seconds



#### 4) Intense Scan, All TCP Ports

- Total Ports: 65535
- Packet uses: TCP SYN packet
- Command: "nmap-p1-65535
- -A <target>"

```
student@cyberforgeacademy:~$ nmap -p 1-65535 -A 172.17.0.2
Starting Nmap 7.80 (https://nmap.org) at 2024-02-25 06:54 IST
Nmap scan report for 172.17.0.2
Host is up (0.00014s latency).
Not shown: 65526 closed ports
PORT
         STATE SERVICE
                          VERSION
21/tcp
         open ftp vsftpd 3.0.5
         open ssh OpenSSH 8.9p1 Ubuntu 3ubuntu0.6 (Ubuntu Linux; pr
22/tcp
         open smtp Postfix smtpd
25/tcp
smtp-commands: 185b11ded85d, PIPELINING, SIZE 10240000, VRFY, ETRN, STARTTI
CHUNKING.
  ssl-cert: Subject: commonName=185b11ded85d
 Subject Alternative Name: DNS:185b11ded85d
 Not valid before: 2024-02-20T10:20:07
 Not valid after: 2034-02-17T10:20:07
 ssl-date: TLS randomness does not represent time
80/tcp
         open http
                          Apache httpd 2.4.52 ((Ubuntu))
http-server-header: Apache/2.4.52 (Ubuntu)
http-title: Apache2 Ubuntu Default Page: It works
139/tcp ppen netbios-ssn Samba smbd 4.6.2
445/tcp
         ppen netbios-ssn Samba smbd 4.6.2
3306/tcp ppen mysql MySQL (unauthorized)
11211/tcp ppen memcached Memcached 1.6.14 (uptime 2453 seconds)
```

33060/tcp bpen mysqlx?



#### 5) Quick Traceroute

- Combination of a quick ping scan and traceroute
- Total Ports Scan: 0
- Packet uses: ICMP Echo Request packet
- Command: "nmap-sn--traceroute <target>"
- student@cyberforgeacademy:~\$ sudo nmap -sn --traceroute 172.17.0.2 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 07:07 IST Nmap scan report for 172.17.0.2 Host is up (0.000081s latency). MAC Address: 02:42:AC:11:00:02 (Unknown)

```
TRACEROUTE
HOP RTT ADDRESS
1 0.08 ms 172.17.0.2
```

Nmap done: 1 IP address (1 host up) scanned in 0.13 seconds

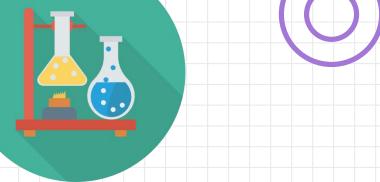


## 6) Intense Scan, No Ping

- A thorough scan without relying on ping for host discovery
- Packet uses: TCP SYN packet
- Total Ports Scan: 1000
- Command: "nmap-T4-Pn <target>"

```
student@cyberforgeacademy:~$ nmap -Pn 172.17.0.2
Starting Nmap 7.80 ( https://nmap.org ) at 2024-0
Nmap scan report for 172.17.0.2
Host is up (0.00014s latency).
Not shown: 993 closed ports
PORT STATE SERVICE
21/tcp open ftp
22/tcp open ssh
25/tcp open smtp
80/tcp open
              http
139/tcp open netbios-ssn
445/tcp open microsoft-ds
3306/tcp open
              mysql
```







# **Comparing Common Scans**



## 1) Default Scan

- Packet uses: SYN, RST, ACK Packets (2020 packets)
- Total Ports Scan: 1,000 most common TCP ports
- Command: nmap <target>



