FORENSICS
LAB SERIES

Lab 10: Network Forensics

Material in this Lab Aligns to the Following Certification Domains/Objectives		
GIAC Certified Forensics Examiner (GCFE) Domains	Certified Cyber Forensics Professional (CCFP) Objectives	Computer Hacking Forensic Investigator (CHFI) Objectives
7: User Communication Analysis	4: Digital Forensics	16: Network Forensics, Investigating Logs and Investigating Network Traffic

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Contents

Introduction

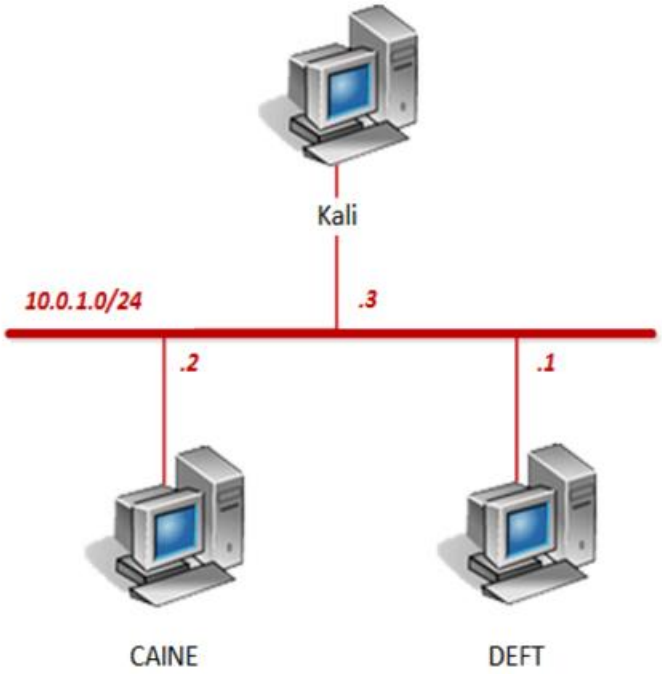
This lab will introduce how to capture packets and interpret them when performing network forensics. We will also examine how to use a graphical network analyzer to interpret the results.

Objective

In this lab, you will be conducting forensic practices using various tools. You will be performing the following tasks:

1. Capturing and Analyzing Traffic with Tcpdump
2. Analyzing Traffic with Wireshark

Pod Topology



Lab Settings

The information in the table below will be needed in order to complete the lab. The task sections below provide details on the use of this information.

Virtual Machine	IP Address	Account (if needed)	Password (if needed)
DEFT	10.0.1.1	deft	password
CAINE	10.0.1.2	caine	
Kali	10.0.1.3	root	toor

1 Capturing and Analyzing Traffic with Tcpdump

1. Click on the **CAINE** graphic on the *topology page* to open the VM.
2. Open a new terminal by clicking on the **MATE Terminal** icon located in the bottom tool pane.

3. Observe the manual for the *tcpdump* application. Enter the command below followed by pressing the **Enter** key.

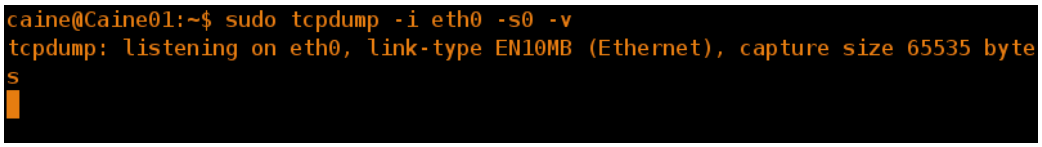
```
man tcpdump
```

```
TCPDUMP(8)                  System Manager's Manual                 TCPDUMP(8)

NAME
       tcpdump - dump traffic on a network

SYNOPSIS
       tcpdump [ -AbdDefhHIJKlLnNOpqRStuUvxX ] [ -B buffer_size ] [ -c count ]
               [ -C file_size ] [ -G rotate_seconds ] [ -F file ]
               [ -i interface ] [ -j tstamp_type ] [ -m module ] [ -H secret ]
               [ -P in|out|inout ]
               [ -r file ] [ -V file ] [ -s snaplen ] [ -T type ] [ -w file ]
               [ -W filecount ]
               [ -E spi@ipaddr algo:secret,...  ]
               [ -y datalinktype ] [ -z postrotate-command ] [ -Z user ]
               [ expression ]

DESCRIPTION
       Tcpdump  prints  out a description of the contents of packets on a net-
       work interface that match the boolean expression.  It can also  be  run
       with the -w flag, which causes it to save the packet data to a file for
       later analysis, and/or with the -r flag, which causes it to read from a
       saved  packet file rather than to read packets from a network interface
       (please note tcpdump is protected via an enforcing apparmor(7)  profile
       in  Ubuntu  which limits the files tcpdump may access).  It can also be
       run with the -V flag, which causes it to read a list  of  saved  packet
       files.  In  all  cases, only packets that match expression will be pro-
       cessed by tcpdump.
 Manual page tcpdump(8) line 1 (press h for help or q to quit)
```

With the *man* command, use the **Enter** key to skip to the next line item or use the **spacebar** to skip by page. When finished, press the **q** character to quit.

