

## 9.3.8 Lab - Exploring Nmap



This lab has been updated for use on NETLAB+.  
[www.netdevgroup.com](http://www.netdevgroup.com)

### Objectives

Part 1: Exploring Nmap

Part 2: Scanning for Open Ports

### Background / Scenario

Port scanning is usually part of a reconnaissance attack. There are a variety of port scanning methods that can be used. We will explore how to use the Nmap utility. Nmap is a powerful network utility that is used for network discovery and security auditing.

### Instructions

#### Part 1: Exploring Nmap

In this part, you will use manual pages (or man pages for short) to learn more about Nmap.

The **man** [ *program* | *utility* | *function* ] command displays the manual pages associated with the arguments. The manual pages are the reference manuals found on Unix and Linux OSs. These pages can include these sections: Name, Synopsis, Descriptions, Examples, and See Also.

- Launch the **Workstation** VM. Log in with username **analyst** and the password **cyberops**.
- Open a **terminal**.
- At the terminal prompt, enter `man nmap`.

```
[analyst@secOps ~]$ man nmap
```

What is Nmap?

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What is nmap used for?

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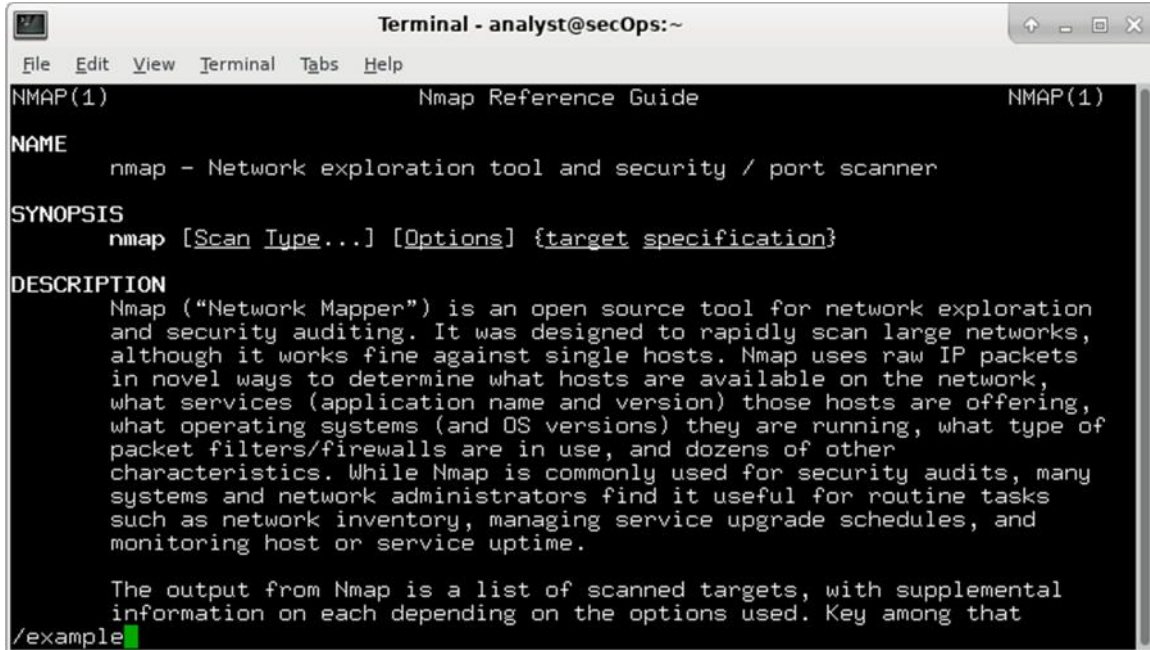
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- While in the man page, you can use the up and down arrow keys to scroll through the pages. You can also press the space bar to forward one page at a time.

To search for a specific term or phrase use enter a forward slash (/) or question mark (?) followed by the term or phrase. The forward slash searches forward through the document, and the question mark searches backward through the document. The key **n** moves to the next match.

