NS LAB 4 SEPTEMBER | Lab Assignment 4

Name: Maloth Aditya
Roll No: 120CS0124

Question:
1. Set constant position for point-to-point nodes and as well as CSMA nodes.
2. Plot a graph by using Gnuplot via, .tr, considering throughput and goodput as parameters for your graph generation.
3. Display the result in NetAnim, Wireshark and TraceMetrics.

CODE:
```
/* -*- Mode:C++; c-file-style:"gnu"; indent-tabs-mode:nil; -*- */
/*
 * This program is free software; you can redistribute it and/or modify
 * it under the terms of the GNU General Public License version 2 as
 * published by the Free Software Foundation;
 *
 * This program is distributed in the hope that it will be useful,
 * but WITHOUT ANY WARRANTY; without even the implied warranty of
 * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  See the
 * GNU General Public License for more details.
 *
 * You should have received a copy of the GNU General Public License
 * along with this program; if not, write to the Free Software
 * Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA  02111-1307  USA
 */

#include "ns3/core-module.h"
#include "ns3/point-to-point-module.h"
#include "ns3/network-module.h"
#include "ns3/applications-module.h"
#include "ns3/mobility-module.h"
#include "ns3/csma-module.h"
#include "ns3/internet-module.h"
#include "ns3/yans-wifi-helper.h"
#include "ns3/ssid.h"
#include "ns3/netanim-module.h"

// Default Network Topology
//
//   Wifi 10.1.3.0
//                 AP
//  *    *    *    *
//  |    |    |    |    10.1.1.0
// n5   n6   n7   n0 -------------- n1   n2   n3   n4
//                   point-to-point  |    |    |    |
//                                   ================
//                                     LAN 10.1.2.0
```

NS LAB 4 SEPTEMBER | Lab Assignment 4

```
using namespace ns3;

NS_LOG_COMPONENT_DEFINE ("ThirdScriptExample");

int
main (int argc, char *argv[])
{
  bool verbose = true;
  uint32_t nCsma = 3;
  uint32_t nWifi = 3;
  bool tracing = false;

  CommandLine cmd (__FILE__);
  cmd.AddValue ("nCsma", "Number of \"extra\" CSMA nodes/devices", nCsma);
  cmd.AddValue ("nWifi", "Number of wifi STA devices", nWifi);
  cmd.AddValue ("verbose", "Tell echo applications to log if true", verbose);
  cmd.AddValue ("tracing", "Enable pcap tracing", tracing);

  cmd.Parse (argc,argv);

  // The underlying restriction of 18 is due to the grid position
  // allocator's configuration; the grid layout will exceed the
  // bounding box if more than 18 nodes are provided.
  if (nWifi > 18)
    {
      std::cout << "nWifi should be 18 or less; otherwise grid layout exceeds the
bounding box" << std::endl;
      return 1;
    }

  if (verbose)
    {
      LogComponentEnable ("UdpEchoClientApplication", LOG_LEVEL_INFO);
      LogComponentEnable ("UdpEchoServerApplication", LOG_LEVEL_INFO);
    }

  NodeContainer p2pNodes;
  p2pNodes.Create (2);

  PointToPointHelper pointToPoint;
  pointToPoint.SetDeviceAttribute ("DataRate", StringValue ("5Mbps"));
  pointToPoint.SetChannelAttribute ("Delay", StringValue ("2ms"));

  NetDeviceContainer p2pDevices;
  p2pDevices = pointToPoint.Install (p2pNodes);

  NodeContainer csmaNodes;
  csmaNodes.Add (p2pNodes.Get (1));
  csmaNodes.Create (nCsma);
```

