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| **Lab Report** |

Department of Information and Communication Technology

**Report No:** 02

**Report Name:** TCP Variants.

**Course Title:** Wireless and Mobile Communication.

**Course Code:** ICT-4201

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| Submitted By | Submitted To |
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Objective:

We have to create a simple dumbbell topology, two client Node1 and Node2 on the left side of the dumbbell and server nodes Node3 and Node4 on the right side of the dumbbell. Let Node5 and Node6 form the bridge of the dumbbell. Use point to point links. Install a TCP socket instance on Node1 that will connect to Node3.install a UDP socket instance on Node2 that will connect to Node4.

**Source Code:**

#include <fstream>

#include "ns3/core-module.h"

#include "ns3/network-module.h"

#include "ns3/internet-module.h"

#include "ns3/point-to-point-module.h"

#include "ns3/applications-module.h"

using namespace ns3;

NS\_LOG\_COMPONENT\_DEFINE ("FifthScriptExample");

// ===========================================================================

//

// node 0 node 1

// +----------------+ +----------------+

// | ns-3 TCP | | ns-3 TCP |

// +----------------+ +----------------+

// | 10.1.1.1 | | 10.1.1.2 |

// +----------------+ +----------------+

// | point-to-point | | point-to-point |

// +----------------+ +----------------+

// | |

// +---------------------+

// 5 Mbps, 2 ms

//

//

// We want to look at changes in the ns-3 TCP congestion window. We need

// to crank up a flow and hook the CongestionWindow attribute on the socket

// of the sender. Normally one would use an on-off application to generate a

// flow, but this has a couple of problems. First, the socket of the on-off

// application is not created until Application Start time, so we wouldn't be

// able to hook the socket (now) at configuration time. Second, even if we

// could arrange a call after start time, the socket is not public so we

// couldn't get at it.

//

// So, we can cook up a simple version of the on-off application that does what

// we want. On the plus side we don't need all of the complexity of the on-off

// application. On the minus side, we don't have a helper, so we have to get

// a little more involved in the details, but this is trivial.

//

// So first, we create a socket and do the trace connect on it; then we pass

// this socket into the constructor of our simple application which we then

// install in the source node.

// ===========================================================================

//

class MyApp : public Application

{

public:

MyApp ();

virtual ~MyApp();

void Setup (Ptr<Socket> socket, Address address, uint32\_t packetSize, uint32\_t nPackets, DataRate dataRate);

private:

virtual void StartApplication (void);

virtual void StopApplication (void);

void ScheduleTx (void);

void SendPacket (void);

Ptr<Socket> m\_socket;

Address m\_peer;

uint32\_t m\_packetSize;

uint32\_t m\_nPackets;

DataRate m\_dataRate;

EventId m\_sendEvent;

bool m\_running;

uint32\_t m\_packetsSent;

};

MyApp::MyApp ()

: m\_socket (0),

m\_peer (),

m\_packetSize (0),

m\_nPackets (0),

m\_dataRate (0),

m\_sendEvent (),

m\_running (false),

m\_packetsSent (0)

{

}

MyApp::~MyApp()

{

m\_socket = 0;

}

void

MyApp::Setup (Ptr<Socket> socket, Address address, uint32\_t packetSize, uint32\_t nPackets, DataRate dataRate)

{

m\_socket = socket;

m\_peer = address;

m\_packetSize = packetSize;

m\_nPackets = nPackets;

m\_dataRate = dataRate;

}

void

MyApp::StartApplication (void)

{

m\_running = true;

m\_packetsSent = 0;

m\_socket->Bind ();

m\_socket->Connect (m\_peer);

SendPacket ();

}

void

MyApp::StopApplication (void)

{

m\_running = false;

if (m\_sendEvent.IsRunning ())

{

Simulator::Cancel (m\_sendEvent);

}

if (m\_socket)

{

m\_socket->Close ();

}

}

void

MyApp::SendPacket (void)

{

Ptr<Packet> packet = Create<Packet> (m\_packetSize);

m\_socket->Send (packet);

if (++m\_packetsSent < m\_nPackets)

{

ScheduleTx ();

}

}

void

MyApp::ScheduleTx (void)

{

if (m\_running)

{

Time tNext (Seconds (m\_packetSize \* 8 / static\_cast<double> (m\_dataRate.GetBitRate ())));

m\_sendEvent = Simulator::Schedule (tNext, &MyApp::SendPacket, this);

}

}

static void

CwndChange (uint32\_t oldCwnd, uint32\_t newCwnd)

