Lab Report

Course Title: Computer Networks Laboratory
Course Code: CSE-3634

Autumn-2021

Lab No: 4

Name of Labwork: Based on Lab-3 define your own message type that holds the hop counts needed for reaching at the destination. Use seeds for randomness and show the average hop counts for your network.

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Date of Submission : 9 April 2022

Marks :

1. Introduction: In this lab I develop a simulation that Turning into real Network of 10 routers and two hosts. The message is “frame47”.

2. Description: One of the nodes will generate message, here PC47_2 will generate message. That message will be passed to router_47[9],then it will forward the massage to router_47[8] and router_47[7] in sometime one of these router will deliver it to router_47[5] or router_47[8]. After router_47[5] getting the message it will continue to deliver to their nearby router_47[6] , router_47[3] , router_47[4] . If router_47[6] get the message then it will again forward to router_47[5] or router_47[8] & then message could possibly back to these two router . Then router_47[3] and router_47[4] is now forward the message to the next router_47[1] . Now router_47[1] will deliver the message to router_47[2] or router_47[0] .After all these by forwarding message from one to one router somehow message will come to router_47[0] & then it will send the message to PC47_1after these long period of time. But actually it will be less than a minute.

4. Module:

frame_47.msg

```
message frame47
{
    int hopcount = 0;
}
```

router47.ned

```
@license(LGPL);
simple router47
{
    parameters:
        @display("i=block/routing");
    gates:
```

```
        inout gate[];
}

network lab4_47_network
{
    @display("bgb=825.28796,595.128");
    types:
        channel Channel extends ned.DelayChannel
        {
            delay = 100ms;
        }
    submodules:
        rt47[10]: router47 {

        }
        pc47_1: pc47 {

        }
        pc47_2: pc47 {

        }
    connections:
        rt47[0].gate++ <--> Channel <--> rt47[1].gate++;
        rt47[0].gate++ <--> Channel <--> rt47[2].gate++;
        rt47[1].gate++ <--> Channel <--> rt47[3].gate++;
        rt47[1].gate++ <--> Channel <--> rt47[3].gate++;
        rt47[4].gate++ <--> Channel <--> rt47[8].gate++;
        rt47[4].gate++ <--> Channel <--> rt47[9].gate++;
        rt47[3].gate++ <--> Channel <--> rt47[4].gate++;
        rt47[2].gate++ <--> Channel <--> rt47[7].gate++;
        rt47[8].gate++ <--> Channel <--> rt47[9].gate++;
        rt47[1].gate++ <--> Channel <--> rt47[5].gate++;
        rt47[5].gate++ <--> Channel <--> rt47[6].gate++;
        rt47[6].gate++ <--> Channel <--> rt47[9].gate++;
        rt47[7].gate++ <--> Channel <--> rt47[8].gate++;
        rt47[7].gate++ <--> Channel <--> rt47[4].gate++;
        pc47_1.interface <--> Channel <--> rt47[0].gate++;
        pc47_2.interface <--> Channel <--> rt47[5].gate++;
}
```

pc47.ned

```
simple PC47_Lab4
{

    parameters:
```

```
        bool sendMsgOnInit = default(false);
    bool recvMsgAtDest = default(false);
    gates:
        inout interface;
}
```

router47.cc

```
#include <stdio.h>
#include <string.h>
#include <omnetpp.h>

#include "frame_47_m.h"

using namespace omnetpp;

class router47 : public cSimpleModule
{
  protected:
    virtual void forwardMessage(Frame47 *msg);
    virtual void initialize() override;
    virtual void handleMessage(cMessage *msg) override;
};

Define_Module(router47);

void router47::initialize()
{
}

void router47::handleMessage(cMessage *msg)
{
    Frame47 *ttmsg = check_and_cast<Frame47 *>(msg);
    forwardMessage(ttmsg);
}

void router47::forwardMessage(Frame47 *msg)
```

```
{
    msg->setHopcount(msg->getHopcount()+1); // Increment hop count.
    // Same routing as before: random gate.
    int n = gateSize("gate");
    int k = intuniform(0, n-1);

    EV << "Forwarding message " << msg << " on gate[" << k << "]\n";
    send(msg, "gate$o", k);
}
```

pc47.cc

```
#include <stdio.h>
#include <string.h>
#include <omnetpp.h>

using namespace omnetpp;

#include "frame_47_m.h"

class pc47 : public cSimpleModule
{
private:

    bool sender,receiver;

protected:

    virtual Frame47 *generateMessage();

    virtual void forwardMessage(Frame47 *msg);

    virtual void initialize() override;

    virtual void handleMessage(cMessage *msg) override;

};

Define_Module(pc47);

void pc47::initialize()
{
```

