Assignment 2

Students' Names:

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Attention:

1. Only one of the group members should submit the solution.
2. You have to submit the solution using this template.
3. Your code and this report file must be attached in Brightspace.
4. In this file, first talk about modifications you did in code, then results (texts, figures, ...). Finally list the name of the files you attached in Brightspace

Task 1

1-1- Modifications in code

1. Please provide images of modifications in code. Highlight the parts you have changed.
   Part A (creating the topologies):
   Add the second CSMA network with 4 devices.

```
int
main (int argc, char *argv[])
{
  bool verbose = true;
  uint32_t nCsma1 = 3;
  uint32_t nCsma2 = 4;
  CommandLine cmd (__FILE__);
  cmd.AddValue ("nCsma1", "Number of \"extra\" CSMA nodes/devices", nCsma1);
  cmd.AddValue ("nCsma2", "Number of \"extra\" CSMA nodes/devices", nCsma2);
  cmd.AddValue ("verbose", "Tell echo applications to log if true", verbose);
```

   P2P topology with rate of 10Mbps and delay of 2ms.

```
  nCsma1 = nCsma1 == 0 ? 1 : nCsma1;
  nCsma2 = nCsma2 == 0 ? 1 : nCsma2;

//Create p2p
NodeContainer p2pNodes;
p2pNodes.Create (2);

PointToPointHelper pointToPoint;
pointToPoint.SetDeviceAttribute ("DataRate", StringValue ("10Mbps"));
pointToPoint.SetChannelAttribute ("Delay", StringValue ("2ms"));

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

Configure the required topologies on the both csmaNodes.

```
//Create csma1
NodeContainer csmaNodes1;
csmaNodes1.Add (p2pNodes.Get (1));
csmaNodes1.Create (nCsma1);

CsmaHelper csma1;
csma1.SetChannelAttribute ("DataRate", StringValue ("100Mbps"));
csma1.SetChannelAttribute ("Delay", StringValue ("50ms"));

NetDeviceContainer csmaDevices1;
csmaDevices1 = csma1.Install (csmaNodes1);
```

```
//Create csma2
NodeContainer csmaNodes2;
csmaNodes2.Add (p2pNodes.Get (0));
csmaNodes2.Create (nCsma2);

CsmaHelper csma2;
csma2.SetChannelAttribute ("DataRate", StringValue ("200Mbps"));
csma2.SetChannelAttribute ("Delay", StringValue ("20ms"));

NetDeviceContainer csmaDevices2;
csmaDevices2 = csma2.Install (csmaNodes2);
```

Install protocol stack on the nodes.

```
InternetStackHelper stack;
stack.Install (csmaNodes1);
stack.Install (csmaNodes2);
```

Install mobility on the nodes.

```
//Install mobility on the nodes
MobilityHelper mobility;
mobility.SetMobilityModel ("ns3::ConstantPositionMobilityModel");
mobility.Install (p2pNodes);
mobility.Install (csmaNodes1);
mobility.Install (csmaNodes2);
```

Install IP on the nodes; for LAN1 nodes.

```
address.SetBase ("10.1.2.0", "255.255.255.0");
Ipv4InterfaceContainer csmaInterfaces1;
csmaInterfaces1 = address.Assign (csmaDevices1);
```

IP range of 10.1.3.0 (with subnet mask 255.255.255.0) for LAN2 nodes.

```
address.SetBase ("10.1.3.0", "255.255.255.0");
Ipv4InterfaceContainer csmaInterfaces2;
csmaInterfaces2 = address.Assign (csmaDevices2);
```

Part 2 (Creating the application):

```
//Send and receive packets between client and server
UdpEchoServerHelper echoServer (9);
ApplicationContainer serverApps = echoServer.Install (csmaNodes1.Get (nCsma1));

serverApps.Start (Seconds (1.0));
serverApps.Stop (Seconds (10.0));


UdpEchoClientHelper echoClient (csmaInterfaces1.GetAddress (nCsma1), 9);
echoClient.SetAttribute ("MaxPackets", UintegerValue (20));
echoClient.SetAttribute ("Interval", TimeValue (Seconds (1.0)));
echoClient.SetAttribute ("PacketSize", UintegerValue (1024));
```

Part3 (Animation):

```
echoClient.SetAttribute ("Interval", TimeValue (Seconds (1.0)));
echoClient.SetAttribute ("PacketSize", UintegerValue (1024));