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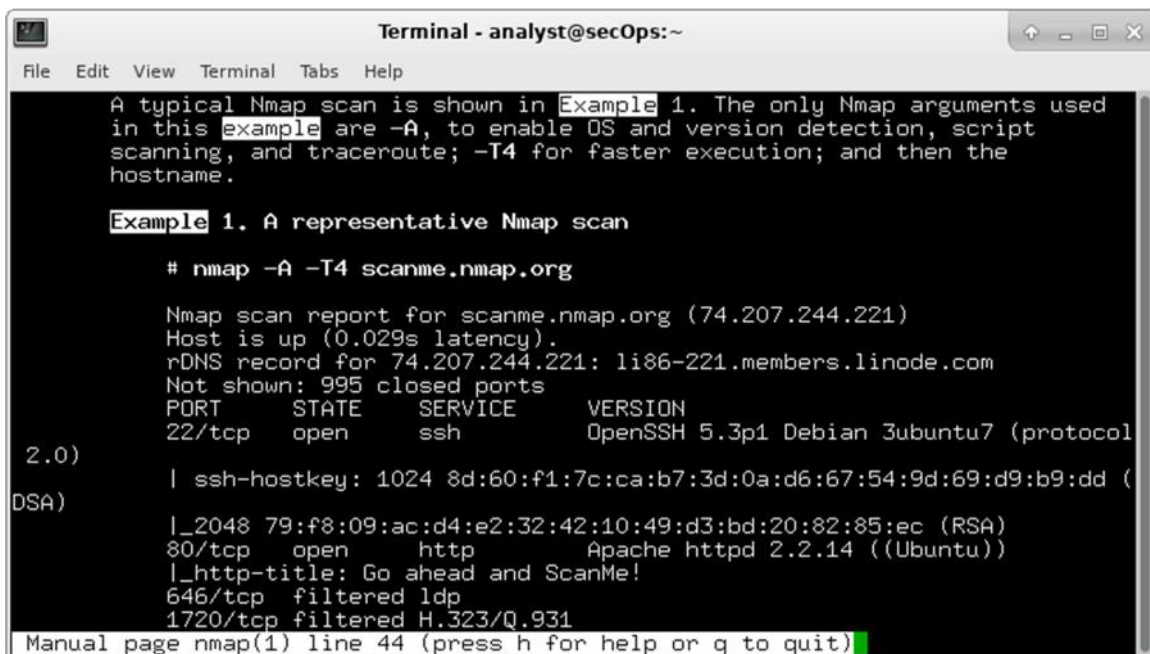
Type `/example` and press ENTER. This will search for the word **example** forward through the man page.



```
Terminal - analyst@secOps:~
File Edit View Terminal Tabs Help
NMAP(1)                                Nmap Reference Guide                                NMAP(1)
NAME
  nmap - Network exploration tool and security / port scanner
SYNOPSIS
  nmap [Scan Type...] [Options] {target specification}
DESCRIPTION
  Nmap ("Network Mapper") is an open source tool for network exploration
  and security auditing. It was designed to rapidly scan large networks,
  although it works fine against single hosts. Nmap uses raw IP packets
  in novel ways to determine what hosts are available on the network,
  what services (application name and version) those hosts are offering,
  what operating systems (and OS versions) they are running, what type of
  packet filters/firewalls are in use, and dozens of other
  characteristics. While Nmap is commonly used for security audits, many
  systems and network administrators find it useful for routine tasks
  such as network inventory, managing service upgrade schedules, and
  monitoring host or service uptime.

  The output from Nmap is a list of scanned targets, with supplemental
  information on each depending on the options used. Key among that
/example
```

- e. In the first instance of `example`, you see three matches. To move to the next match, press **n**.



```
Terminal - analyst@secOps:~
File Edit View Terminal Tabs Help
A typical Nmap scan is shown in Example 1. The only Nmap arguments used
in this example are -A, to enable OS and version detection, script
scanning, and traceroute; -T4 for faster execution; and then the
hostname.

Example 1. A representative Nmap scan

# nmap -A -T4 scanme.nmap.org

Nmap scan report for scanme.nmap.org (74.207.244.221)
Host is up (0.029s latency).
rDNS record for 74.207.244.221: li86-221.members.linode.com
Not shown: 995 closed ports
PORT      STATE      SERVICE      VERSION
22/tcp    open      ssh          OpenSSH 5.3p1 Debian 3ubuntu7 (protocol
2.0)
| ssh-hostkey: 1024 8d:60:f1:7c:ca:b7:3d:0a:d6:67:54:9d:69:d9:b9:dd (
DSA)
|_ 2048 79:f8:09:ac:d4:e2:32:42:10:49:d3:bd:20:82:85:ec (RSA)
80/tcp    open      http         Apache httpd 2.2.14 ((Ubuntu))
|_ http-title: Go ahead and ScanMe!
646/tcp   filtered  ldap
1720/tcp  filtered  H.323/Q.931

Manual page nmap(1) line 44 (press h for help or q to quit)
```