4. *Tcpdump* can perform network captures as well as filtering specific traffic. Enter the command below to try a simple capture.

```
sudo tcpdump -i eth0 -s0 -v
```



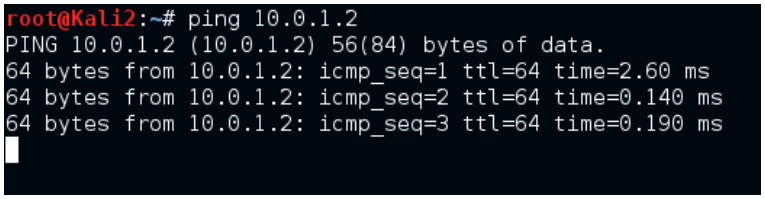
Command breakdown:
-i means interface
-s0 means capture all bytes within the packet
-v mean results should be verbose

If prompted for a password, type **password** and press the **Enter** key.

5. Change focus to the topology page and click on the **Kali** graphic to open the VM.
6. Login using **root** as the *username* and **toor** as the *password*.
7. Open a new terminal by clicking on the **Terminal** icon located in the left tool pane.

8. Using the terminal, enter the command below to continuously ping the CAINE system.

```
ping 10.0.1.2
```



Leave this running in the background.

9. Change focus to the **CAINE** PC viewer.
10. Notice on the terminal window, *tcpdump* is reportedly capturing *ICMP* traffic from the *Kali* system. Press **CTRL+C** to stop the capture.

```
18:34:18.282094 IP (tos 0x0, ttl 64, id 14378, offset 0, flags [none], proto ICM
P (1), length 84)
    10.0.1.2 > 10.0.1.3: ICMP echo reply, id 1796, seq 96, length 64
18:34:19.282077 IP (tos 0x0, ttl 64, id 1266, offset 0, flags [DF], proto ICMP (
1), length 84)
    10.0.1.3 > 10.0.1.2: ICMP echo request, id 1796, seq 97, length 64
18:34:19.282109 IP (tos 0x0, ttl 64, id 14603, offset 0, flags [none], proto ICM
P (1), length 84)
    10.0.1.2 > 10.0.1.3: ICMP echo reply, id 1796, seq 97, length 64
18:34:20.282063 IP (tos 0x0, ttl 64, id 1381, offset 0, flags [DF], proto ICMP (
1), length 84)
    10.0.1.3 > 10.0.1.2: ICMP echo request, id 1796, seq 98, length 64
18:34:20.282091 IP (tos 0x0, ttl 64, id 14843, offset 0, flags [none], proto ICM
P (1), length 84)
    10.0.1.2 > 10.0.1.3: ICMP echo reply, id 1796, seq 98, length 64
^C
272 packets captured
274 packets received by filter
0 packets dropped by kernel
caine@Caine01:~$
```

11. Enter the command below to dump captured packets to a **.pcap** file type.

```
sudo tcpdump -i eth0 -s0 -v > dump1.pcap
```

If prompted for a password, type **password** and press the **Enter** key.

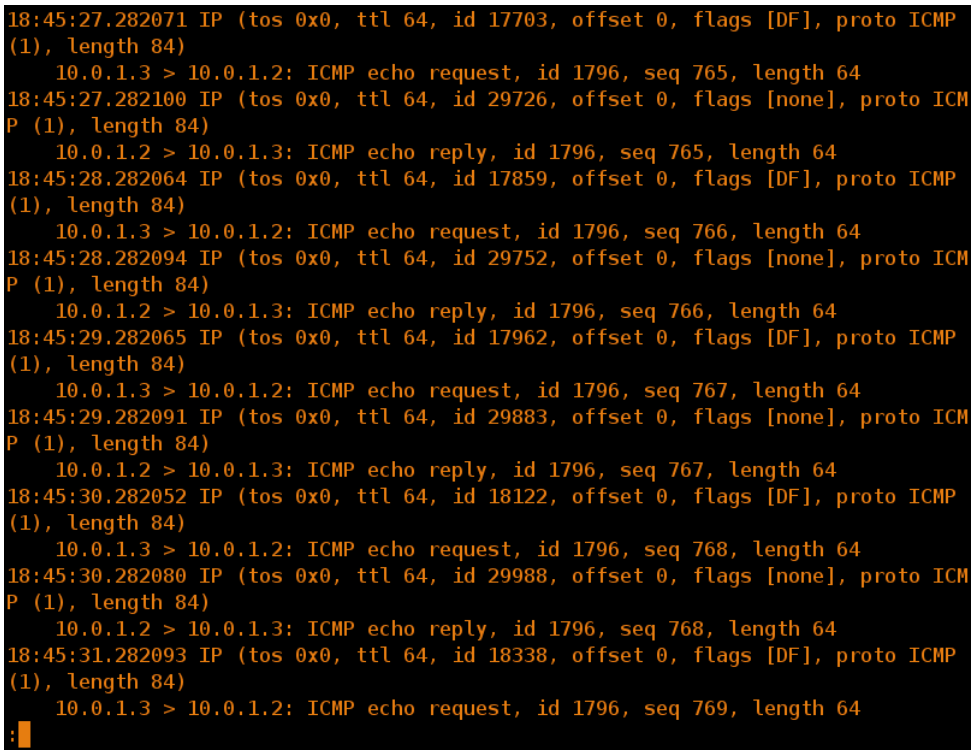
12. Wait for about 1-2 minutes of capturing traffic and press **CTRL+C** to stop the *tcpdump* capture.

```
caine@Caine01:~$ sudo tcpdump -i eth0 -s0 -v > dump1.pcap
tcpdump: listening on eth0, link-type EN10MB (Ethernet), capture size 65535 byte
s
^C722 packets captured
724 packets received by filter
0 packets dropped by kernel
caine@Caine01:~$
```