ApplicationContainer clientApps = echoClient.Install (csmaNodes2.Get (nCsma2));

clientApps.Start (Seconds (2.0));
clientApps.Stop (Seconds (10.0));

Ipv4GlobalRoutingHelper::PopulateRoutingTables ();
```

```
//visualize csma1
anim.SetConstantPosition (csmaNodes1.Get (1), 60, 40, 0);
anim.UpdateNodeDescription (csmaNodes1.Get (1), "n2");
anim.UpdateNodeColor (csmaNodes1.Get (1), 50, 50, 168);  //blue
anim.SetConstantPosition (csmaNodes1.Get (2), 70, 40, 0);
anim.UpdateNodeDescription (csmaNodes1.Get (2), "n3");
anim.UpdateNodeColor (csmaNodes1.Get (2), 50, 50, 168);  //blue
anim.SetConstantPosition (csmaNodes1.Get (3), 80, 40, 0);
anim.UpdateNodeDescription (csmaNodes1.Get (3), "n4");
anim.UpdateNodeColor (csmaNodes1.Get (3), 50, 50, 168);  //blue
```

```
//visualize csma2
anim.SetConstantPosition (csmaNodes2.Get (4), 10, 40, 0);
anim.UpdateNodeDescription (csmaNodes2.Get (4), "n8");
anim.UpdateNodeColor (csmaNodes2.Get (4), 232, 113, 9);  //orange
anim.SetConstantPosition (csmaNodes2.Get (3), 20, 40, 0);
anim.UpdateNodeDescription (csmaNodes2.Get (3), "n7");
anim.UpdateNodeColor (csmaNodes2.Get (3), 232, 113, 9);  //orange
anim.SetConstantPosition (csmaNodes2.Get (2), 30, 40, 0);
anim.UpdateNodeDescription (csmaNodes2.Get (2), "n6");
anim.UpdateNodeColor (csmaNodes2.Get (2), 232, 113, 9);  //orange
anim.SetConstantPosition (csmaNodes2.Get (1), 40, 40, 0);
anim.UpdateNodeDescription (csmaNodes2.Get (1), "n5");
anim.UpdateNodeColor (csmaNodes2.Get (1), 232, 113, 9);  //orange