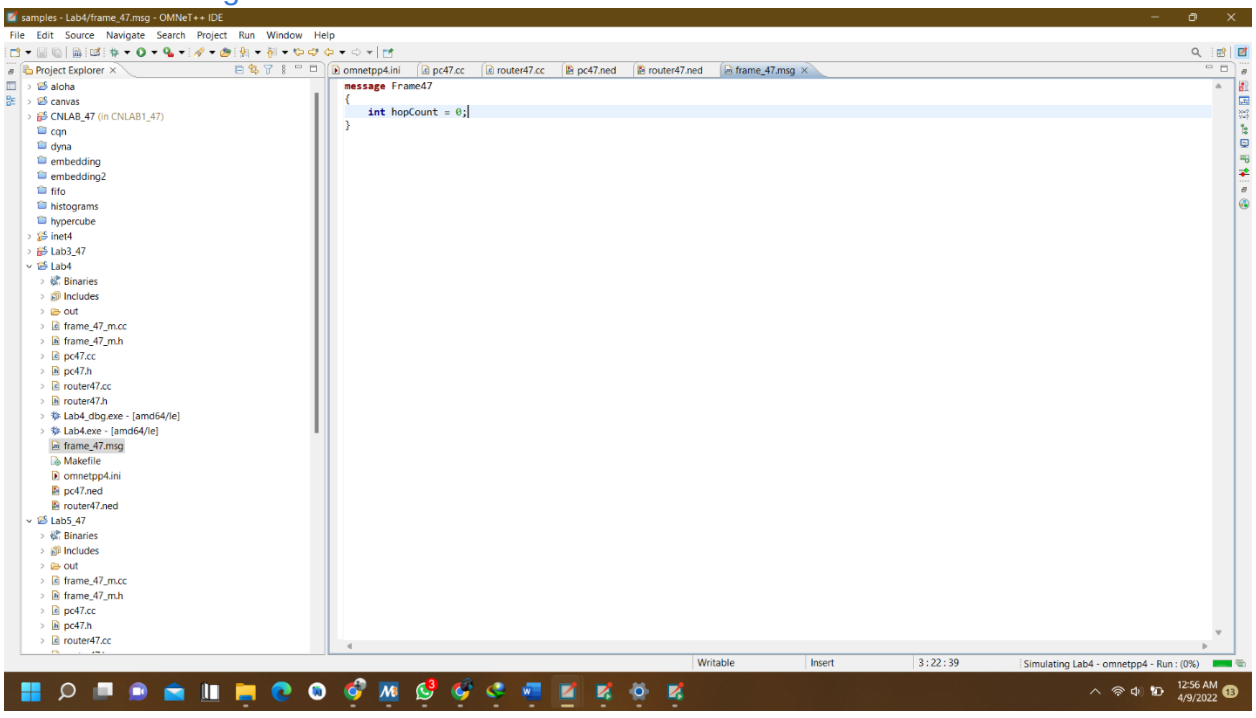
```
    sender=par("sendMsgOnInit");

        receiver=par("recvMsgAtDest");

            if (sender == true) {

               Frame47 *msg = generateMessage();

                send(msg, "interface$o");

            }

}

void pc47::handleMessage(cMessage *msg)
{
   Frame47 *ttmsg = check_and_cast<Frame47 *>(msg);

    if (receiver == true) {

        // Message arrived.

        EV << "Message " << ttmsg << " arrived after " << ttmsg->getHopcount() << "
hops.\n";

        bubble("ARRIVED, Deleting Frame!");

        delete ttmsg;
}
    else {

        forwardMessage(ttmsg); // We need to forward the message.

    }
}

Frame47 *pc47::generateMessage()
{

    char msgname[20];

    sprintf(msgname,"FRAME47");

    // Create message object and set source and destination field.

   Frame47 *msg = new Frame47(msgname);

    return msg;

}

void pc47::forwardMessage(Frame47 *msg)
{
```

```
    // Increment hop count.
    msg->setHopcount(msg->getHopcount()+1);
    EV << "Forwarding back message " << msg << " on its interface "<<"\n";
    send(msg, "interface$o");
```