Notice 724 packets have been captured from this example.

13. Analyze only the *ICMP* traffic from the *dump1.pcap* file by using the *grep* command. Enter the command below.

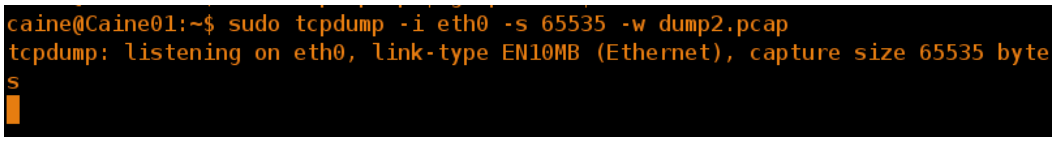
```
cat dump1.pcap | grep ICMP | less
```



With the *less* command, use the **Enter** key to skip to the next line item or use the **spacebar** to skip by page. When finished, press the **q** character to quit.

14. Initiate a new capture with *tcpdump* that can be opened in a graphical network analyzer. Enter the command below.

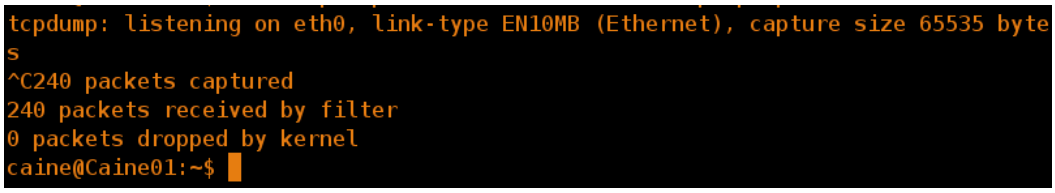
```
sudo tcpdump -i eth0 -s 65535 -w dump2.pcap
```



Command breakdown:
-s means capture 65535 bytes
-w means write to a file

If prompted for a password, type **`password`** and press the **Enter** key.

15. Wait for about 1-2 minutes of capturing traffic and press **CTRL+C** to stop the *tcpdump* capture.



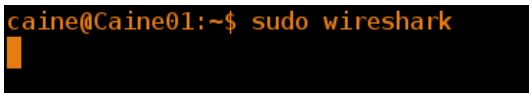
Notice 240 packets have been captured from this example.

16. Leave the terminal open to continue with the next task.

2 Analyzing Traffic with Wireshark

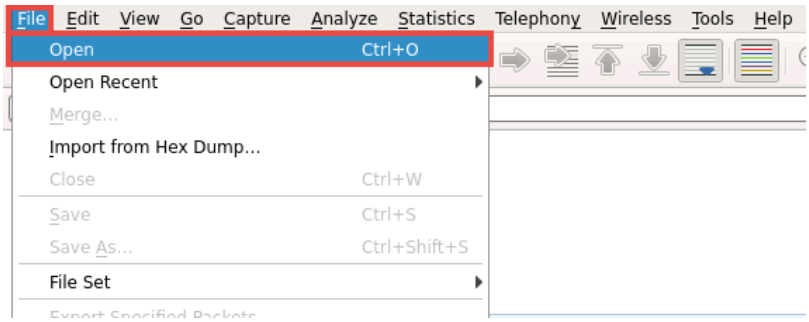
1. Using the terminal, enter the command below to launch a GUI based network analyzer named *Wireshark*.

```
sudo wireshark
```

