CSCI322 Lab Exercises

Lab 3

Objective

You will install and learn to use a packet capture and analysis tools.

Systems Administrators are often called upon to troubleshoot systems that usually rely on a network, but that network traffic is rarely observable at an application level. `Wireshark` and other tools like it allow us to see what is happening at a packet level (OSI layer 3/4) and frame level (OSI level 2). And the interface offers quite effective filters to reduce "noise", allowing a sysadmin to focus more clearly on the protocols and sequences being investigated.

This is a powerful tool. And as you have no doubt heard, with great power comes great responsibility. When sniffing the traffic on a network, you are likely to see at least some unencrypted traffic which may contain passwords or other privileged information. In a perfect world, such information would not be leaked by applications, but we all know that this world is not perfect. Never misuse the information that you see. Always protect the privacy of your peers and clients. When using tools such as `tcpdump` or `Wireshark`, be mindful of what you do and for your own sake, document everything that you do. You never know when you will be required to produce that documentation for legal purposes.

IMPORTANT NOTE: **From the University's IT Acceptable Use Policy, to which you are all bound [Section 4 part 2]: All users must accept full responsibility for using the University's IT Facilities in an honest, ethical and legal manner and with regard to the privacy, rights and sensitivities of other people. Use must be in accordance with University policies and all relevant federal and state legislation.**

So be sensible and ethical, but particularly when using `tcpdump` or `Wireshark`.

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1. **Set time zone from CLI (command-line interface)**

   Check the current time on the *server*:

   ```
   date
   ```

   You may find that the current time on the server is a UTC time.

   Display the time zone file:

   ```
   more /etc/timezone
   ```

   You may find that your time zone is `Etc/UTC`, which is a special area for the universal coordinated time (zone). The time zone is name using Area/Location in the IANA-timezones-database.

   Find out the available time zone in Australia:

   ```
   timedatectl list-timezones | grep Australia
   ```

   The closest time zone in the database to Wollongong is `Australia/Sydney`. Use the following command to set the time zone:

   ```
   sudo timedatectl set-timezone Asia/Singapore
   ```

   Display the time zone file and check the current time again.

   The current time zone should be `Australia/Sydney` and the time should be an `AEST` time now.

You can also use the `timedatectl` command to query the system clock and its settings:

```
timedatectl status
```

You can use the `timedatectl` command to query a remote system. From your desktop VM, issue the following command to confirm the time zone of the server VM to have been set to `Asia/Singapore`. (If you did not install openSSH on the server, you will need to install it first.)

```
timedatectl -H csci322@serverIP status
```

Restart the `cron` to allow it to pick up the time zone change:

```
sudo service cron restart
```

2. **Capture packets using `tcpdump` from CLI**

First let's inspect the ARP cache using the following command on the *server*:

```
arp
```

Find out your desktop IP address and remove it from the ARP cache:

```
sudo arp -d desktopIP
```

Capture 4 either ICMP or ARP packets using `tcpdump` command:

```
sudo tcpdump -c 4 "icmp or arp"
```

On the *desktop*, open a `terminal` program and issue the following command:

```
ping -c 1 serverIP
```

On the *server*, you can see ARP request/reply packets and ICMP request/reply packets, which is the protocol the `ping` utility uses.

Record the desktop's MAC address from the packet captured.

3. **Packet capture and analysis with `Wireshark`**

- Install `Wireshark` on the *desktop*

  Start the `Ubuntu Software` by clicking at the icon on the dock at the left of the screen.

  Search for `wireshark`.

  Install `Wireshark` (with 5 stars) and accept all defaults.