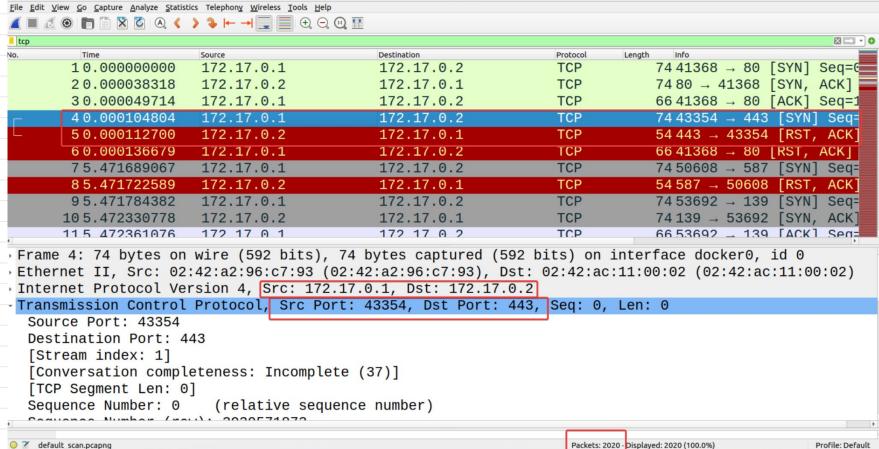
student@cyberforgeacademy:~\$ nmap 172.17.0.2 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 07:02 IST Nmap scan report for 172.17.0.2 Host is up (0.00018s latency). Not shown: 993 closed ports PORT STATE SERVICE 21/tcp open ftp 22/tcp open ssh 25/tcp open smtp 80/tcp open http 139/tcp open netbios-ssn 445/tcp open microsoft-ds 3306/tcp open mysql

Nmap done: 1 IP address (1 host up) scanned in 0.12 seconds



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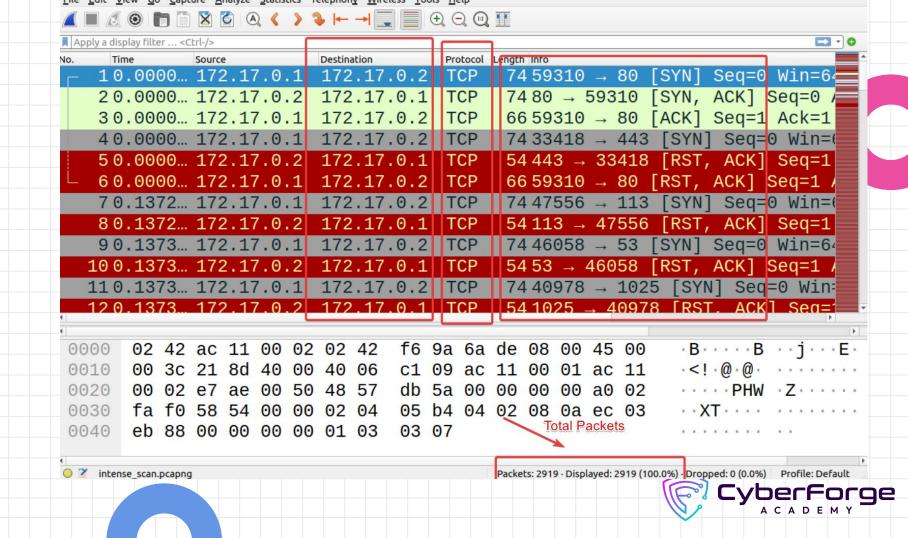
## 2) Intense Scan

- Packet uses: SYN Packets (SYN-ACK,RST)(2919 packets)
- Total Ports Scan: 1000 ports
- Command : nmap -A <target>



```
student@cyberforgeacademy:~/CyberForgeAcademy/code/nmap-target$ nmap -A 172.17.0.2
 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-21 17:31 IST
 Nmap scan report for 172.17.0.2
 Host is up (0.000098s latency).
 Not shown: 993 closed ports
 PORT
         STATE SERVICE
                          VERSION
 21/tcp open ftp
                         vsftpd 3.0.5
 22/tcp open ssh
                          OpenSSH 8.9p1 Ubuntu 3ubuntu0.6 (Ubuntu Linux; protocol 2.0)
                          Postfix smtpd
 25/tcp open smtp
 smtp-commands: 185b11ded85d, PIPELINING, SIZE 10240000, VRFY, ETRN, STARTTLS, ENHANCEDSTATUSCO
 F8, CHUNKING,
   ssl-cert: Subject: commonName=185b11ded85d
   Subject Alternative Name: DNS:185b11ded85d
   Not valid before: 2024-02-20T10:20:07
  Not valid after: 2034-02-17T10:20:07
  ssl-date: TLS randomness does not represent time
 80/tcp open http
                          Apache httpd 2.4.52 ((Ubuntu))
  http-server-header: Apache/2.4.52 (Ubuntu)
 http-title: Apache2 Ubuntu Default Page: It works
 139/tcp open netbios-ssn Samba smbd 4.6.2
 445/tcp open netbios-ssn Samba smbd 4.6.2
 3306/tcp open mysal MySOL (unauthorized)
 Service Info: Host: 185b11ded85d; OSs: Unix, Linux; CPE: cpe:/o:linux:linux kernel
```