```

2. A technical reflection on the assignment: Write a brief account (around 250 words) about your approach and the challenges you faced during this assignment. Reflect on the following:

   • Difficulties encountered and solutions implemented while setting up the UDP Echo Client and Server application.
   The main difficulty I encountered was getting the UDP Echo Client and Server applications to work properly. I had to make sure that the correct IP addresses and ports were being used, and that the applications were being started and stopped at the correct times. I also had to make sure that the animation module was properly configured.

   • Your insights about the interplay between P2P and CSMA network topologies, gained through this assignment.
   P2P networks are typically used for high-bandwidth, low-latency applications, such as video streaming and gaming. CSMA networks are typically used for low-bandwidth, high-reliability applications, such as file sharing and VoIP. In this assignment, I used a combination of P2P and CSMA networks to create a network that could support both high-bandwidth and low-latency applications.

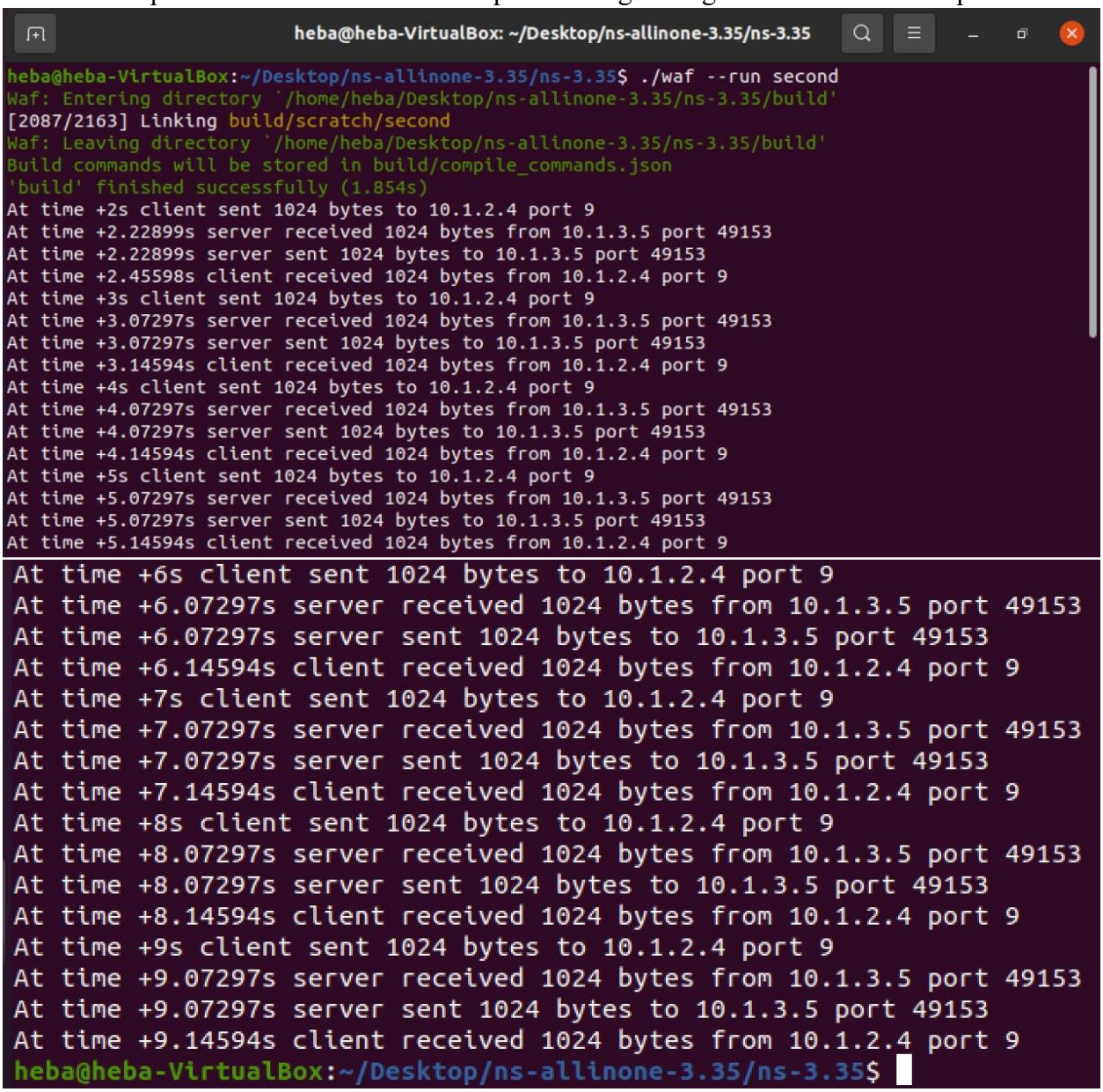
- Experience and learning about network simulation from the process of adding the animation module to your script.

  Animation can be a useful tool for visualizing network activity. This can help to identify problems with the network and to troubleshoot issues.