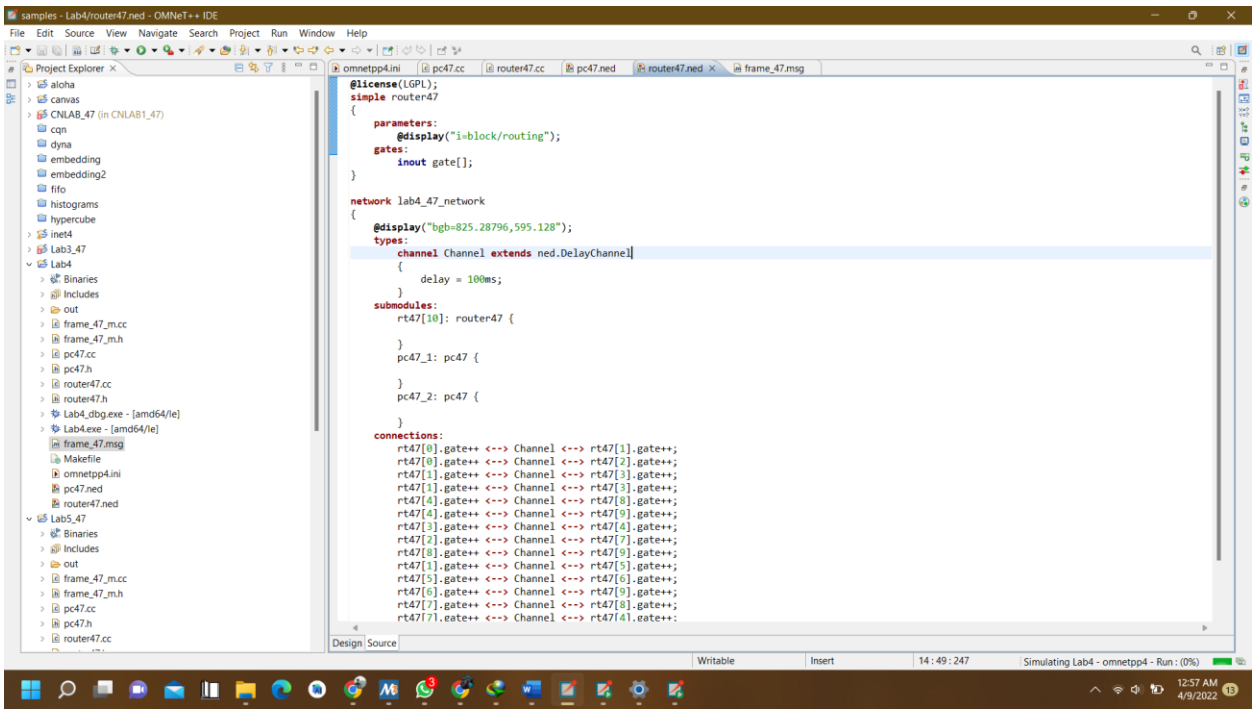
omnetpp4.ini [General]

```
[General]
[Config lab4_47_network]
seed-0-mt=352569
network = lab4_47_network
**.pc47_2.sendMsgOnInit = true
**.pc47_1.recvMsgAtDest = true
```