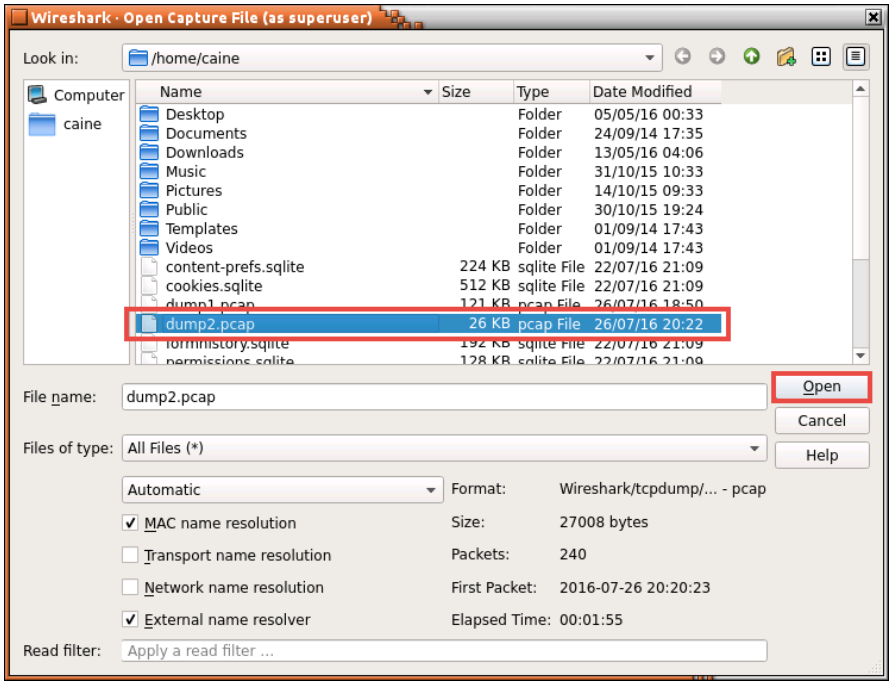


If prompted for a password, type **password** and press the **Enter** key.

2. Using Wireshark, click on **File** and select **Open**.



3. In the *Open Capture File* window, navigate to the **/home/caine/** directory and select **dump2.pcap**. Click **Open**.



4. Notice the *ICMP* traffic data fill the middle pane of the *Wireshark* application. Change focus to **Kali** system to generate some additional traffic.

5. Focusing on the terminal, press **CTRL+C** to stop the pings from occurring.
6. Using the terminal, enter the command below to start the *Apache* web service on the *Kali* system.

```
service apache2 start
```

```
root@Kali2:~# service apache2 start
root@Kali2:~#
```

If *Apache* returns with an error, enter the following command and continue to the next step: **`service apache2 restart`**

7. Verify the status of the *Apache* service by entering the command below.

```
root@Kali2:~# service apache2 status
● apache2.service - LSB: Apache2 web server
   Loaded: loaded (/etc/init.d/apache2)
   Active: active (running) since Wed 2016-07-27 10:17:10 CDT; 21min ago
  Process: 1683 ExecStart=/etc/init.d/apache2 start (code=exited, status=0/SUCCE
SS)
   CGroup: /system.slice/apache2.service
           ├─1704 /usr/sbin/apache2 -k start
           ├─1708 /usr/sbin/apache2 -k start
           ├─1709 /usr/sbin/apache2 -k start
           ├─1710 /usr/sbin/apache2 -k start
           ├─1711 /usr/sbin/apache2 -k start
           ├─1712 /usr/sbin/apache2 -k start
           └─1713 /usr/sbin/apache2 -k start

Jul 27 10:17:10 Kali2 apache2[1683]: Starting web server: apache2.
root@Kali2:~#
```

8. Start the *FTP* service on the *Kali* system. Enter the command below.

```
service vsftpd start
```

```
root@Kali2:~# service vsftpd start
root@Kali2:~#
```

9. Enter the command below to verify the status of the *FTP* service.

```
service vsftpd status
```

```
root@Kali2:~# service vsftpd status
● vsftpd.service - vsftpd FTP server
   Loaded: loaded (/lib/systemd/system/vsftpd.service; disabled)
   Active: active (running) since Wed 2016-07-27 10:41:22 CDT; 27s ago
  Process: 1790 ExecStartPre=/bin/mkdir -p /var/run/vsftpd/empty (code=exited, s
tatus=0/SUCCESS)
 Main PID: 1792 (vsftpd)
   CGroup: /system.slice/vsftpd.service
           └─1792 /usr/sbin/vsftpd /etc/vsftpd.conf
root@Kali2:~#
```

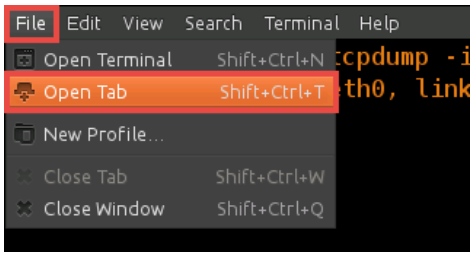

10. Change focus to the **CAINE** system.
11. Close the **Wireshark** application.
12. Using the terminal, enter the command below to initiate a new *tcpdump* capture.

```
sudo tcpdump -i eth0 -s 65535 -w dump3.pcap
```

```
caine@Caine01:~$ sudo tcpdump -i eth0 -s 65535 -w dump3.pcap
tcpdump: listening on eth0, link-type EN10MB (Ethernet), capture size 65535 byte
s
```

If prompted for a password, type **password** and press the **Enter** key.