{

NS\_LOG\_UNCOND (Simulator::Now ().GetSeconds () << "\t" << newCwnd);

}

static void

RxDrop (Ptr<const Packet> p)

{

NS\_LOG\_UNCOND ("RxDrop at " << Simulator::Now ().GetSeconds ());

}

int

main (int argc, char \*argv[])

{

CommandLine cmd;

cmd.Parse (argc, argv);

NodeContainer nodes;

nodes.Create (2);

PointToPointHelper pointToPoint;

pointToPoint.SetDeviceAttribute ("DataRate", StringValue ("5Mbps"));

pointToPoint.SetChannelAttribute ("Delay", StringValue ("2ms"));

NetDeviceContainer devices;

devices = pointToPoint.Install (nodes);

Ptr<RateErrorModel> em = CreateObject<RateErrorModel> ();

em->SetAttribute ("ErrorRate", DoubleValue (0.00001));

devices.Get (1)->SetAttribute ("ReceiveErrorModel", PointerValue (em));

InternetStackHelper stack;

stack.Install (nodes);

Ipv4AddressHelper address;

address.SetBase ("10.1.1.0", "255.255.255.252");

Ipv4InterfaceContainer interfaces = address.Assign (devices);

uint16\_t sinkPort = 8080;

Address sinkAddress (InetSocketAddress (interfaces.GetAddress (1), sinkPort));

PacketSinkHelper packetSinkHelper ("ns3::TcpSocketFactory", InetSocketAddress (Ipv4Address::GetAny (), sinkPort));

ApplicationContainer sinkApps = packetSinkHelper.Install (nodes.Get (1));

sinkApps.Start (Seconds (0.));

sinkApps.Stop (Seconds (20.));

Ptr<Socket> ns3TcpSocket = Socket::CreateSocket (nodes.Get (0), TcpSocketFactory::GetTypeId ());

ns3TcpSocket->TraceConnectWithoutContext ("CongestionWindow", MakeCallback (&CwndChange));

Ptr<MyApp> app = CreateObject<MyApp> ();

app->Setup (ns3TcpSocket, sinkAddress, 1040, 1000, DataRate ("1Mbps"));

nodes.Get (0)->AddApplication (app);

app->SetStartTime (Seconds (1.));

app->SetStopTime (Seconds (20.));

devices.Get (1)->TraceConnectWithoutContext ("PhyRxDrop", MakeCallback (&RxDrop));

Simulator::Stop (Seconds (20));

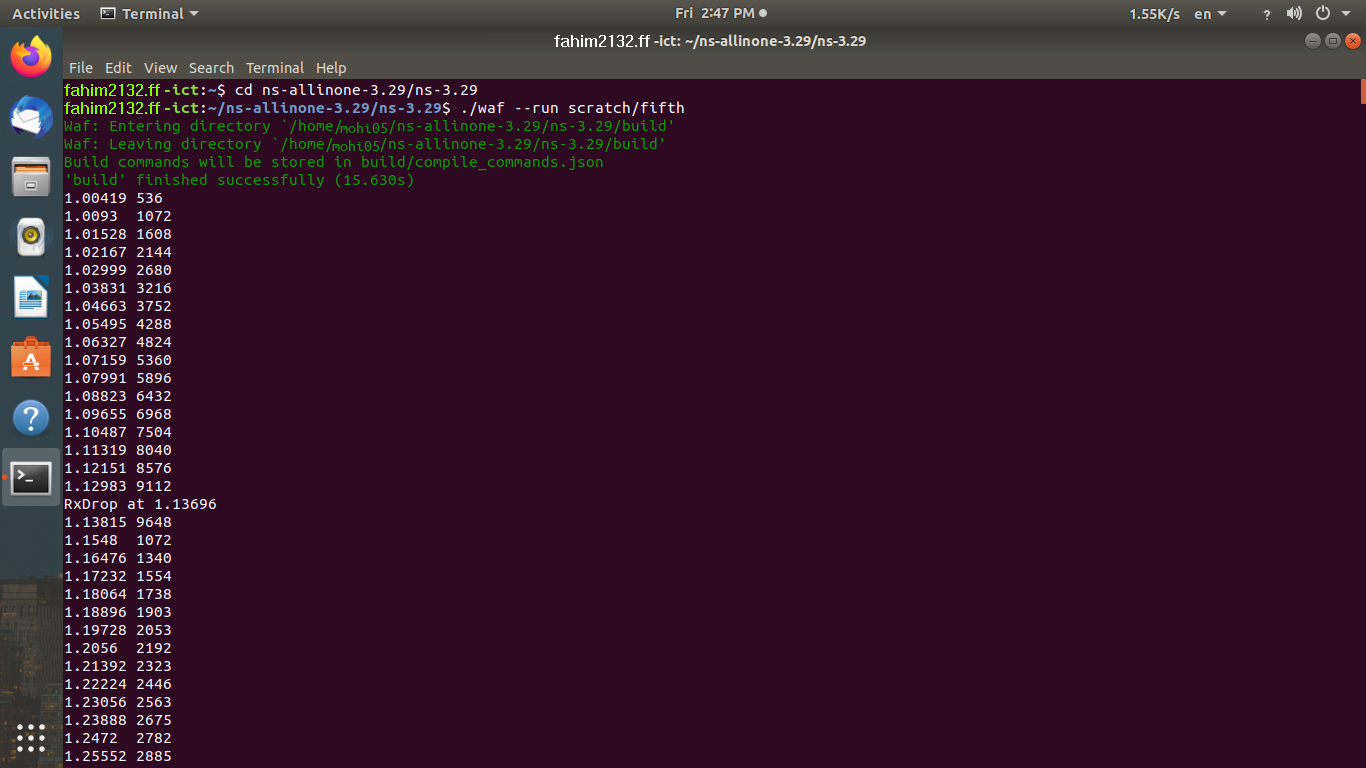
Simulator::Run ();