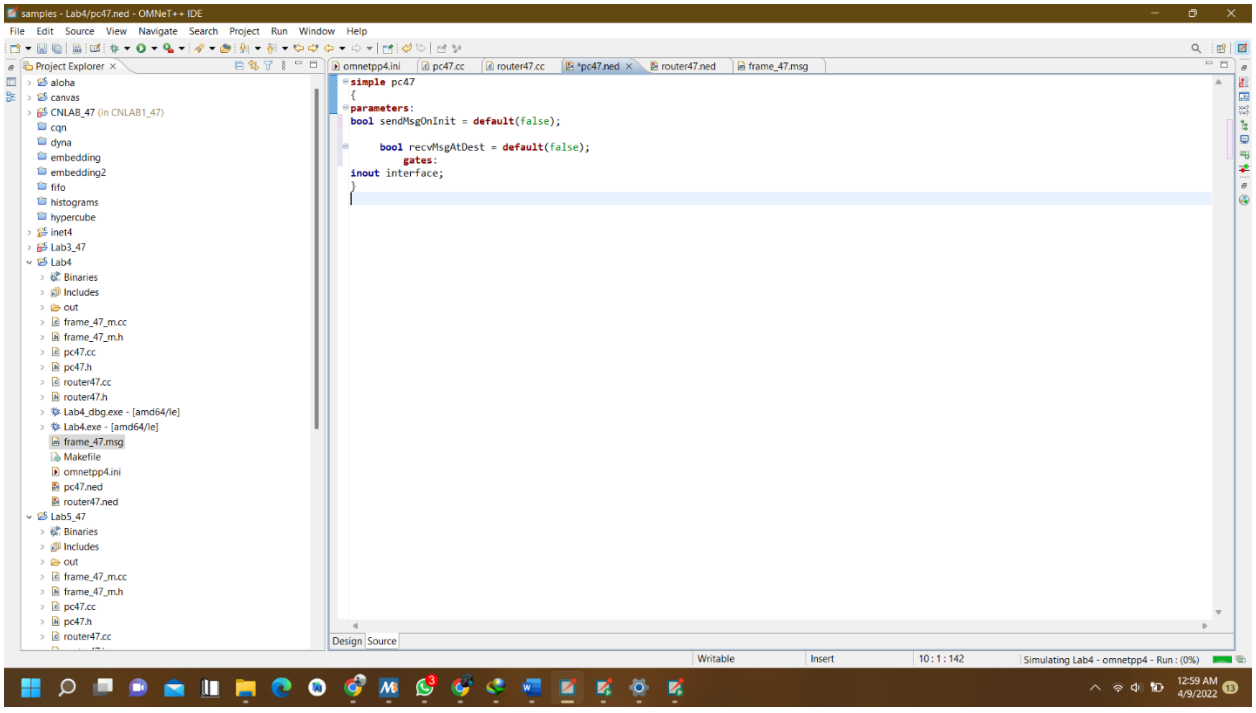
4.Frame Message file :



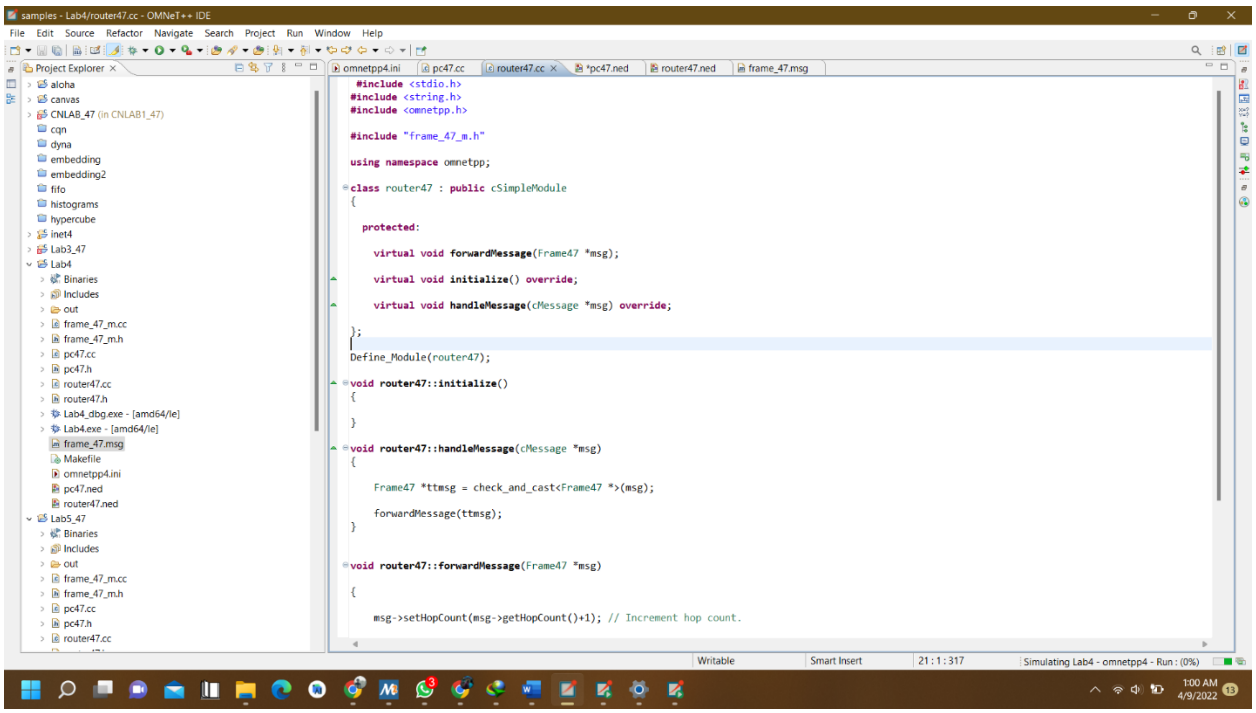
5. Router NED file:



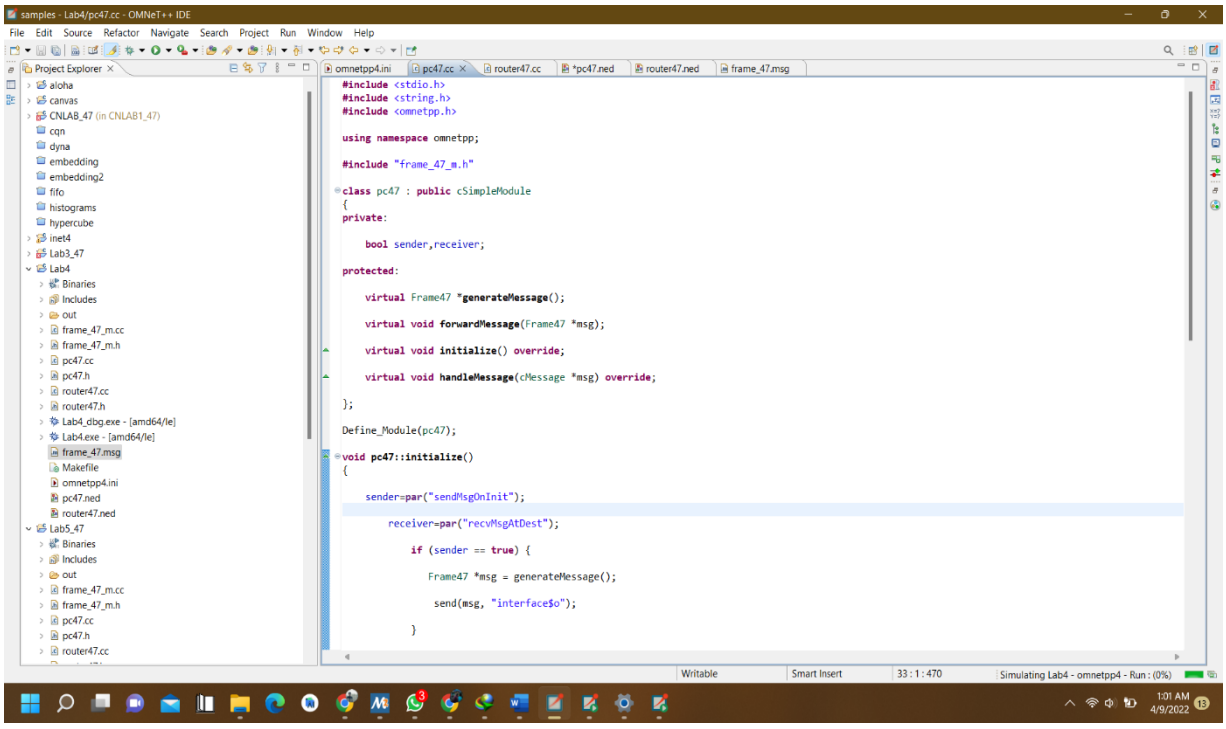
6. PC NED file :