NS LAB 4 SEPTEMBER | Lab Assignment 4

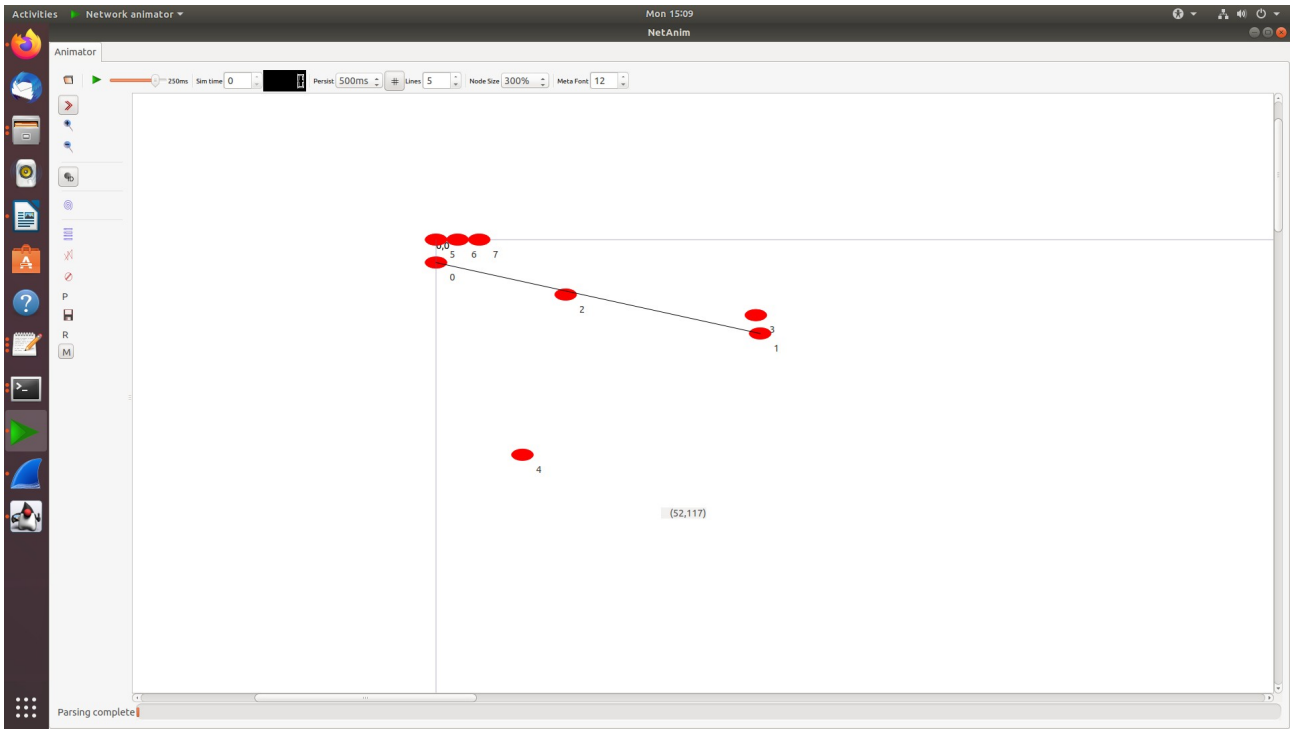
```
CsmaHelper csma;
csma.SetChannelAttribute ("DataRate", StringValue ("100Mbps"));
csma.SetChannelAttribute ("Delay", TimeValue (NanoSeconds (6560)));

NetDeviceContainer csmaDevices;
csmaDevices = csma.Install (csmaNodes);

NodeContainer wifiStaNodes;
wifiStaNodes.Create (nWifi);
NodeContainer wifiApNode = p2pNodes.Get (0);

YansWifiChannelHelper channel = YansWifiChannelHelper::Default ();
YansWifiPhyHelper phy;
phy.SetChannel (channel.Create ());

WifiHelper wifi;
wifi.SetRemoteStationManager ("ns3::AarfWifiManager");

WifiMacHelper mac;
Ssid ssid = Ssid ("ns-3-ssid");
mac.SetType ("ns3::StaWifiMac",
            "Ssid", SsidValue (ssid),
            "ActiveProbing", BooleanValue (false));

NetDeviceContainer staDevices;
staDevices = wifi.Install (phy, mac, wifiStaNodes);

mac.SetType ("ns3::ApWifiMac",
            "Ssid", SsidValue (ssid));

NetDeviceContainer apDevices;
apDevices = wifi.Install (phy, mac, wifiApNode);

MobilityHelper mobility;

mobility.SetPositionAllocator ("ns3::GridPositionAllocator",
                               "MinX", DoubleValue (0.0),
                               "MinY", DoubleValue (0.0),
                               "DeltaX", DoubleValue (5.0),
                               "DeltaY", DoubleValue (10.0),
                               "GridWidth", UintegerValue (3),
                               "LayoutType", StringValue ("RowFirst"));

mobility.SetMobilityModel ("ns3::RandomWalk2dMobilityModel",
                           "Bounds", RectangleValue (Rectangle (-50, 50, -50, 50)));
mobility.Install (wifiStaNodes);

mobility.SetMobilityModel ("ns3::ConstantPositionMobilityModel");
```

```
  mobility.Install (wifiApNode);

  InternetStackHelper stack;
  stack.Install (csmaNodes);
  stack.Install (wifiApNode);
  stack.Install (wifiStaNodes);

  Ipv4AddressHelper address;

  address.SetBase ("10.1.1.0", "255.255.255.0");