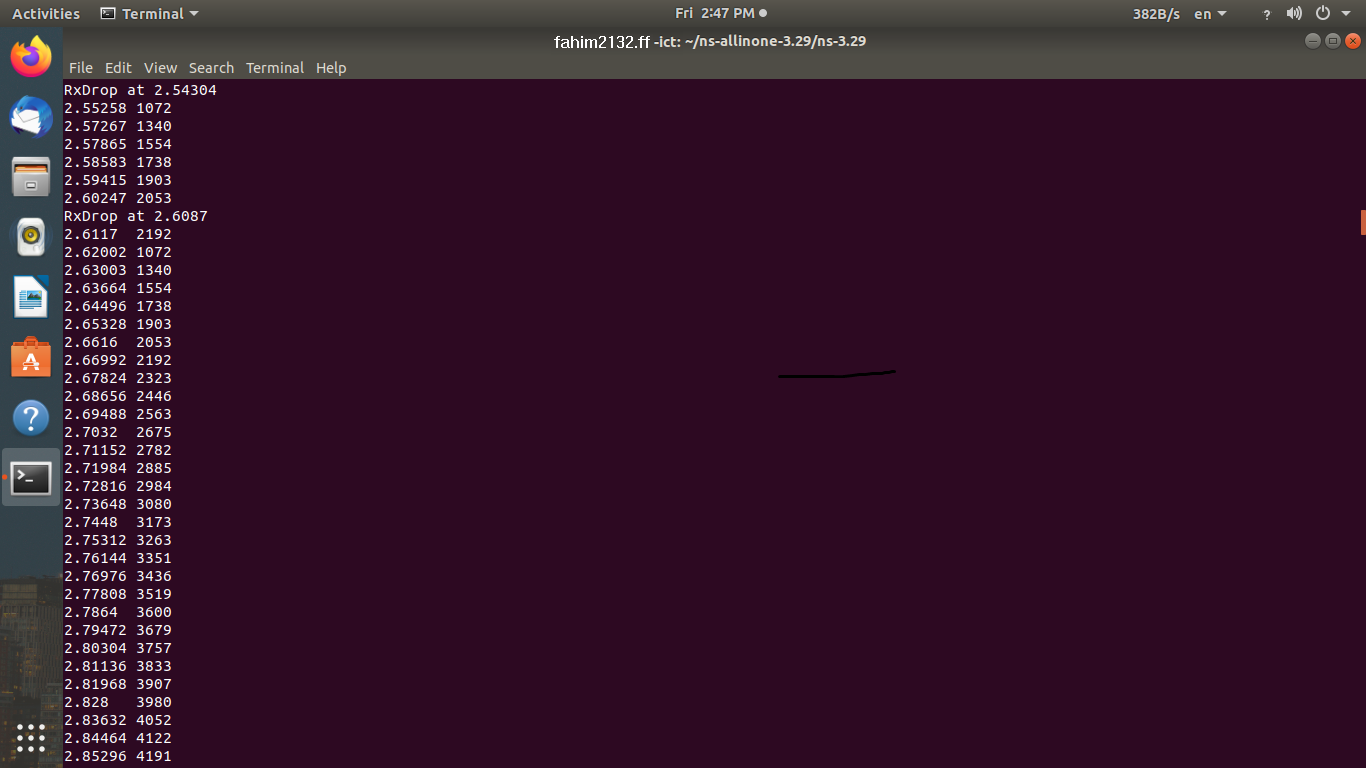
Simulator::Destroy ();