7. Router CC file :


samples - Lab4/router47.cc - OMNeT++ IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer
aloha
canvas
CNLAB_47 (in CNLAB1_47)
cqn
dyna
embedding
embedding2
fifo
histograms
hypercube
inet4
Lab3_47
Lab4
Binaries
Includes
out
frame_47_m.cc
frame_47_m.h
pc47.cc
pc47.h
router47.cc
router47.h
Lab4_dbg.exe - [amd64/le]
Lab4.exe - [amd64/le]
frame_47.msg
Makefile
omnetpp4.ini
pc47.ned
router47.ned
Lab5_47
Binaries
Includes
out
frame_47_m.cc
frame_47_m.h
pc47.cc
pc47.h
router47.cc
omnetpp4.ini
pc47.cc
router47.cc
*pc47.ned
router47.ned
frame_47.msg
#include <stdio.h>
#include <string.h>
#include <omnetpp.h>
#include "frame_47_m.h"
using namespace omnetpp;
class router47 : public cSimpleModule
{
protected:
virtual void forwardMessage(Frame47 *msg);
virtual void initialize() override;
virtual void handleMessage(cMessage *msg) override;
};
Define_Module(router47);
void router47::initialize()
{
}
void router47::handleMessage(cMessage *msg)
{
Frame47 *ttmsg = check_and_cast<Frame47 *>(msg);
forwardMessage(ttmsg);
}
void router47::forwardMessage(Frame47 *msg)
{
msg->setHopCount(msg->getHopCount()+1); // Increment hop count.
Writable
Smart Insert
21 : 1 : 317
Simulating Lab4 - omnetpp4 - Run : (0%)
1:00 AM
4/9/2022