Look at Example 1.

What is the **nmap** command used?

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Use the search function to answer the following questions.

What does the switch -A do?

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What does the switch -T4 do?

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- f. Scroll through the page to learn more about nmap. Type **q** when finished.

## Part 2: Scanning for Open Ports

In this part, you will use the switches from the example in the Nmap man pages to scan your localhost, your local network, and a remote server at [scanme.nmap.org](https://scanme.nmap.org).

### Step 1: Scan your localhost.

- a. If necessary, open a terminal on the VM. At the prompt, enter **nmap -A -T4 localhost**. Depending on your local network and devices, the scan will take anywhere from a few seconds to a few minutes.

```
[analyst@secOps ~]$ nmap -A -T4 localhost
```

```
Starting Nmap 7.40 ( https://nmap.org ) at 2017-05-01 17:20 EDT
Nmap scan report for localhost (127.0.0.1)
Host is up (0.000056s latency).
Other addresses for localhost (not scanned): ::1
rDNS record for 127.0.0.1: localhost.localdomain
Not shown: 996 closed ports
PORT      STATE SERVICE VERSION
21/tcp    open  ftp      vsftpd 2.0.8 or later
| ftp-anon: Anonymous FTP login allowed (FTP code 230)
|_ -rw-r--r--  1 0          0                  0 Apr 19 15:23 ftp_test
<some output omitted>
```

- b. Review the results and answer the following questions.

Which ports and services are opened?

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For each of the open ports, record the software that is providing the services.

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### Step 2: Scan your network.

**Warning: Before using Nmap on any network, please gain the permission of the network owners before proceeding.**

- a. At the terminal command prompt, enter **ip address** to determine the IP address and subnet mask for this host. For this example, the IP address for this VM is 10.0.2.15 and the subnet mask is 255.255.255.0.

```
[analyst@secOps ~]$ ip address
```

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<output omitted>

```
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP
group default qlen 1000
    link/ether 08:00:27:ed:af:2c brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 85777sec preferred_lft 85777sec
    inet6 fe80::a00:27ff:feed:af2c/64 scope link
        valid_lft forever preferred_lft forever
```

Run the command on the *Workstation* VM, record the IP address and subnet mask.

Which network does your VM belong to?

- 
- b. To locate other hosts on this LAN, enter **nmap -A -T4 network address/prefix**. The last octet of the IP address should be replaced with a zero. For example, in the IP address 10.0.2.15, the .15 is the last octet. Therefore, the network address is 10.0.2.0. The /24 is called the prefix and is a shorthand for the netmask 255.255.255.0. If your VM has a different netmask, search the internet for a “CIDR conversion table” to find your prefix. For example, 255.255.0.0 would be /16. The network address 10.0.2.0/24 is used in this example

**Note:** This operation can take some time, especially if you have many devices attached to the network. In one test environment, the scan took about 4 minutes.

```
[analyst@secOps ~]$ nmap -A -T4 192.168.0.0/24
```

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```
[analyst@secOps ~]$ nmap -A -T4 192.168.0.0/24
Starting Nmap 7.80 ( https://nmap.org ) at 2020-08-09 21:15 EDT
Nmap scan report for 192.168.0.12
Host is up (0.00015s latency).
Not shown: 997 closed ports
PORT      STATE SERVICE      VERSION
135/tcp    open  msrpc        Microsoft Windows RPC
139/tcp    open  netbios-ssn  Microsoft Windows netbios-ssn
445/tcp    open  microsoft-ds Microsoft Windows Server 2008 R2 - 2012 microsoft-ds
Service Info: OSs: Windows, Windows Server 2008 R2 - 2012; CPE: cpe:/o:microsoft:windows

