VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031
Department of Computer Science & Engineering
INNOVATION IN TEACHING

Course Name: CN (Computer Networks) **Faculty Name:** T Nishitha
Topic Name: Network layer Functionalities **Year/Sem:** III year/V Sem

Teaching aid/Tool Used: Network Simulator-3

Description of the Tool:
NS-3 is a discrete-event network simulator for Internet systems, targeted primarily for research and educational use.

Tool usage in Teaching:
NS-3 installation and execution of example programs
List of packages for installing ns-3 in Ubuntu operating system
Packages required for installing ns-3:

1.gcc
2. g++
3. python
4. python-dev

Packages required for installing netanim:

1. qt4-dev-tools

packages required for installing PyViz:

1. libgtk-3-dev
2. python-pygoocanvas
3. python-pygraphviz

packages required for installing TraceMetrics:

1. openjdk-8-jdk (openjdk-7-jdk if OS is less than Ubuntu 16.04)

packages required for installing gnuplot:

1. gnuplot

packages required for installing wireshark:

1. wireshark

command to install all packages at once:
sudo apt-get install gcc g++ python python-dev qt4-dev-tools libgtk-3-dev python-pygoocanvas python-pygraphviz openjdk-8-jdk gnuplot wireshark

steps to install ns-3:

1. Download ns-allinone-3.26.tar.bz2 and unzip it.
2. Go to ns-allinone-3.26 and give the following command:
   ./build.py --enable-examples --enable-tests
   (This command will install ns-3,NetAnim and PyViz)

You are done with it, if you do not see any erros!
Similar instructions to install ns-3 can be found at the following link:
http://mohittahiliani.blogspot.in/2015/10/installing-ns-3-on-ubuntu-simplified.html

details to install ns-3 in other operating systems can be found at the following link:
http://www.nsnam.org/wiki/installation

Steps to play with first.cc

Step 1: Copy first.cc from ns-allinone-3.26/ns-3.26/examples/tutorial
Step 2: paste it in ns-allinone-3.26/ns-3.26/scratch
Step 3: go to ns-allinone-3.26/ns-3.26 via terminal and run the program with following command:

(Note: ./waf command must be always run form ns-allinone-3.26/ns-3.26)
./waf –run scratch/first
(above command prints the output on the console)

Step 4: to see animated output, run the program with following command:

./waf –run scratch/first –vis
(above command animates the output using PyViz, if it is installed)

Changes required to generate .pcap files for first.cc

Step 5: open first.cc that is placed in ns-allinone-3.26/ns-3.26/scratch
Step 6: Type the following line before "Simulator::Run() :"

PointToPoint.EnablePcpAll("first");

Step 7:run the program with following command:

./waf --run scratch/first
(above command prints the output on console and generates two pcap files)

Step 8: check whether two pcap files are generated by using the following

Ls *.pcap
(above command displays all the pcap files in ns-3.26 directory)

Step 9: open the first pcap file by using the following command:

Wireshark first-0-0.pcp
(above command opens the pcap file in wireshark)

Changes required to use NetAnim and generate .xml file for first.cc

Step 10: Add the following header files in first.cc

#include "ns3/netanim-module.h"
#include "ns3/mobility-module.h"

Step 11: type the following lines before "Simulator::Run() ;"

```
MobilityHelper mobility;
mobility.SetMobilityModel ("ns3::ConstantPositionMobilityModel");
mobility.Install (nodes);
AnimationInterface anim ("first.xml");
AnimationInterface::SetConstantPosition (nodes.Get (0), 10, 25);
AnimationInterface::SetConstantPosition (nodes.Get (1), 40, 25);
Anim.EnablePacketMetadata (true);       //what protocol, port no//do it false//
```

Step 12: Run the program with following command:

./waf –run scratch/first

(above command prints the output on console and generates one xml file)

Step 13: check whether the xml file is generated by using the following

Ls *.xml

(above command displays all the xml files in ns-3.26 directory)

Step 14: Load the xml file after giving the following command:

../netanim-3.107/NetAnim

(above command opens the NetAnim window if it is installed)