13. In the terminal window, click on **File** and select **Open Tab**.



14. In the new tab of the terminal window, enter the command below to initiate an ftp connection to the Kali FTP service.

```
ftp 10.0.1.3
```

```
caine@Caine01:~$ ftp 10.0.1.3
Connected to 10.0.1.3.
220 Welcome to Kali FTP service.
Name (10.0.1.3:caine):
```

15. When prompted with a name field, type **caine** and press the **Enter** key.

```
Name (10.0.1.3:caine): caine
331 Please specify the password.
Password:
```

16. When prompted for a password, type **password** and press **Enter**.

```
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp>
```


17. Once the ***ftp>*** prompt appears, enter the command below to list the files and directories.

```
ls
```

```
ftp> ls
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
drwxr-xr-x    2 1000     1001         4096 May 20 10:31 Desktop
drwxr-xr-x    2 1000     1001         4096 May 20 10:56 Documents
drwxr-xr-x    2 1000     1001         4096 May 20 10:31 Downloads
drwxr-xr-x    2 1000     1001         4096 May 20 10:31 Music
drwxr-xr-x    2 1000     1001         4096 May 20 10:31 Pictures
drwxr-xr-x    2 1000     1001         4096 May 20 10:31 Public
drwxr-xr-x    2 1000     1001         4096 May 20 10:31 Templates
drwxr-xr-x    2 1000     1001         4096 May 20 10:31 Videos
226 Directory send OK.
ftp>
```

18. Navigate to the Documents/ directory by entering the command below.

```
cd Documents
```

```
ftp> cd Documents
250 Directory successfully changed.
ftp>
```

19. List the files and directories again. Enter the command below.

```
ls
```

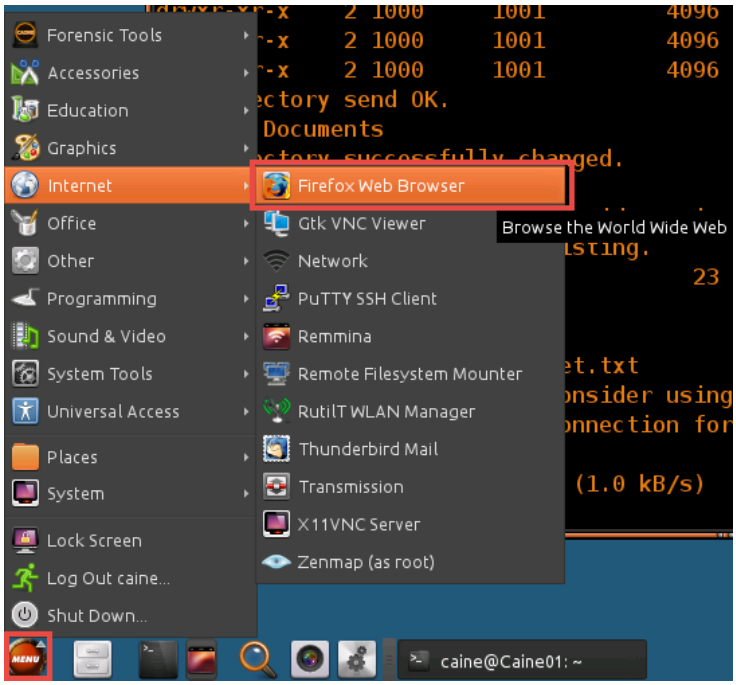
```
ftp> ls
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
-rw-r--r--    1 0        0              23 May 20 10:56 secret.txt
226 Directory send OK.
ftp>
```

20. Notice the *secret.txt* file. Download this file locally by entering the command below.

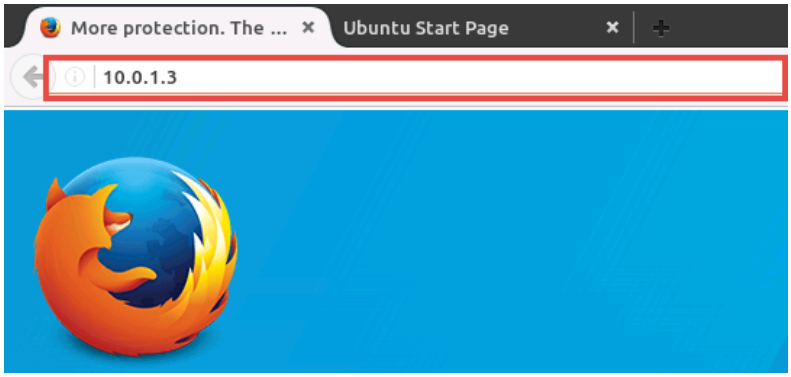
```
get secret.txt
```

```
ftp> get secret.txt
local: secret.txt remote: secret.txt
200 PORT command successful. Consider using PASV.
150 Opening BINARY mode data connection for secret.txt (23 bytes).
226 Transfer complete.
23 bytes received in 0.02 secs (1.0 kB/s)
ftp>
```