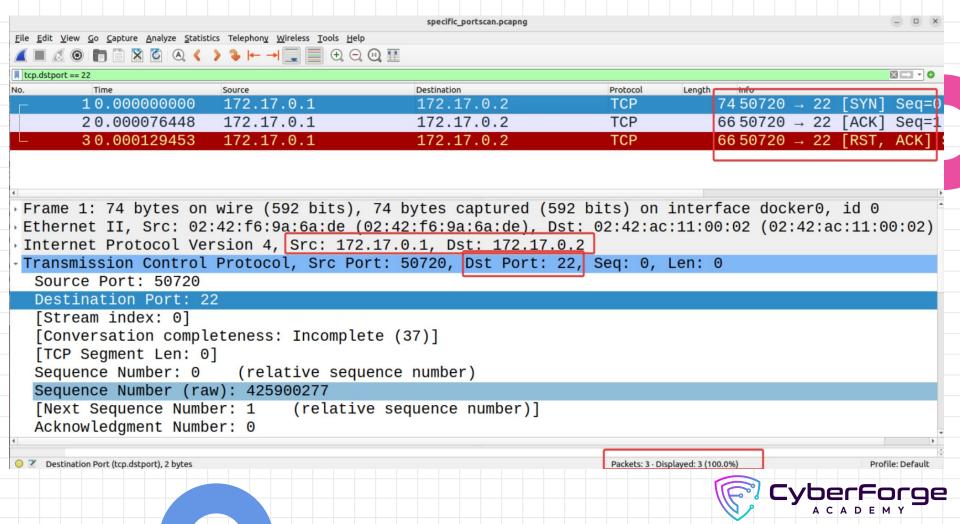
#### 4) Specific Port Scan

- Sends packets to specific ports and analyzes responses
- Determines port status (open, closed, or filtered) based on responses
- Packet uses: TCP packets targeting specified ports (3 packets)
- Command: "nmap -p <port\_number> <target>"
- student@cyberforgeacademy:~\$ nmap -p 22 172.17.0.2 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-25 07:42 IST Nmap scan report for 172.17.0.2 Host is up (0.00022s latency).

PORT STATE SERVICE 22/tcp open ssh

Nmap done: 1 IP address (1 host up) scanned in 5.19 seconds





# **Comparison Between all 3 Scans**



## **Nmap Scripts**

- Nmap scripts are Lua programs
- used to automate tasks like vulnerability detection and service enumeration within Nmap scans.
- Run by NSE (Nmap Scripting Engine)

student@cyberforgeacademy:~\$ cd /usr/share/nmap/scripts/ student@cyberforgeacademy:/usr/share/nmap/scripts\$ ls -a http-headers.nse nping-brute.nse http-hp-ilo-info.nse nrpe-enum.nse acarsd-info.nse http-huawei-hg5xx-vuln.nse ntp-info.nse address-info.nse http-icloud-findmyiphone.nse ntp-monlist.nse http-icloud-sendmsg.nse afp-brute.nse omp2-brute.nse afp-ls.nse http-iis-short-name-brute.nse omp2-enum-targets.nse afp-path-vuln.nse http-iis-webdav-vuln.nse omron-info.nse afp-serverinfo.nse http-internal-ip-disclosure.ns openlookup-info.nse afp-showmount.nse http-joomla-brute.nse openvas-otp-brute.nse ajp-auth.nse http-jsonp-detection.nse CyberForge