  Ipv4InterfaceContainer p2pInterfaces;
  p2pInterfaces = address.Assign (p2pDevices);

  address.SetBase ("10.1.2.0", "255.255.255.0");
  Ipv4InterfaceContainer csmaInterfaces;
  csmaInterfaces = address.Assign (csmaDevices);

  address.SetBase ("10.1.3.0", "255.255.255.0");
  address.Assign (staDevices);
  address.Assign (apDevices);

  UdpEchoServerHelper echoServer (9);

  ApplicationContainer serverApps = echoServer.Install (csmaNodes.Get
(nCsma));
  serverApps.Start (Seconds (1.0));
  serverApps.Stop (Seconds (10.0));

  UdpEchoClientHelper echoClient (csmaInterfaces.GetAddress (nCsma), 9);
  echoClient.SetAttribute ("MaxPackets", UintegerValue (1));
  echoClient.SetAttribute ("Interval", TimeValue (Seconds (1.0)));
  echoClient.SetAttribute ("PacketSize", UintegerValue (1024));

  ApplicationContainer clientApps =
    echoClient.Install (wifiStaNodes.Get (nWifi - 1));
  clientApps.Start (Seconds (2.0));
  clientApps.Stop (Seconds (10.0));

  Ipv4GlobalRoutingHelper::PopulateRoutingTables ();

  Simulator::Stop (Seconds (10.0));

  //Configure node positions
  AnimationInterface anim("lab4.xml");
  anim.SetConstantPosition(p2pNodes.Get(0), 12.0,12.0);
  anim.SetConstantPosition(p2pNodes.Get(1), 24.0,12.0);
  anim.SetConstantPosition(csmaNodes.Get(0), 24.0,24.0);
  anim.SetConstantPosition(csmaNodes.Get(1), 12.0,24.0);
  anim.SetConstantPosition(csmaNodes.Get(2), 12.0, 36.0);
```

```
  anim.SetConstantPosition(csmaNodes.Get(3), 24.0,36.0);

  AsciiTraceHelper ascii;
  pointToPoint.EnableAsciiAll(ascii.CreateFileStream("lab4-point-to-point.tr"));
  csma.EnableAsciiAll(ascii.CreateFileStream("lab4-csma.tr"));

  csma.EnablePcapAll("lab4-pcap",false);

  if (tracing)
    {
      phy.SetPcapDataLinkType (WifiPhyHelper::DLT_IEEE802_11_RADIO);
      pointToPoint.EnablePcapAll ("third");
      phy.EnablePcap ("third", apDevices.Get (0));
      csma.EnablePcap ("third", csmaDevices.Get (0), true);
    }

  Simulator::Run ();
  Simulator::Destroy ();
  return 0;
}
```