21. Open the *Firefox* web browser by navigating to **Menu > Internet > Firefox Web Browser**.



22. Using *Firefox*, type `10.0.1.3` into the address field and press **Enter**.



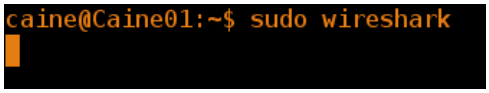
23. Notice the *Apache2 Debian Default Page* appears. Change focus to the terminal window in *CAINE* and click on the **first tab**.
24. Press **CTRL+C** to stop the *tcpdump* capture.

```
caine@Caine01:~$ sudo tcpdump -i eth0 -s 65535 -w dump3.pcap
tcpdump: listening on eth0, link-type EN10MB (Ethernet), capture size 65535 byte
s
^C1472 packets captured
1472 packets received by filter
0 packets dropped by kernel
caine@Caine01:~$
```

If prompted for a password, type `password` and press the **Enter** key.

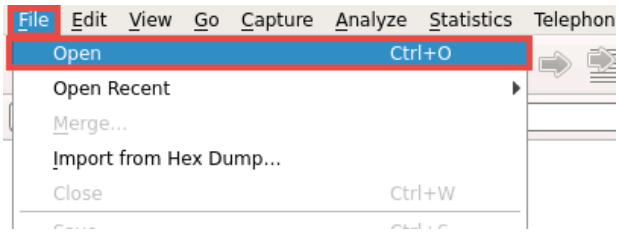
25. Using the terminal, enter the command below to open **Wireshark**.

```
sudo wireshark
```

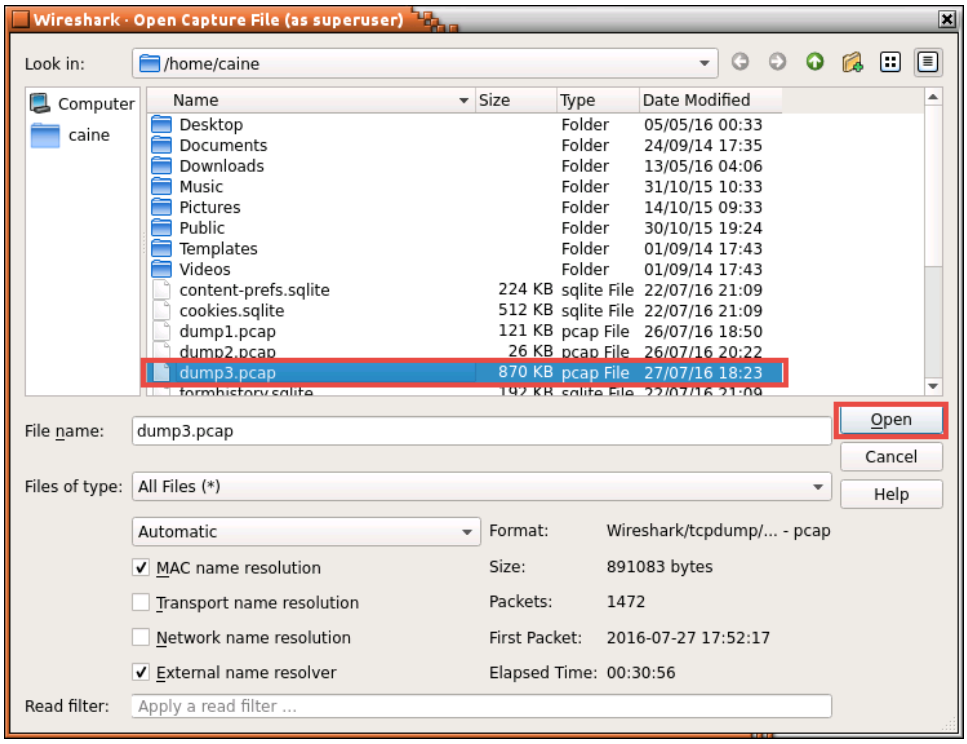


If prompted for a password, type password and press the Enter key.

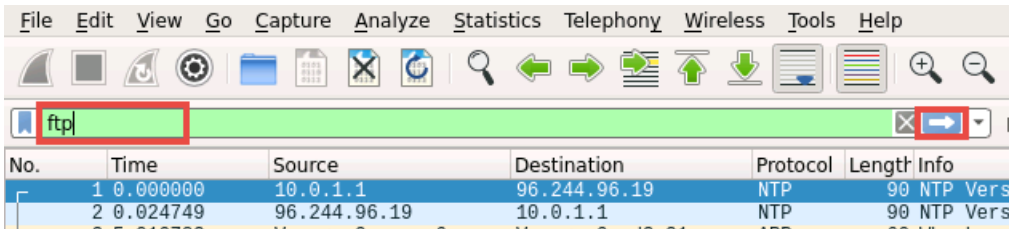
26. Using the *Wireshark* application, click **File** and select **Open**.