Topic Name: Network layer Functionalities

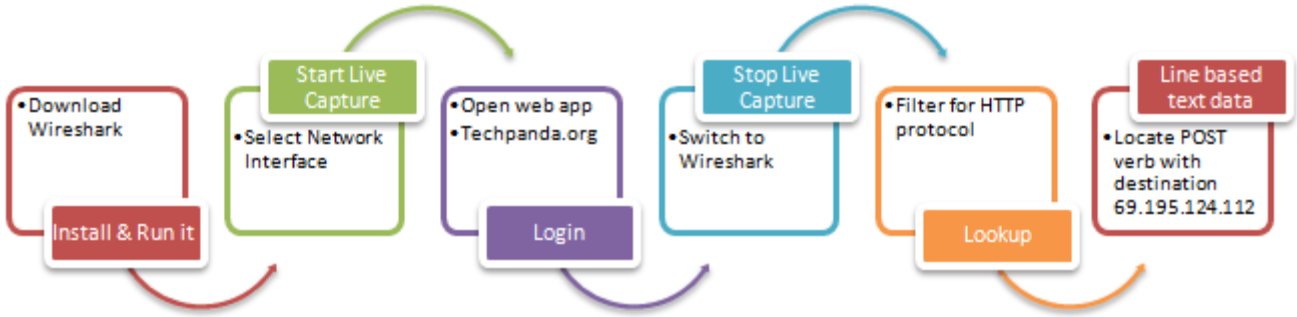
Teaching aid/Tool Used: Wireshark

Description of the Tool: Capture,Filter and inspect packets using Wireshark

Wireshark, a network analysis tool captures packets in real time and display them in human-readable format. Wireshark includes filters, color coding, and other features that let you dig deep into network traffic and inspect individual packets.

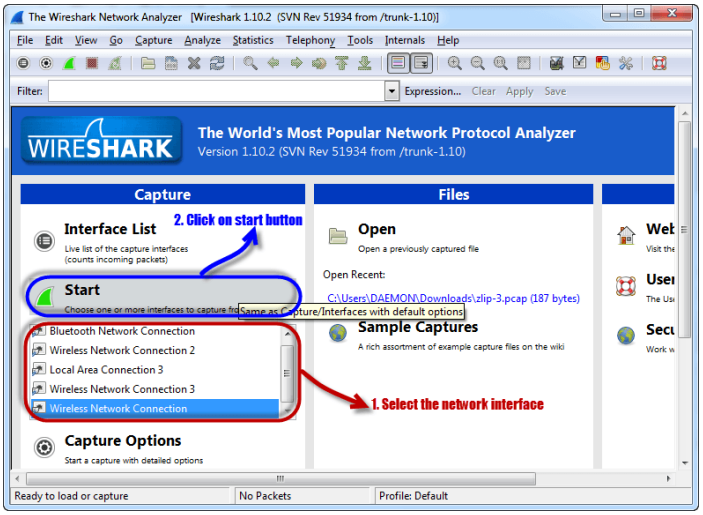
Professionals use it to debug network protocol implementations, examine security problems and inspect network protocol internals.

Tool usage in Teaching: The illustration below shows you the steps that are required to understand sniffing of packets using Wireshark.



Step 1:Download Wireshark from this link http://www.wireshark.org/download.html

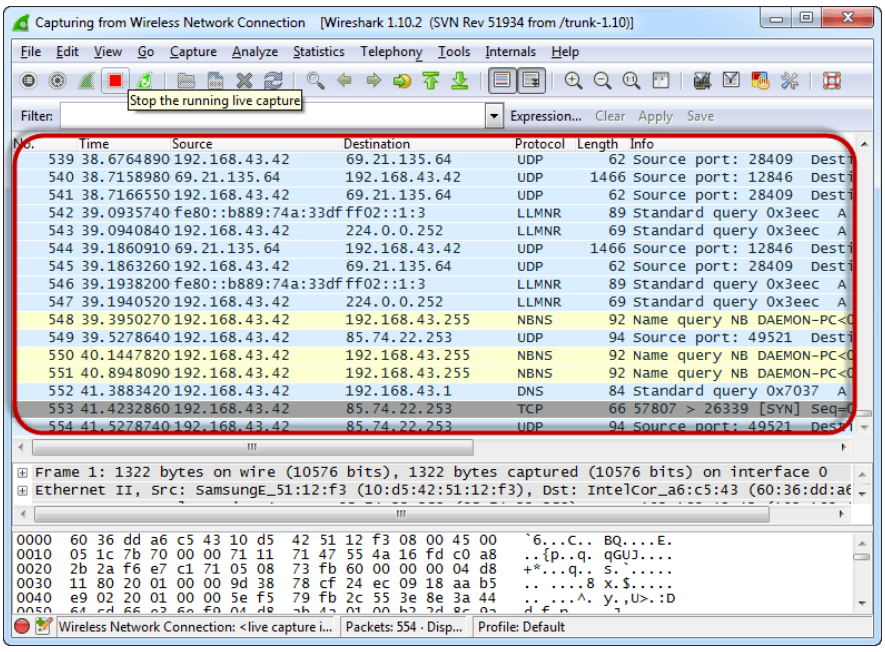
- Open Wireshark
- You will get the following screen



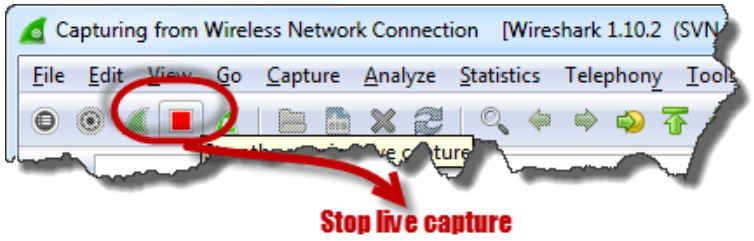
Step 2: Select the network interface you want to sniff. Note for this demonstration, we are using a wireless network connection. If you are on a local area network, then you should select the local area network interface.