Host script results:
|_nbstat: NetBIOS name: WINCLIENT, NetBIOS user: <unknown>, NetBIOS MAC: 00:50:56:82:da:48 (VMware)
|_smb-os-discovery: ERROR: Script execution failed (use -d to debug)
|_smb-security-mode:
|   account_used: guest
|   authentication_level: user
|   challenge_response: supported
|_ message_signing: disabled (dangerous, but default)
|_smb2-security-mode:
|   2.02:
|_   Message signing enabled but not required
|_smb2-time:
|   date: 2020-08-10T01:18:16
|_   start_date: 2020-08-10T00:33:13

Nmap scan report for 192.168.0.14
Host is up (0.000078s latency).
Not shown: 997 closed ports
PORT      STATE SERVICE      VERSION
21/tcp    open  ftp          vsftpd 2.0.8 or later
|_ftp-anon: Anonymous FTP login allowed (FTP code 230)
|_ -rw-r--r--  1 0      0              0 Mar 26  2018 ftp_test
|_ftp-syst:
|   STAT:
|_FTP server status:
|   Connected to 192.168.0.14
|   Logged in as ftp
|   TYPE: ASCII
|   No session bandwidth limit
|   Session timeout in seconds is 300
|   Control connection is plain text
|   Data connections will be plain text
|   At session startup, client count was 2
|   vsFTPD 3.0.3 - secure, fast, stable
|_End of status
22/tcp    open  ssh          OpenSSH 8.2 (protocol 2.0)
23/tcp    open  telnet?
Service Info: Host: Welcome

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 256 IP addresses (2 hosts up) scanned in 196.44 seconds
```

How many hosts are up?

From your Nmap results, list the IP addresses of the hosts that are on the same LAN as your VM. List some of the services that are available on the detected hosts.

### Step 3: Scan a remote server.

- a. Open a web browser and navigate to **scanme.nmap.org**. Please read the message posted.

What is the purpose of this site?

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- b. Look at the following nmap result:

```
[analyst@secOps Desktop]$ nmap -A -T4 scanme.nmap.org

Starting Nmap 7.40 ( https://nmap.org ) at 2017-05-01 16:46 EDT
Nmap scan report for scanme.nmap.org (45.33.32.156)
Host is up (0.040s latency).
Other addresses for scanme.nmap.org (not scanned): 2600:3c01::f03c:91ff:fe18:bb2f
Not shown: 992 closed ports
PORT      STATE      SERVICE      VERSION
22/tcp    open      ssh          OpenSSH 6.6.1p1 Ubuntu 2ubuntu2.8 (Ubuntu Linux; protocol 2.0)
| ssh-hostkey:
|   1024 ac:00:a0:1a:82:ff:cc:55:99:dc:67:2b:34:97:6b:75 (DSA)
|   2048 20:3d:2d:44:62:2a:b0:5a:9d:b5:b3:05:14:c2:a6:b2 (RSA)
|_  256 96:02:bb:5e:57:54:1c:4e:45:2f:56:4c:4a:24:b2:57 (ECDSA)
25/tcp    filtered  smtp
80/tcp    open      http         Apache httpd 2.4.7 ((Ubuntu))
|_http-server-header: Apache/2.4.7 (Ubuntu)
|_http-title: Go ahead and ScanMe!
135/tcp   filtered  msrpc
139/tcp   filtered  netbios-ssn
445/tcp   filtered  microsoft-ds
593/tcp   filtered  http-rpc-epmap
4444/tcp  filtered  krb524
9929/tcp  open      nping-echo   Nping echo
31337/tcp open      tcpwrapped
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at
https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 23.96 seconds
```

- c. Review the results and answer the following questions.

Which ports and services are opened?

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Which ports and services are filtered?

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What is the IP address of the server?

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What is the operating system?

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#### Reflection Question

Nmap is a powerful tool for network exploration and management. How can Nmap help with network security?  
How can Nmap be used by a threat actor as a nefarious tool?

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