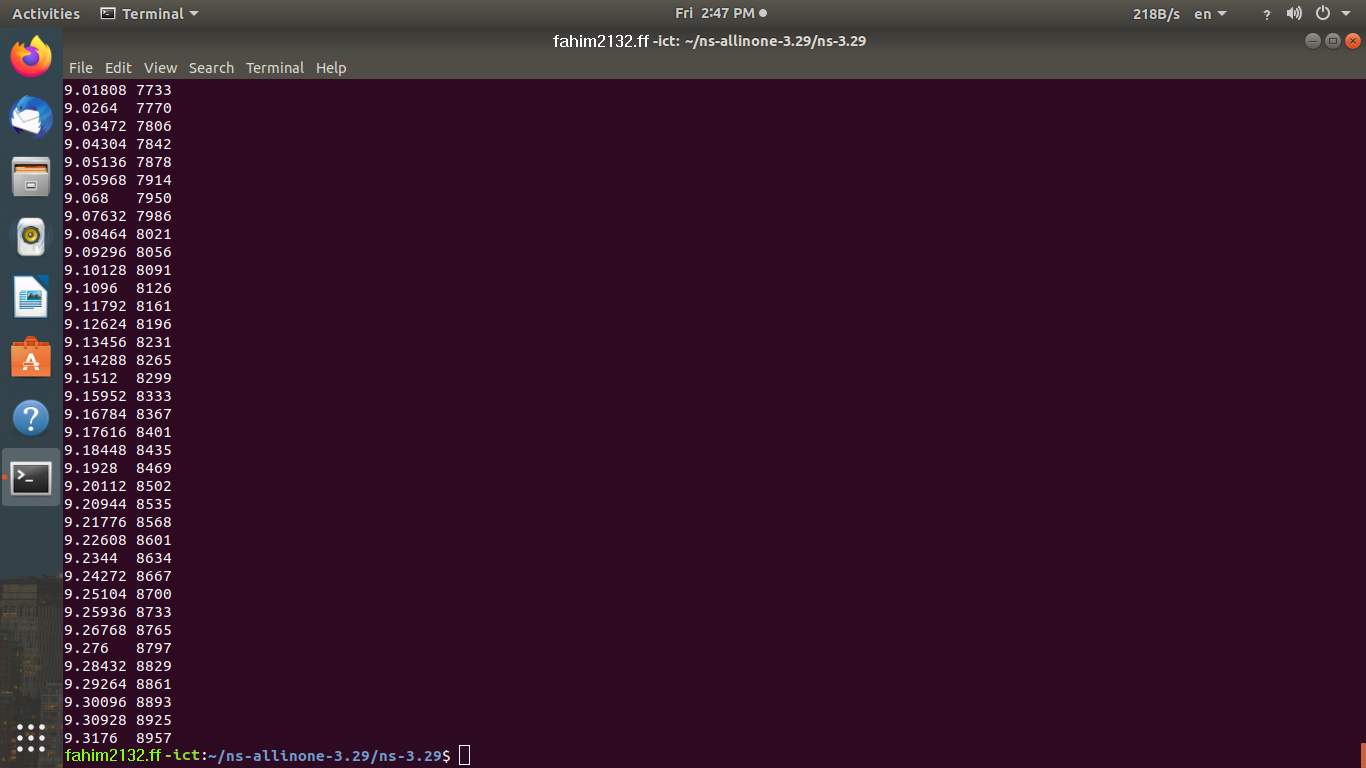
return 0;

}

**Output:**

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**Conclusion:**

Transmission Control Protocol (TCP) uses a network congestion-avoidance algorithm that includes various aspects of an additive increase/multiplicative decrease (AIMD) scheme, along with other schemes including **slow start** and **congestion window**, to achieve congestion avoidance. The **TCP congestion-avoidance algorithm** is the primary basis for congestion control in the Internet.  Per the end-to-end principle congestion control is largely a function of internet hosts, not the network itself. There are several variations and versions of the algorithm implemented in protocol stacks of operating systems of computers that connect to the Internet.