# **Nmap Scripts-Discovery**

Used to gather information about hosts within a network

Command: nmap --script discovery <target>

```
student@cyberforgeacademy:/usr/share/nmap/scripts$ nmap --script discovery 172.17.0.2
 Starting Nmap 7.80 (https://nmap.org) at 2024-02-22 07:41 IST
 Pre-scan script results:
   targets-asn:
   _ targets-asn.asn is a mandatory parameter
 Nmap scan report for 172.17.0.2
 Host is up (0.00023s latency).
 Not shown: 993 closed ports
          STATE SERVICE
 PORT
 21/tcp open ftp
  banner: 220 (vsFTPd 3.0.5)
 22/tcn open ssh
   banner: SSH-2.0-OpenSSH 8.9p1 Ubuntu-3ubuntu0.6
   ssh2-enum-algos:
     kex_algorithms: (11)
     server_host_key_algorithms: (4)
     encryption algorithms: (6)
     mac algorithms: (10)
     compression algorithms: (2)
 25/tcn open smtn
   banner: 220 185b11ded85d ESMTP Postfix (Ubuntu)
   _smtp-commands: 185b11ded85d, PIPELINING, SIZE 10240000, VRFY, ETRN, STARTTLS, ENHANCEDSTATUSCODES, 81
   smtp-open-relay: Server doesn't seem to be an open relay, all tests failed
```

- Scripts include:
  - banner:Connects to an open TCP port and prints any response from the service.

```
21/tcp open ftp
|_banner: 220 (vsFTPd 3.0.5)

22/tcp open ssh
|_banner: SSH-2.0-OpenSSH_8.9p1 Ubuntu-3ubuntu0.6
| ssh2-enum-algos:
| kex_algorithms: (11)
| server_host_key_algorithms: (4)
| encryption_algorithms: (6)
| mac_algorithms: (10)
|_ compression_algorithms: (2) T
```



dns-brute: Attempts to enumerate DNS hostnames by brute force guessing of common subdomains

```
Host script results:

|_dns-brute: Can't guess domain of "172.17.0.2"; use dns-brute.domain script argument.

|_fcrdns: FAIL (No PTR record)
```



# **Nmap Scripts-exploit**

- To test for and exploit known vulnerabilities in target systems.
- Command: nmap --script exploit <target>

```
student@cyberforgeacademy:/usr/share/nmap/scripts$ nmap --script exploit 172.17.0.2
 Starting Nmap 7.80 ( https://nmap.org ) at 2024-02-22 07.59 IST
 Nmap scan report for 172.17.0.2
 Host is up (0.00012s latency).
 Not shown: 993 closed ports
 PORT
          STATE SERVICE
 21/tcp open ftp
 clamav-exec: ERROR: Script execution failed (use -d to debug)
 22/tcp open ssh
  clamav-exec: ERROR: Script execution failed (use -d to debug)
 25/tcp open smtp
  clamav-exec: ERROR: Script execution failed (use -d to debug)
  smtp-vuln-cve2010-4344:
     The SMTP server is not Exim: NOT VULNERABLE
 80/tcp open http
  clamay-exec: ERROR: Script execution failed (use -d to debug)
  http-csrf: Couldn't find any CSRF vulnerabilities.
  http-dombased-xss: Couldn't find any DOM based XSS.
  http-stored-xss: Couldn't find any stored XSS vulnerabilities.
  וופרסדמס חובר ווה ביי ביי ייסי וויסי וויסי
```

- Scripts include:
  - smtp-vuln-cve2010-4344: Checks SMTP servers for vulnerability
     CVE-2010-4344

```
_clamav-exec: ERROR: Script execution failed (use -d to debug)
smtp-vuln-cve2010-4344:
_ The SMTP server is not Exim: NOT VULNERABLE
80/tcp open http
```



- http-csrf: Tests for CSRF vulnerabilities in HTTP applications
- http-dombased-xss: Detects DOM-based XSS vulnerabilities in HTTP apps
- http-stored-xss: Identifies Stored XSS flaws in HTTP apps

```
|_http-csrf: Couldn't find any CSRF vulnerabilities.
|_http-dombased-xss: Couldn't find any DOM based XSS.
|_http-stored-xss: Couldn't find any stored XSS vulnerabilities.
```





# Thanks!

## Do you have any questions?

contact@cyberforge.academy
+91 8837537763

https://cyberforge.academy
https://github.com/CyberForgeAcademy/Workshops