8. PC CC file :


samples - Lab4/pc47.cc - OMNeT++ IDE
File Edit Source Refactor Navigate Search Project Run Window Help
Project Explorer
aloha
canvas
CNLAB_47 (in CNLAB1_47)
cqn
dyna
embedding
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Binaries
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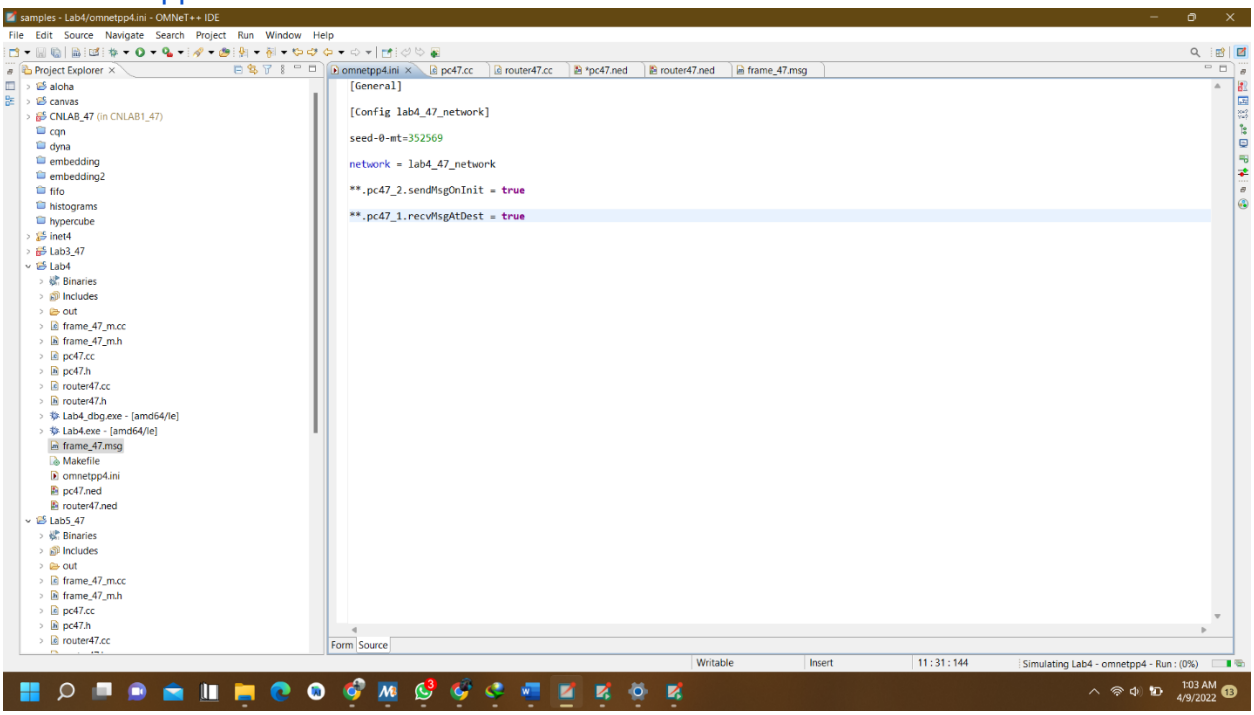
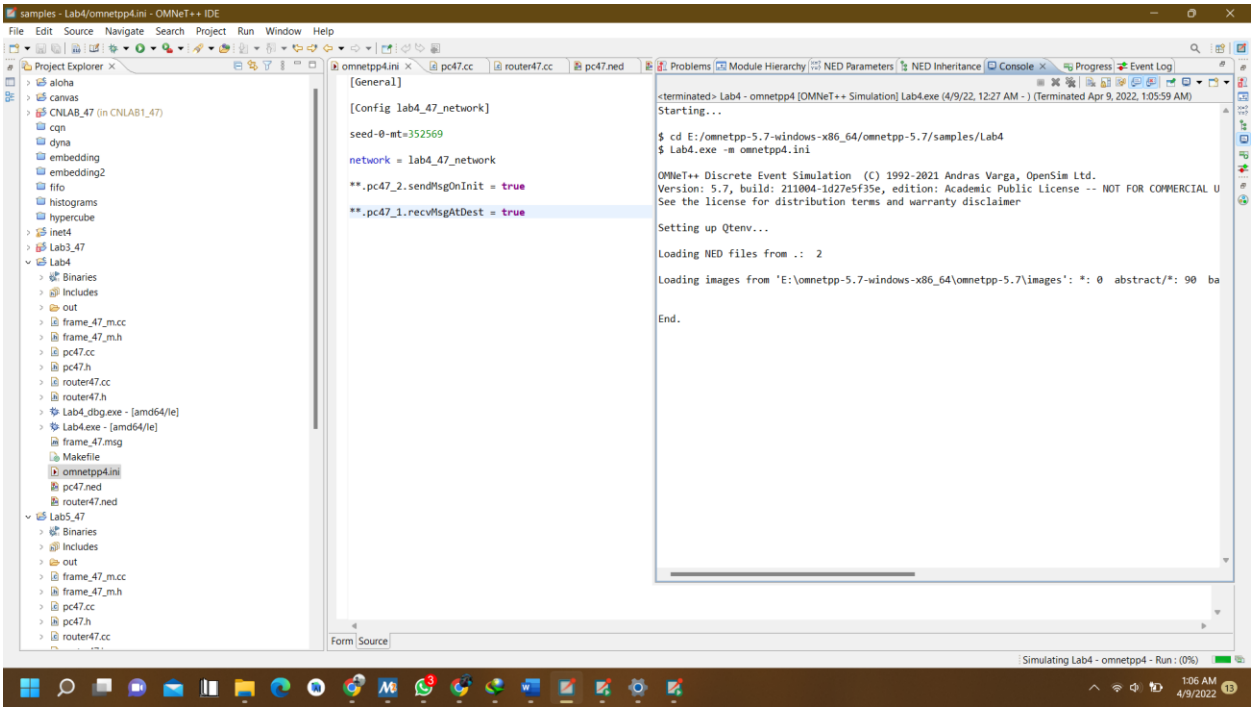
pc47.cc
pc47.h
router47.cc
router47.h
Lab4_dbg.exe - [amd64/le]
Lab4.exe - [amd64/le]
frame_47.msg
Makefile
omnetpp4.ini
pc47.ned
router47.ned
Lab5_47
Binaries
Includes
out
frame_47_m.cc
frame_47_m.h
pc47.cc
pc47.h
router47.cc
omnetpp4.ini
pc47.cc
router47.cc
*pc47.ned
router47.ned
frame_47.msg
#include <stdio.h>
#include <string.h>
#include <omnetpp.h>
using namespace omnetpp;
#include "frame_47_m.h"
class pc47 : public cSimpleModule
{
private:
bool sender,receiver;
protected:
virtual Frame47 *generateMessage();
virtual void forwardMessage(Frame47 *msg);
virtual void initialize() override;
virtual void handleMessage(cMessage *msg) override;
};
Define_Module(pc47);
void pc47::initialize()
{
sender=par("sendMsgOnInit");
receiver=par("recvMsgAtDest");
if (sender == true) {
Frame47 *msg = generateMessage();
send(msg, "interface$o");
}
Writable
Smart Insert
33 : 1 : 470
Simulating Lab4 - omnetpp4 - Run : (0%)
1:01 AM
4/9/2022