- Start `Wireshark` from CLI

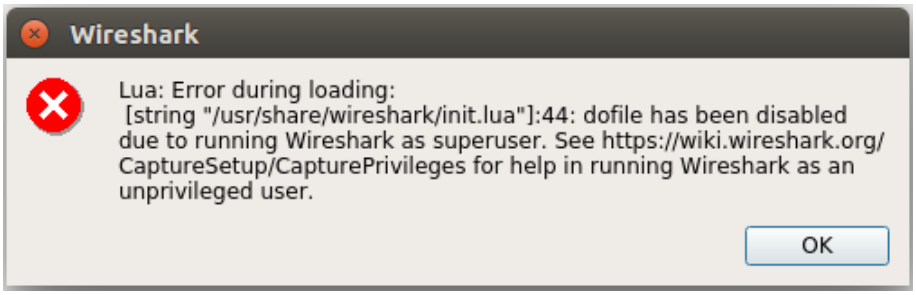
  Now start up the `Wireshark` as a superuser. (Once a user has been authenticated, a time stamp is updated and the user may then use `sudo` without a password for a short period of time. The "&" at the end of this command is to push the process to the "background" of that terminal window. For your purposes, this just means that your terminal is usable for other things now while `Wireshark` is still running.)

  In the terminal, issue the following commands:

```
sudo ls
sudo wireshark &
```

The GUI should load up…

If you receive a message as shown,



You may press OK to ignore it or do the following to fix it.

```
sudo gedit /usr/share/wireshark/init.lua
```

Then make the following change and save.

```
"disable_lua = false" to "disable_lua = true"
```

Then select the Ethernet interface of the VM, likely to be `enp0s3`, by double-clicking to start capturing.

Note the sections of the GUI:

- Menu Bar
- Main Toolbar
- Filter Toolbar
- Packet List pane, showing one line for every packet you capture
- Packet Details pane, showing a decoded breakdown of the selected packet
- Packet Bytes pane, showing the raw content of the packet
- Status bar

These will make more sense once you have run a capture.

- Capture packets

  On the *server*, try this:

  ```
  ping -c 2 desktopIP
  ```

  (How to find out your desktop VM's IP?)

  On the *desktop*, point your browser to `www.google.com`

  Then, stop the capture and save the capture to a file.

- Analyse packets

  Now let's analyse the packet capture.

  a. Filter the results down to just ICMP – in the filter toolbar, simply by typing `icmp` and <Enter>

  Select one of the `ping` request packet (noting that it comes from your source IP address). Record the packet number (leftmost column).

  Now in the Packet Details pane, you may drill down into ever deeper levels via the triangles on the left. Find your source MAC address and the destination MAC address. (Note them down for your tutor)

Then select the corresponding ping reply packet (it should be next recorded packet to the request packet). Dig in the Packet Details pane for the Internet Control Message Protocol and dig out the response time of that ping. (Note it down for your tutor).

b. Filter the results down to DNS (remove the previous keyword and type `dns` and <Enter>

Select the DNS response packet.

Find out the IP address of the host www.google.com.au from the answer. (Note it down for your tutor).

- What are all of the protocols that Wireshark allows us to inspect?

  From the menu bar: `Analyze -> Enabled Protocols`

  (This is also the answer to 'what protocol is XYZ that showed up in my capture?')

- Analyse packets from a Wireshark Capture file

  Let's now analyse somebody else's packet capture. (This is one of the sample `pcap` files that come from Wireshark's creators) Open the file http_with_jpegs.cap in Wireshark.

  Put the following into the filter toolbar:

  ```
  tcp.stream eq 6
  ```

  You can observe the HTTP request and response, but also the TCP transactions underneath.

  But here is a nice feature (especially if you work with web protocols):

  ```
  Analyze -> Follow -> TCP Stream
  ```

  What is the version of the Apache server hosting these pictures? (Note it down for your tutor)

We are unable to cover very much in a lab. You are strongly recommended that you spend some time to learn to use `Wireshark` effectively.

You can find more information at wiki.wireshark.org.

Submission and mark

For full marks today, show your lab tutor

1. `/etc/timezone` file on the server;
2. the desktop's MAC address from the packet captured by `tcpdump` on the server;
3. MAC addresses of the source and destination, response time of `ping` from the packets with `Wireshark`;
4. IP address of `www.google.com.au` from the packet with `Wireshark`;
5. the version of the Apache server hosting the pictures from the given file with `Wireshark`.

3 marks for all 5 items above;
2 marks for any 3-4 items above;
1 mark for any 2 items above
0 mark for 1 or less items above.

You should be ready to answer any questions to demonstrate that all work is done by yourself otherwise you may receive 0 mark.