Step 3: Click on start button as shown above

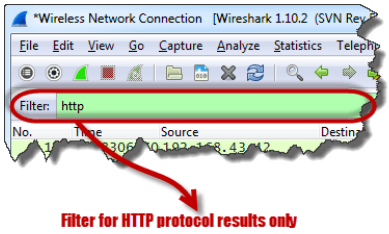
Step 4: Open your web browser and type ihttp://www.vce.ac.in/



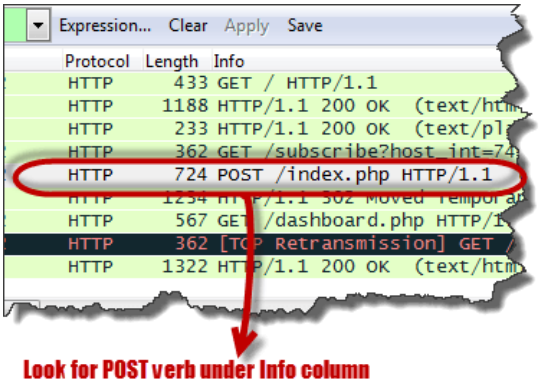
Step 5: Go back to Wireshark and stop the live capture



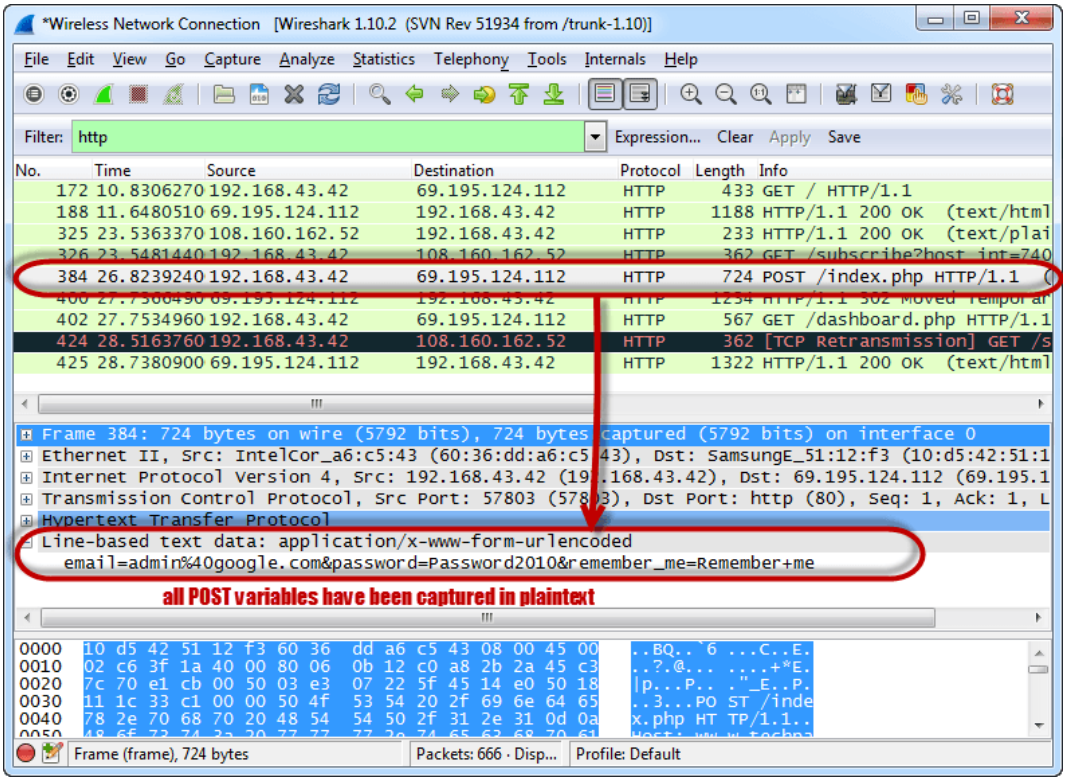
Step 6: Filter for HTTP protocol results only using the filter textbox



Step 7:Locate the Info column and look for entries with the HTTP verb POST and click on it



Step 8: Just below the log entries, there is a panel with a summary of captured data. Look for the summary that says Line-based text data: application/x-www-form-urlencoded



- You should be able to view the plaintext values of all the POST variables submitted to the server via HTTP protocol.

Summary

- Network sniffing is intercepting packages as they are transmitted over the network
- Passive sniffing is done on a network that uses a hub. It is difficult to detect.
- Active sniffing is done on a network that uses a switch. It is easy to detect.