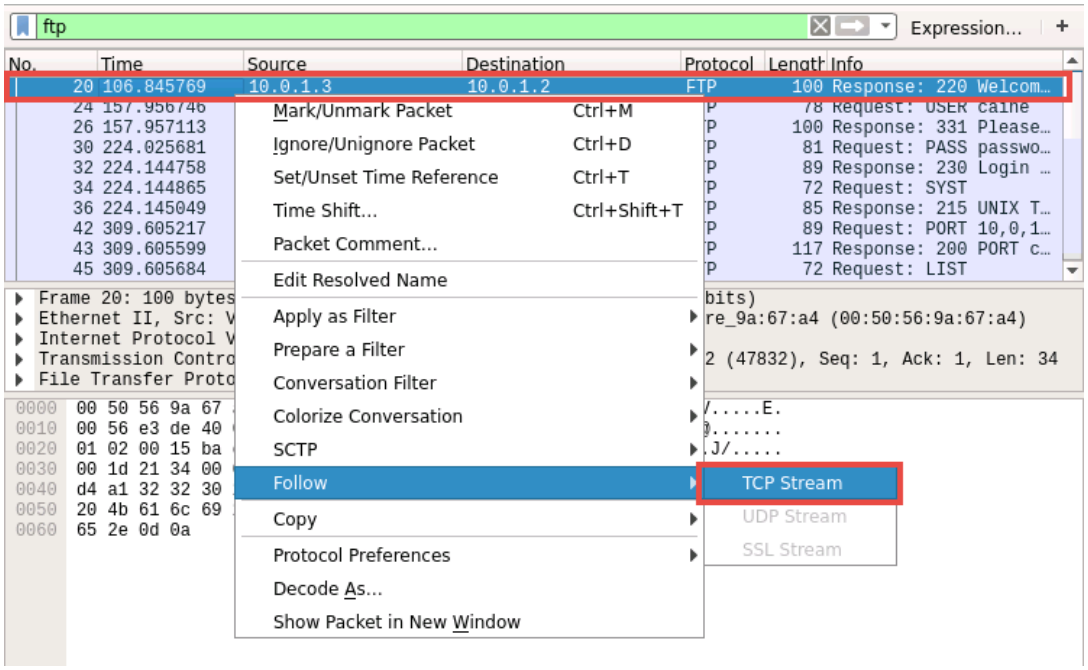
27. In the *Open Capture File* window, navigate to the **/home/caine/** directory and select **dump3.pcap**. Click **Open**.



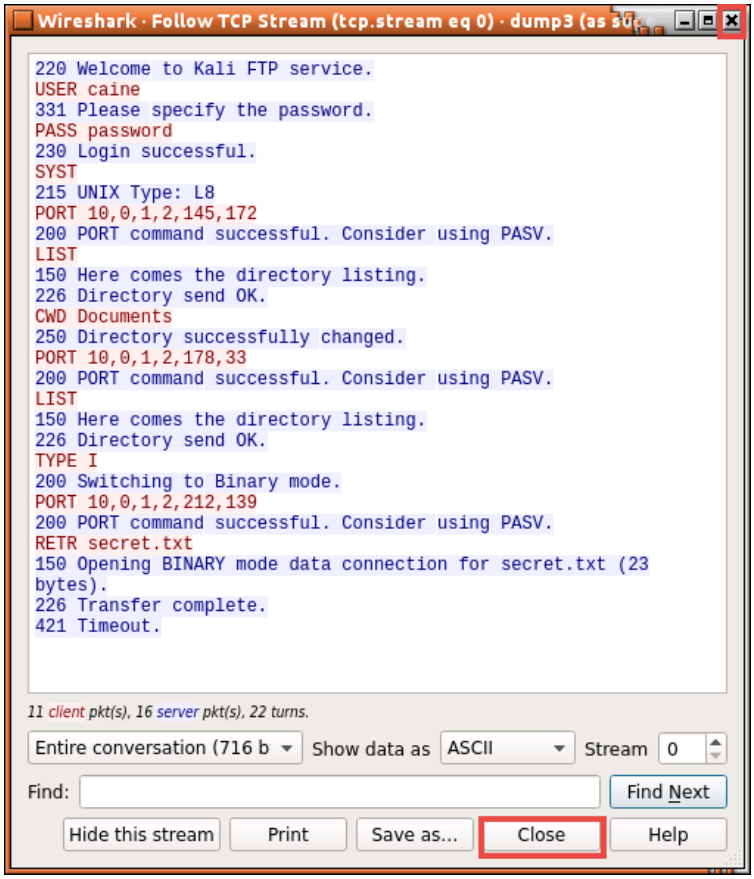
28. Notice the traffic data populating the middle pane. Filter the traffic for just *FTP* traffic by typing **`ftp`** into the filter field and clicking on the **blue arrow** to apply.



