Assignment 7 160117733185

Aim:Implementation of bus topology in ns-3 simulator

Description:In bus topology we have one point to point connection and all oyher nodes are considered as “extra nodes”.Theses extra nodes are implemented using CSMA(carrier sense media access) channel.Bus topology is implemented same as that of the two nodes using pointTopointHelper including the csmaHelper for the extra nodes.
In this program we include "ns3/ipv4-global-routing-helper.h" which is a helper class that adds ns3::Ipv4GlobalRouting objects and "ns3/csma-module.h" which has classes for implementing csma channel between nodes that are connected to a single wire like the present bus topology.

Source Code:

```
#include "ns3/core-module.h"
#include "ns3/network-module.h"
#include "ns3/csma-module.h"
#include "ns3/internet-module.h"
#include "ns3/point-to-point-module.h"
#include "ns3/applications-module.h"
#include "ns3/ipv4-global-routing-helper.h"
#include "ns3/netanim-module.h"

using namespace ns3;
NS_LOG_COMPONENT_DEFINE ("SecondScriptExample");

int main (int argc, char *argv[])
{
bool verbose = true;
uint32_t nCsma = 4 ;
CommandLine cmd;

cmd.AddValue ("nCsma", "Number of \"extra\" CSMA nodes/devices", nCsma);
cmd.AddValue ("verbose", "Tell echo applications to log if true", verbose);
cmd.Parse (argc,argv);

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

nCsma = nCsma == 0 ? 1 : nCsma;

NodeContainer p2pNodes;
p2pNodes.Create (2);
```

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

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

NetDeviceContainer p2pDevices;
p2pDevices = pointToPoint.Install (p2pNodes);
CsmaHelper csma;
csma.SetChannelAttribute ("DataRate", StringValue ("100Mbps"));
csma.SetChannelAttribute ("Delay", TimeValue (NanoSeconds (6560)));

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

InternetStackHelper stack;
stack.Install (p2pNodes.Get (0));
stack.Install (csmaNodes);

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);

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 (p2pNodes.Get (0));
clientApps.Start (Seconds (2.0));
clientApps.Stop (Seconds (10.0));

Ipv4GlobalRoutingHelper::PopulateRoutingTables ();
```

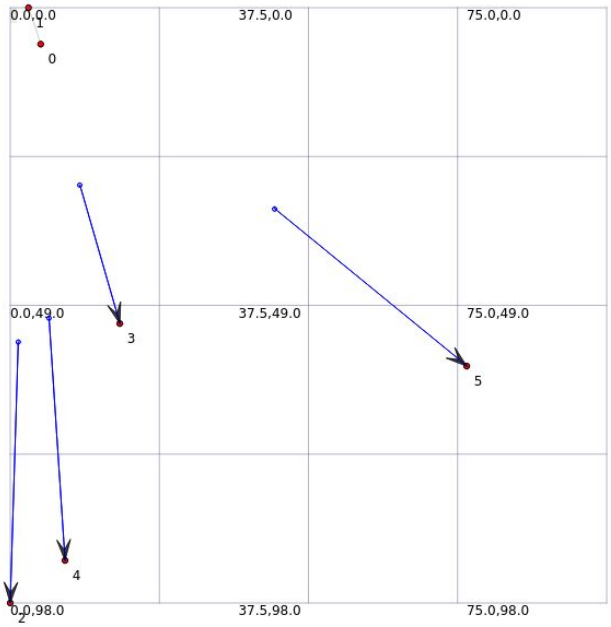
```
pointToPoint.EnablePcapAll ("second");
csma.EnablePcap ("second", csmaDevices.Get (1), true);
AnimationInterface anim ("bustopology.xml");
Simulator::Run ();
Simulator::Destroy ();
return 0;
}
```

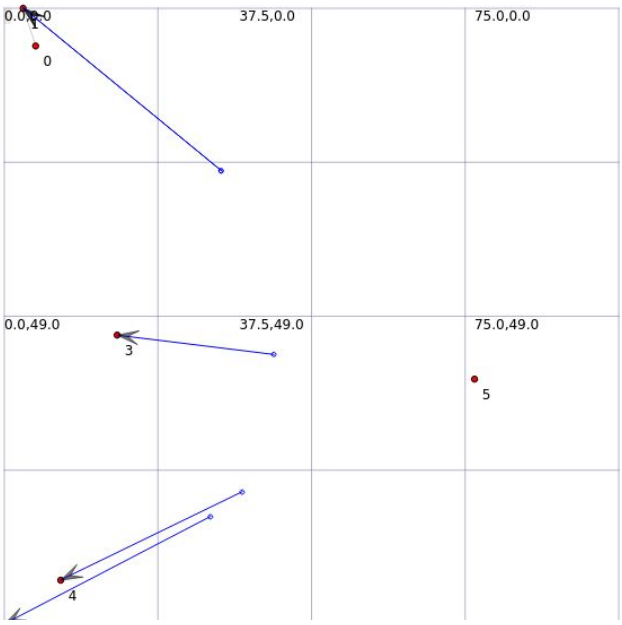
Output:

Pcap output:-

```
student@cbit-OptiPlex-3060:~/Downloads/NS3/ns-allinone-3.28/ns-3.28$ tcpdump -nn -tt -r second-0-0.pcap
reading from file second-0-0.pcap, link-type PPP (PPP)
2.000000 IP 10.1.1.1.49153 > 10.1.2.5.9: UDP, length 1024
2.024607 IP 10.1.2.5.9 > 10.1.1.1.49153: UDP, length 1024
student@cbit-OptiPlex-3060:~/Downloads/NS3/ns-allinone-3.28/ns-3.28$ tcpdump -nn -tt -r second-1-0.pcap
reading from file second-1-0.pcap, link-type PPP (PPP)
2.003686 IP 10.1.1.1.49153 > 10.1.2.5.9: UDP, length 1024
2.020921 IP 10.1.2.5.9 > 10.1.1.1.49153: UDP, length 1024
student@cbit-OptiPlex-3060:~/Downloads/NS3/ns-allinone-3.28/ns-3.28$ tcpdump -nn -tt -r second-2-0.pcap
reading from file second-2-0.pcap, link-type EN10MB (Ethernet)
2.011698 ARP, Request who-has 10.1.2.5 (ff:ff:ff:ff:ff:ff) tell 10.1.2.1, length 50
2.011710 ARP, Reply 10.1.2.5 is-at 00:00:00:00:00:07, length 50
2.011803 IP 10.1.1.1.49153 > 10.1.2.5.9: UDP, length 1024
2.020815 ARP, Request who-has 10.1.2.1 (ff:ff:ff:ff:ff:ff) tell 10.1.2.5, length 50
2.020828 ARP, Reply 10.1.2.1 is-at 00:00:00:00:00:03, length 50
2.020921 IP 10.1.2.5.9 > 10.1.1.1.49153: UDP, length 1024
student@cbit-OptiPlex-3060:~/Downloads/NS3/ns-allinone-3.28/ns-3.28$
```

NetAnim output:-




0.0,0.0
37.5,0.0
75.0,0.0
1
0
0.0,49.0
37.5,49.0
75.0,49.0
3
5
4