

5. Simulate to implement the connection of 2 nodes and 4 router such that the extremes nodes act as client and server using Point-to-Point protocol. Apply NetAnim software to demonstrate the scenario graphically. Analyze packet parameters by creating trace file using Ascii trace metrics.

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Open Save
pr5.cc -/ns-allinone-3.33/ns-3.33/scratch
1 #include "ns3/core-module.h"
2 #include "ns3/network-module.h"
3 #include "ns3/internet-module.h"
4 #include "ns3/point-to-point-module.h"
5 #include "ns3/applications-module.h"
6 #include "ns3/csma-module.h"
7 #include "ns3/pv4-global-routing-helper.h"
8 using namespace ns3;
9 NS_LOG_COMPONENT_DEFINE ("PointToPointPPPEExample");
10 int main (int argc, char *argv[])
11 {
12     CommandLine cmd ("--FILE=");
13     cmd.Parse (argc, argv);
14     Time::SetResolution (Time::NS);
15     LogComponentEnable ("UdpEchoClientApplication", LOG_LEVEL_INFO);
16     LogComponentEnable ("UdpEchoServerApplication", LOG_LEVEL_INFO);
17     // Create nodes
18     NodeContainer nodes;
19     nodes.Create (2); // Client (n0) and Server (n1)
20     NodeContainer routers;
21     routers.Create (4);
22     PointToPointHelper pointToPoint;
23     pointToPoint.SetDeviceAttribute ("DataRate", StringValue ("5Mbps"));
24     pointToPoint.SetDeviceAttribute ("Delay", StringValue ("2ms"));
25     pointToPoint.SetChannelAttribute ("Delay", StringValue ("2ms"));
26     // Create devices
27     NetDeviceContainer devices = pointToPoint.Install (nodes.Get (0), routers.Get (0)); // n0-r0
28     NetDeviceContainer devices1 = pointToPoint.Install (routers.Get (0), routers.Get (1)); // r0-r1
29     NetDeviceContainer devices2 = pointToPoint.Install (routers.Get (1), routers.Get (2)); // r1-r2
30     NetDeviceContainer devices3 = pointToPoint.Install (routers.Get (2), routers.Get (3)); // r2-r3
31     NetDeviceContainer devices4 = pointToPoint.Install (routers.Get (3), nodes.Get (1)); // r3-n1
32     // Install Internet Stack
33     InternetStackHelper stack;
34     stack.Install (nodes);
35     stack.Install (routers);
36     // Assign IP addresses
37     Ipv4AddressHelper address;
38     address.SetBase ("10.1.1.0", "255.255.255.0");
39     Ipv4InterfaceContainer interfaces0 = address.Assign (devices0);
40     address.SetBase ("10.1.2.0", "255.255.255.0");
41     address.SetBase ("10.1.3.0", "255.255.255.0");
42     address.SetBase ("10.1.4.0", "255.255.255.0");
43     Ipv4InterfaceContainer interfaces2 = address.Assign (devices2);
44     address.SetBase ("10.1.4.0", "255.255.255.0");
45     Ipv4InterfaceContainer interfaces3 = address.Assign (devices3);
46     address.SetBase ("10.1.5.0", "255.255.255.0");
47     Ipv4InterfaceContainer interfaces4 = address.Assign (devices4);
48     // Set up UDP Echo Server
49     Ipv4GlobalRoutingHelper::PopulateRoutingTables ();
50
51     UdpEchoServerHelper echoServer (9);
52     ApplicationContainer serverApps = echoServer.Install (nodes.Get (1));
53     serverApps.Start (Seconds (1.0));
54     serverApps.Stop (Seconds (10.0));
    
```

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33 NetDeviceContainer devices4 = pointToPoint.Install (routers.Get (3), nodes.Get (1)); // r3-n1
34
35 InternetStackHelper stack;
36 stack.Install (nodes);
37 // Assign IP addresses
38 Ipv4AddressHelper address;
39 address.SetBase ("10.1.1.0", "255.255.255.0");
40 address.SetBase ("10.1.2.0", "255.255.255.0");
41 Ipv4InterfaceContainer interfaces0 = address.Assign (devices0);
42 address.SetBase ("10.1.3.0", "255.255.255.0");
43 Ipv4InterfaceContainer interfaces2 = address.Assign (devices2);
44 address.SetBase ("10.1.4.0", "255.255.255.0");
45 Ipv4InterfaceContainer interfaces3 = address.Assign (devices3);
46 address.SetBase ("10.1.5.0", "255.255.255.0");
47 Ipv4InterfaceContainer interfaces4 = address.Assign (devices4);
48
49 Ipv4GlobalRoutingHelper::PopulateRoutingTables ();
50 // Set up UDP Echo Server
51 UdpEchoServerHelper echoServer (9);
52 ApplicationContainer serverApps = echoServer.Install (nodes.Get (1));
53 serverApps.Start (Seconds (1.0));
54 serverApps.Stop (Seconds (10.0));
55
56 UdpEchoClientHelper echoClient (interfaces4.GetAddress (0));
57 echoClient.SetAttribute ("MaxPackets", UintegerValue (1));
58 echoClient.SetAttribute ("Interval", TimeValue (Seconds (1.0)));
59 echoClient.SetAttribute ("PacketSize", UintegerValue (1024));
60 ApplicationContainer clientApps = echoClient.Install (nodes.Get (0));
61 clientApps.Start (Seconds (2.0));
62 clientApps.Stop (Seconds (10.0));
63
64 system ("mkdir -p output");
65 Ptr<Node> n0 = nodes.Get (0);
66 Ptr<Node> n1 = nodes.Get (1);
67 Ptr<Node> r0 = routers.Get (0);
68 Ptr<Node> r1 = routers.Get (1);
69 Ptr<Node> r2 = routers.Get (2);
70 Ptr<Node> r3 = routers.Get (3);
71 AnimationInterface anim ("fifth.xml");
72 anim.SetConstantPosition (n0, 100, 200);
73 anim.SetConstantPosition (r0, 200, 200);
74 anim.SetConstantPosition (r1, 300, 200);
75 anim.SetConstantPosition (r2, 400, 200);
76 anim.SetConstantPosition (r3, 500, 200);
77 anim.SetConstantPosition (n1, 600, 200);
78 // ASCII Tracing
79 AsciitTraceHelper ascii;
80 pointToPoint.EnableAsciiAll (ascii.CreateFileStream ("output/5th.tr"));
81 Simulator::Run ();
82 Simulator::Destroy ();
83 return 0;
84 }
    
```