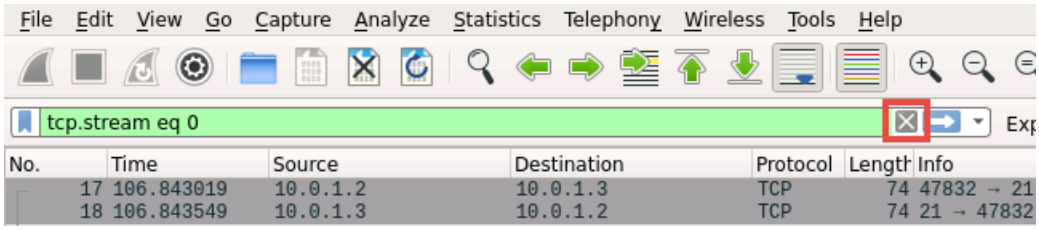
29. Only traffic with the *FTP* protocol should appear in the middle pane. Analyze the stream of data that happened by right-clicking on the **first FTP frame** and selecting **Follow > TCP Stream**.



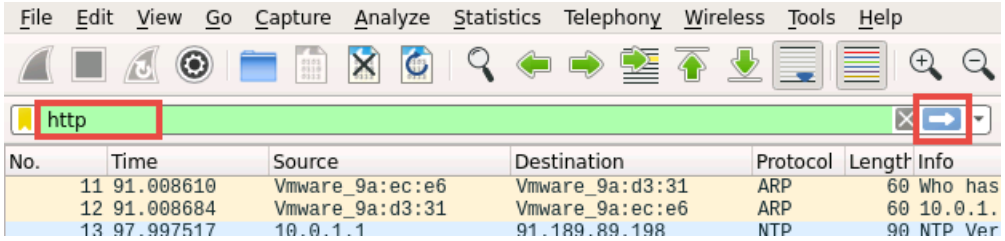
30. Notice in a new window, the entire *FTP* conversation appears in clear text. The login and password can be seen, along with which file was downloaded and its corresponding filename. Close the window.



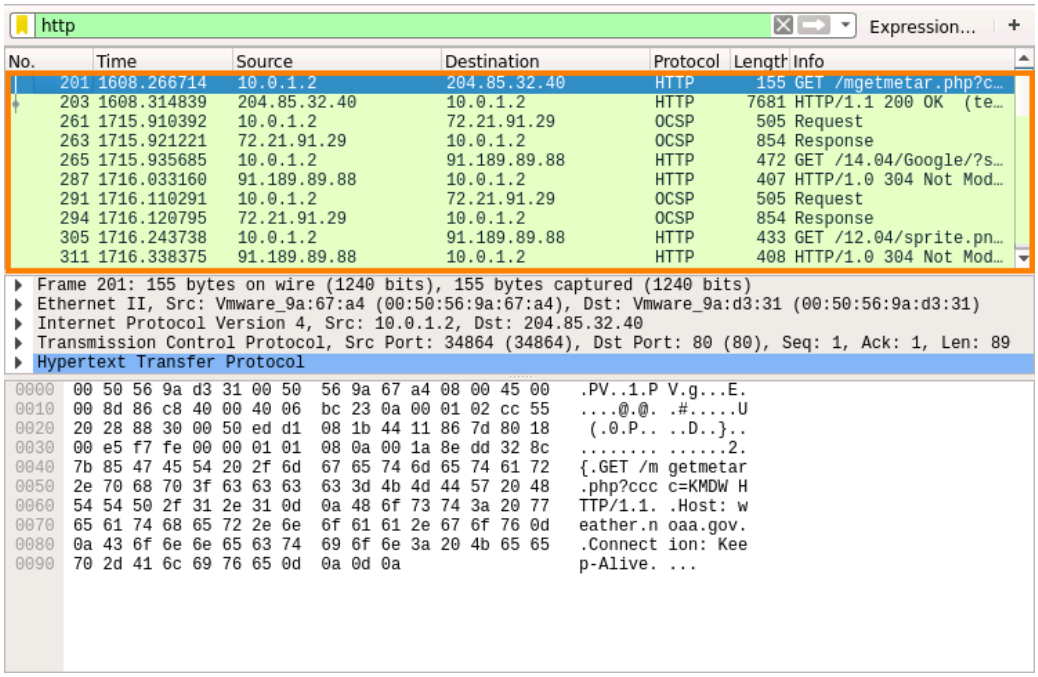
31. Clear the filter field by clicking on the "**x**" symbol next to the blue arrow.



32. Type `http` into the filter field followed by clicking on the **blue arrow** to apply.



33. Notice that only traffic with the *HTTP* protocol should appear in the middle pane. Briefly analyze the data presented.



34. Close all **PC Viewers** and end the reservation to complete the lab.