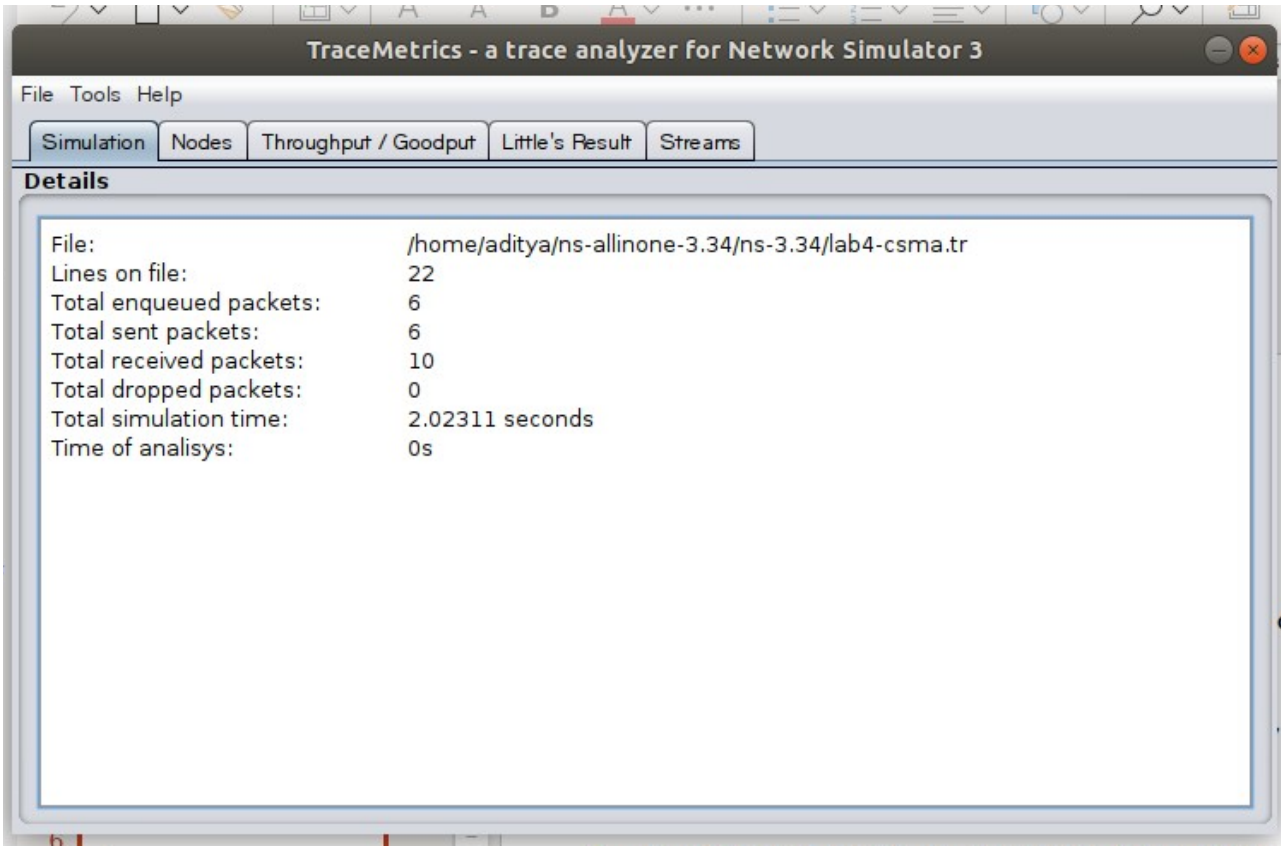
OUTPUT:

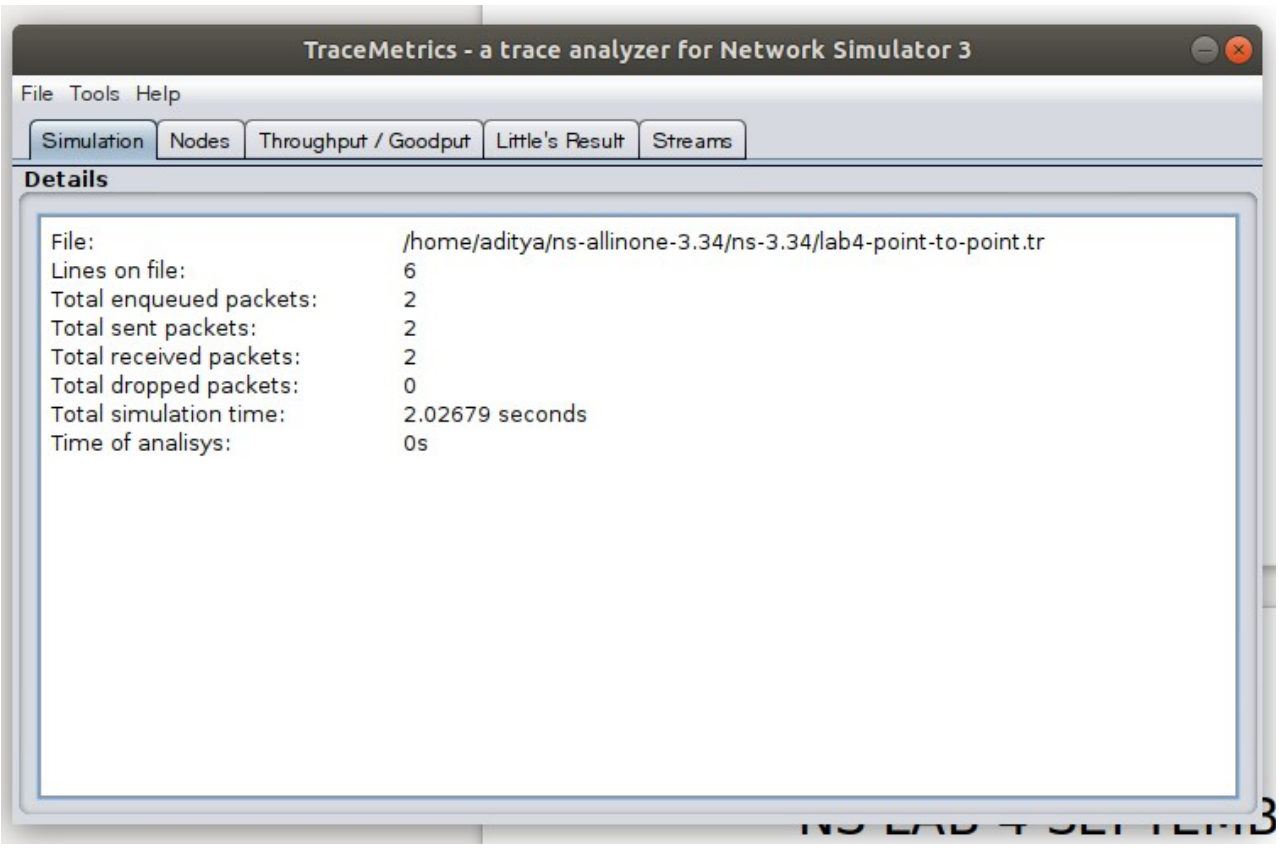
NetAnim:



TraceMetrics:

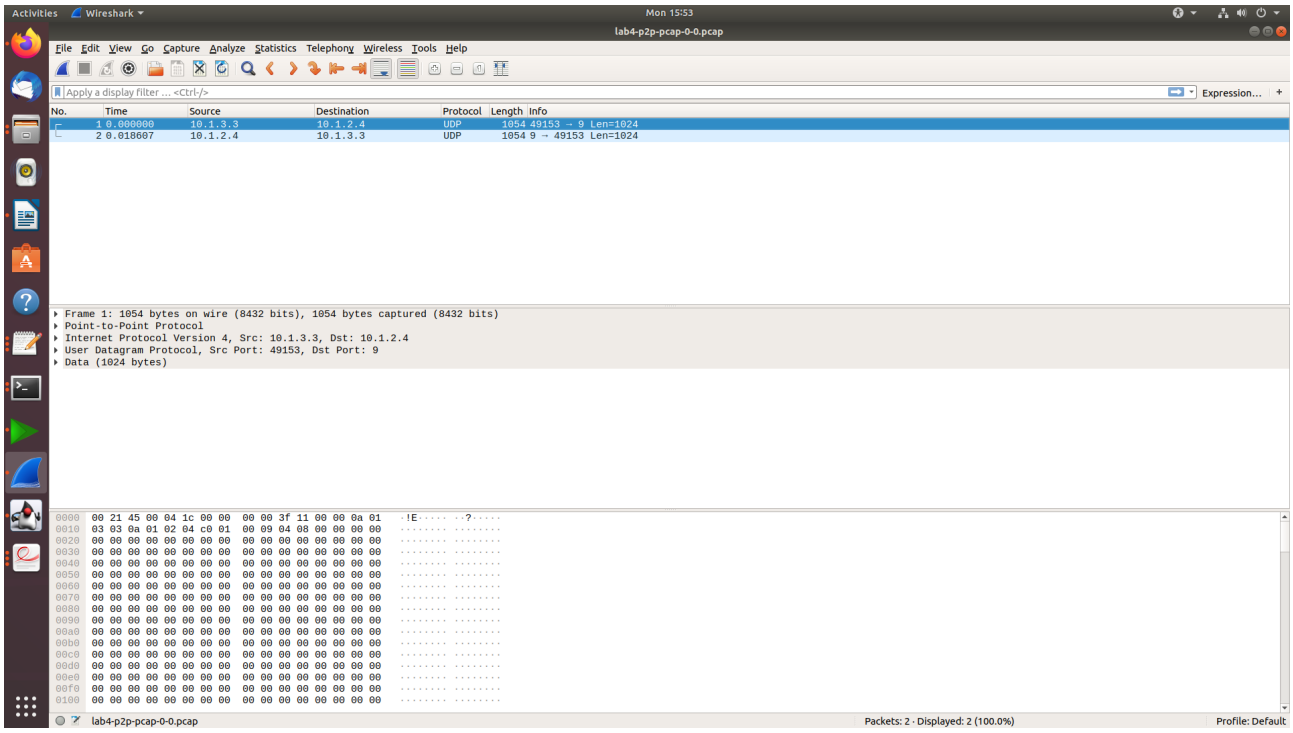
NS LAB 4 SEPTEMBER | Lab Assignment 4

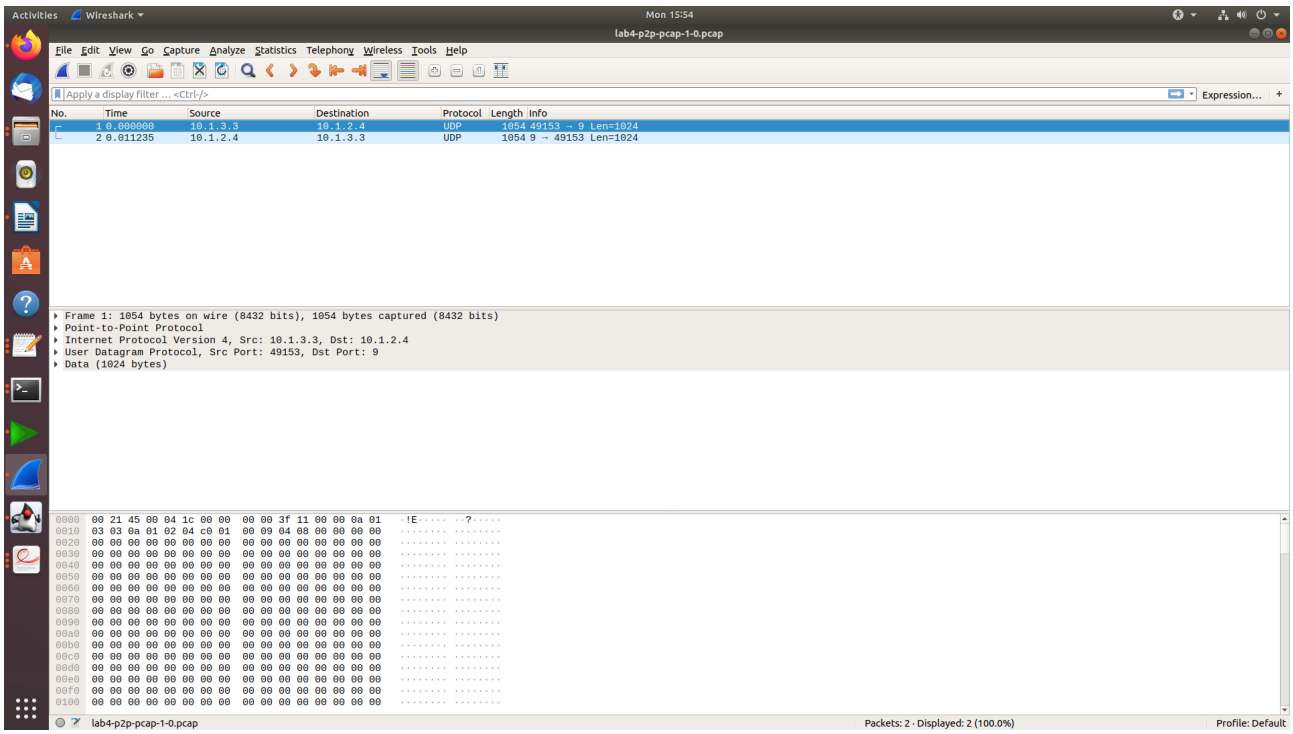