1-2- Results

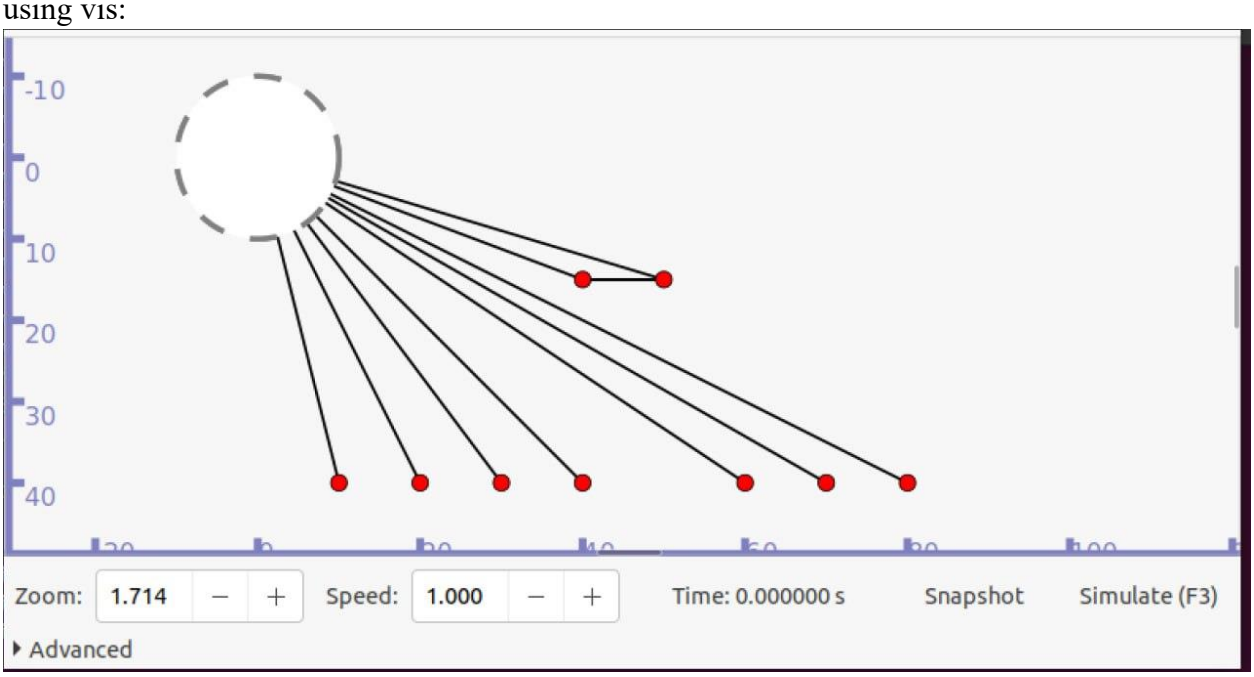
Please provide your output (figures, texts, …):

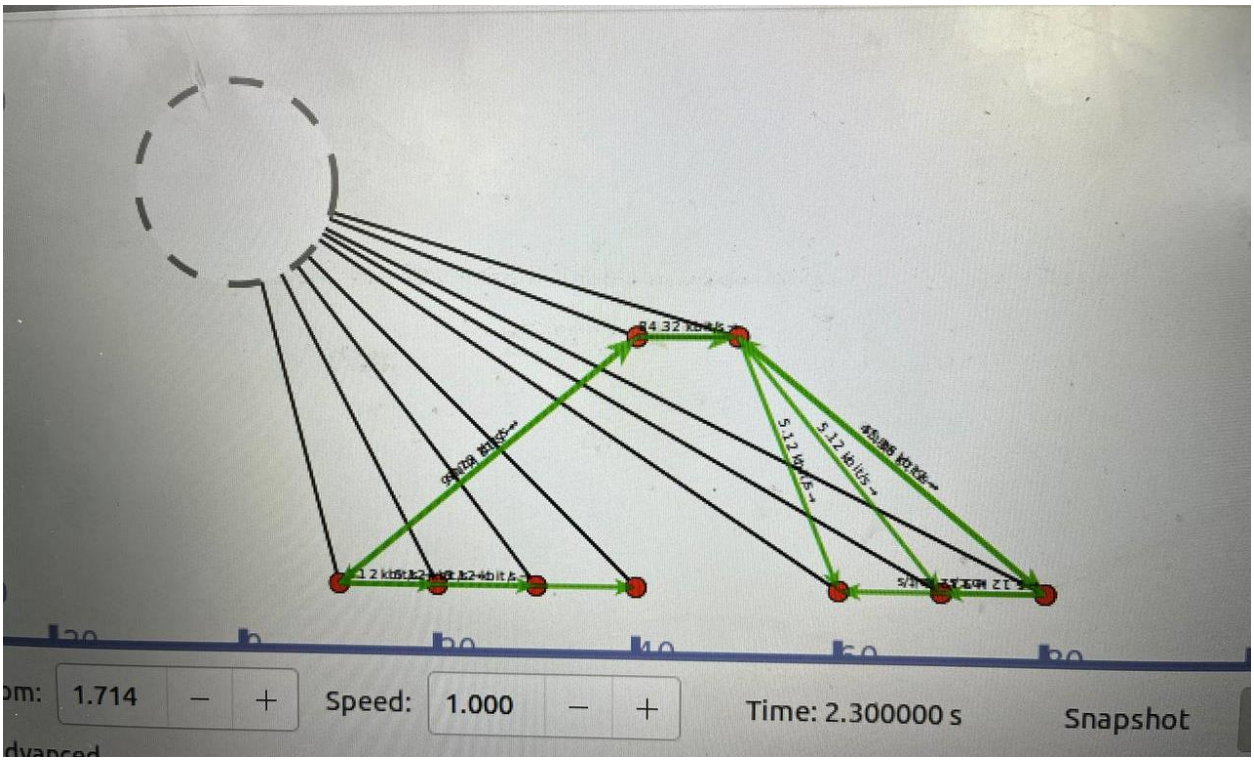
1. A snapshot of the command line output showing the log of sent and received packets

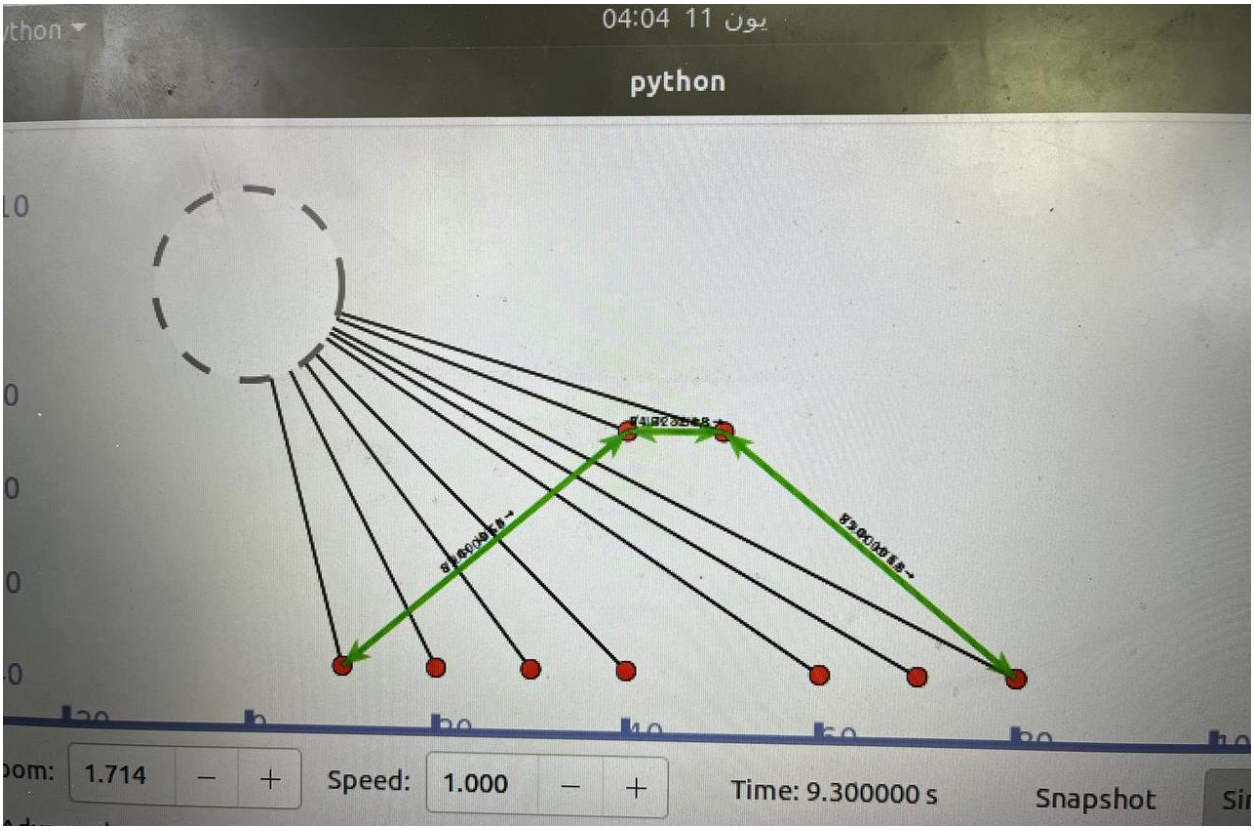


2. A snapshot of the visualization using vis or netanim

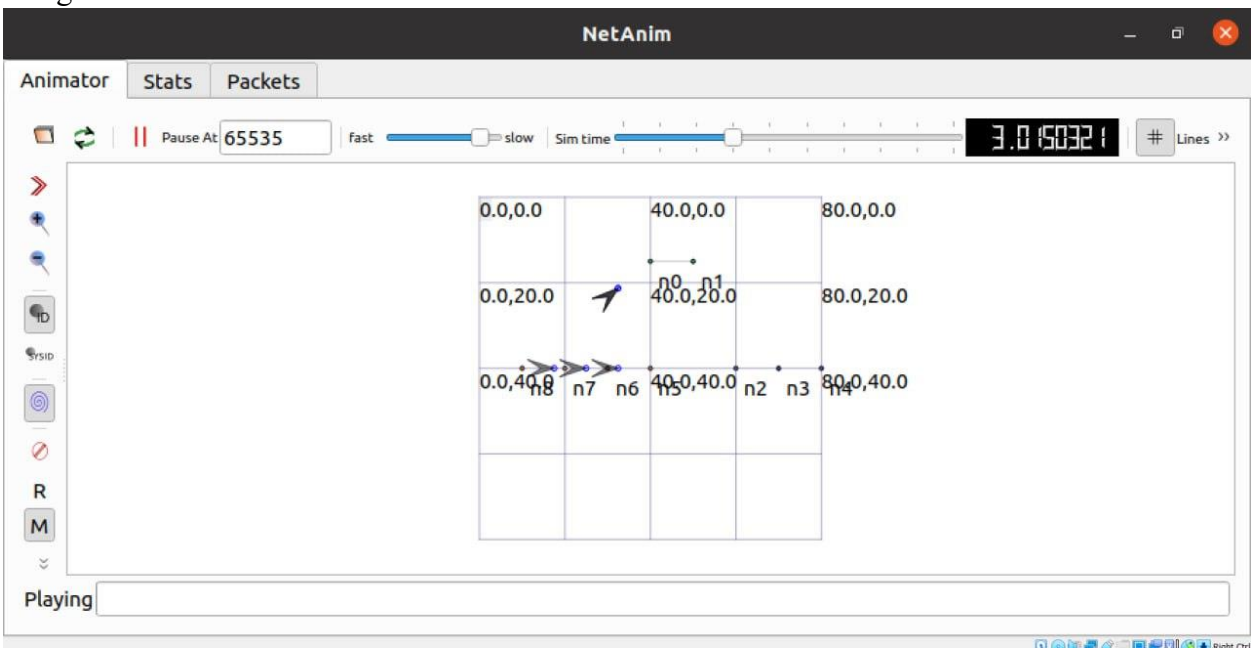
using vis:

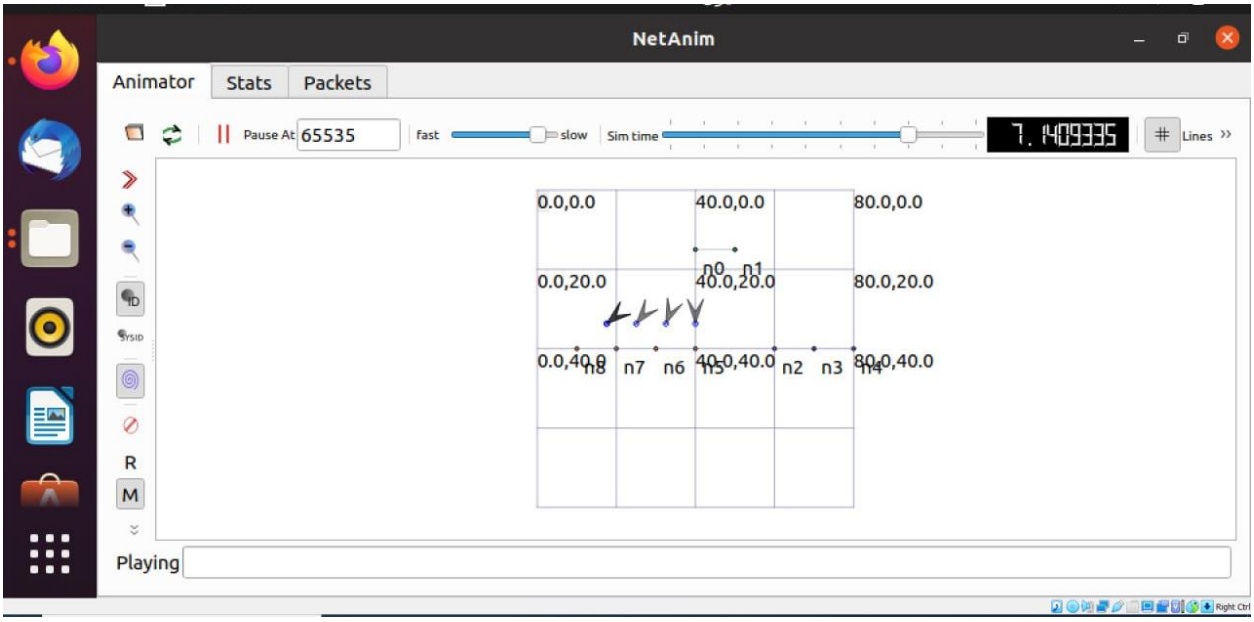






using netanim:





1-3- List of files

Please mention the name of the files you have attached in Brightspace. Also, attach this file and modified code file in Brightspace

1- Assignment template.pdf
2- second.cc
3- second-example.xml
4- second-0-0.pcap
5- second-1-0.pcap
6- second-2-0.pcap