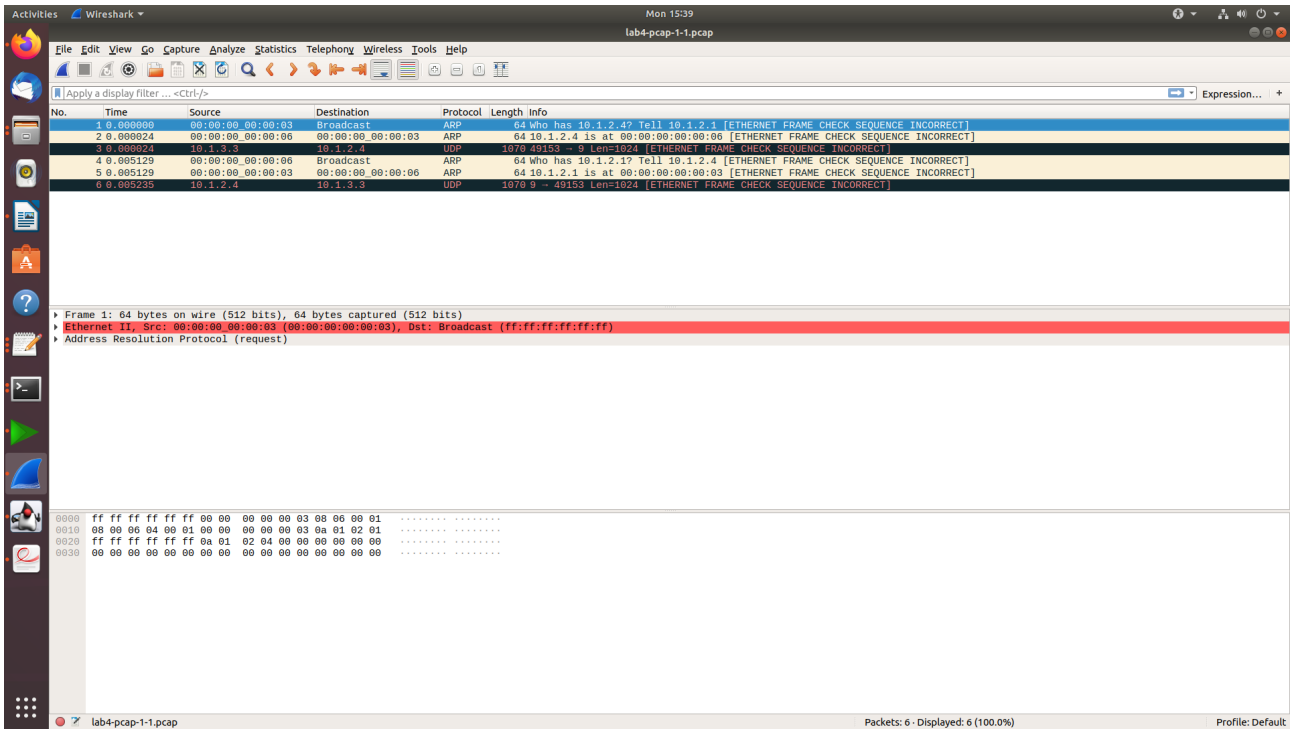
NS LAB 4 SEPTEMBER | Lab Assignment 4

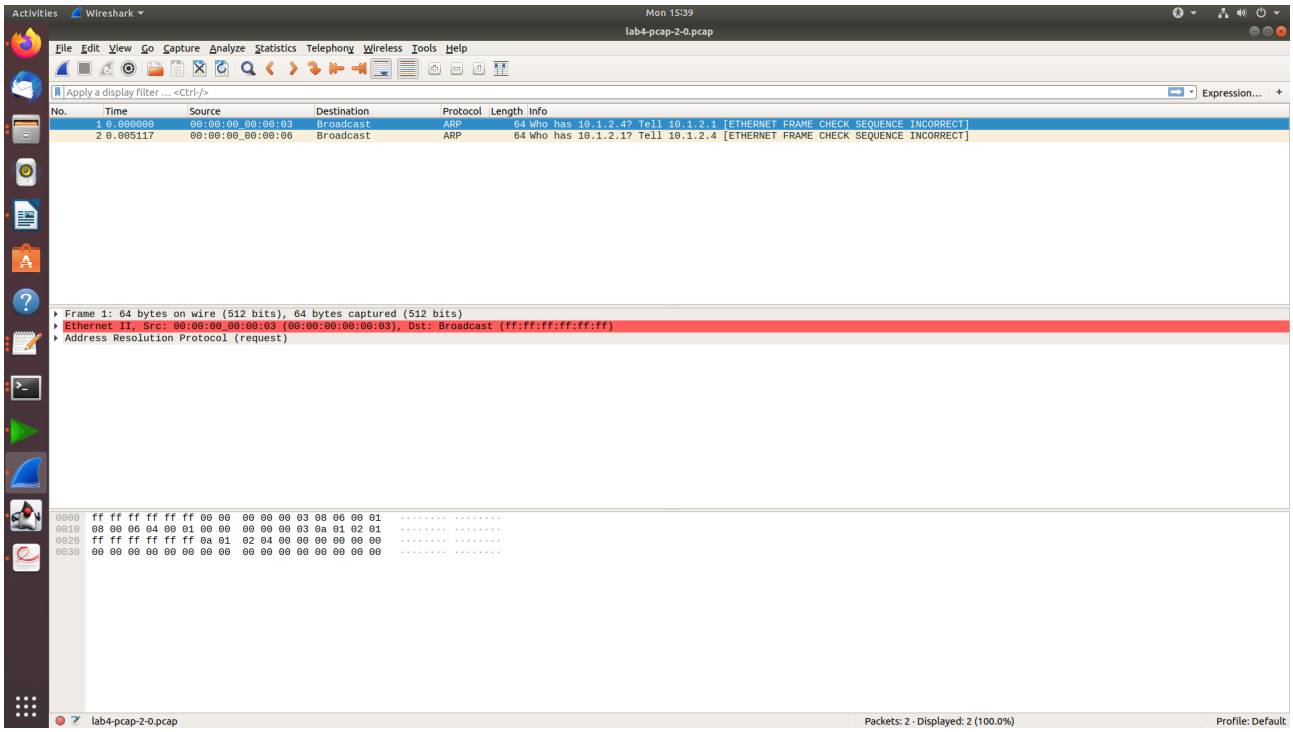
Wireshark:



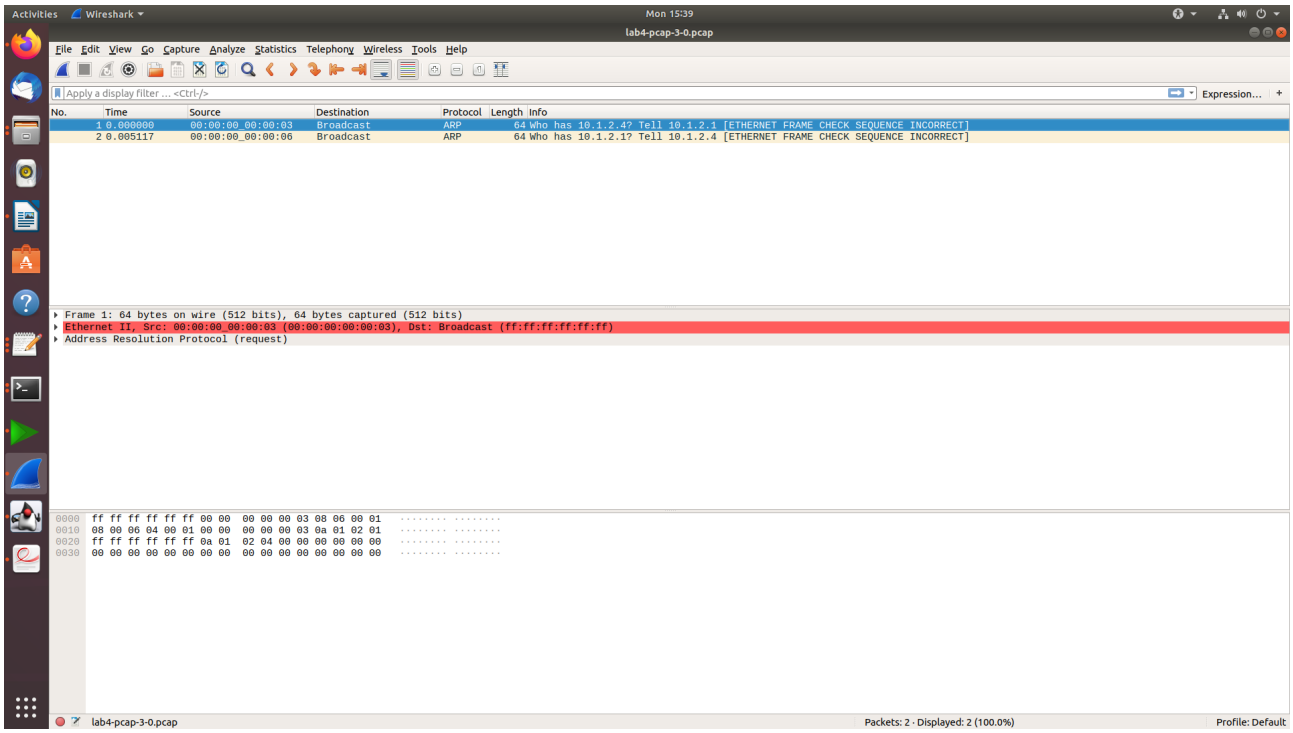


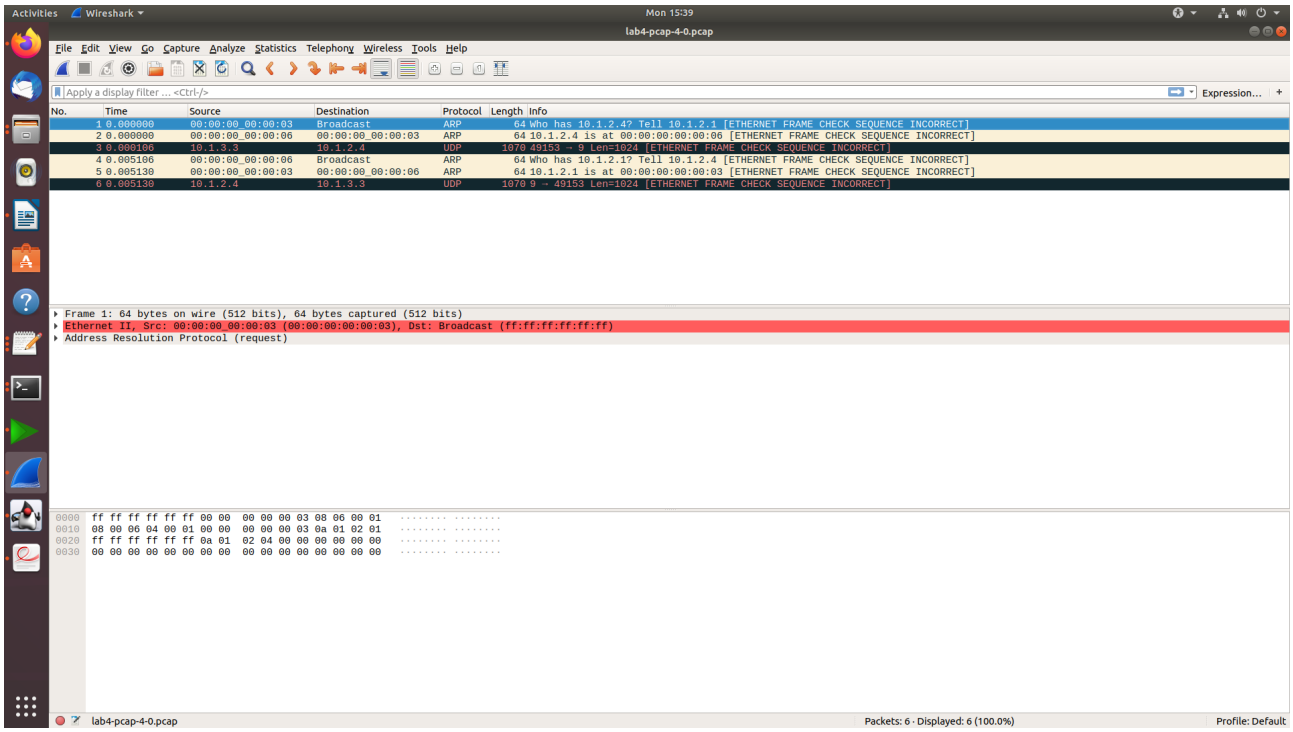
NS LAB 4 SEPTEMBER | Lab Assignment 4





NS LAB 4 SEPTEMBER | Lab Assignment 4





Gnuplot:

NS LAB 4 SEPTEMBER | Lab Assignment 4