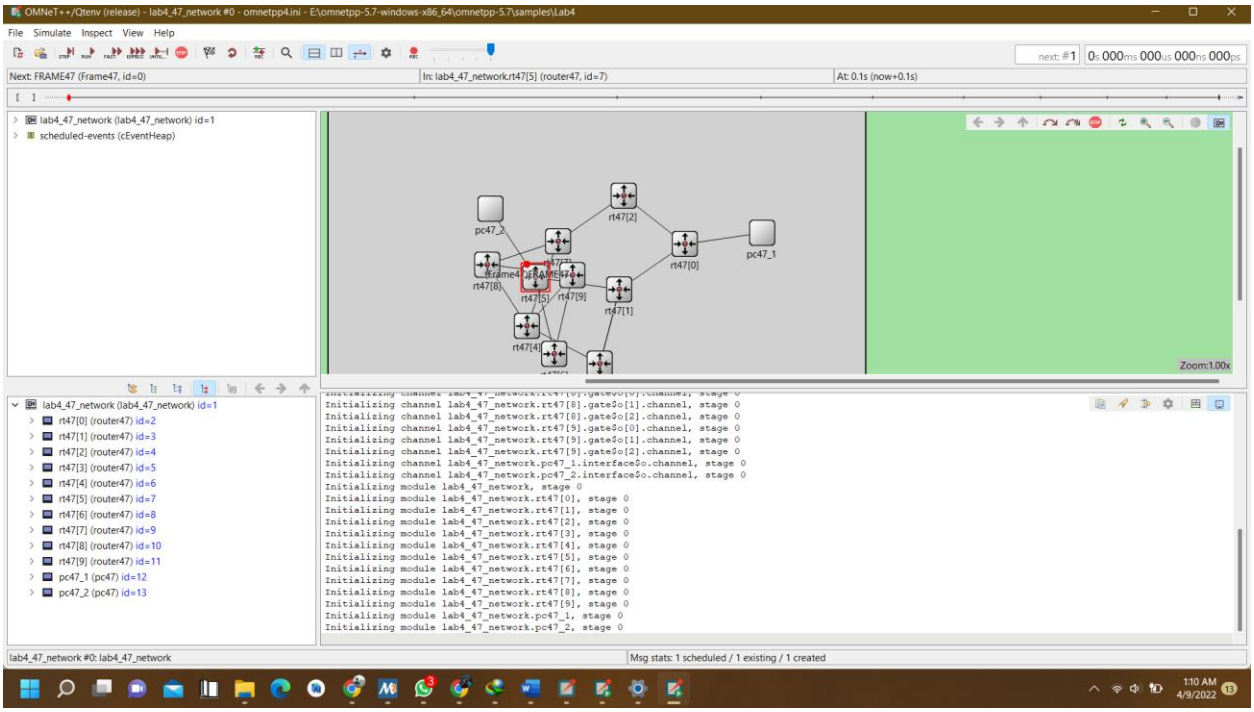
9.

10. Omnetpp INI file :

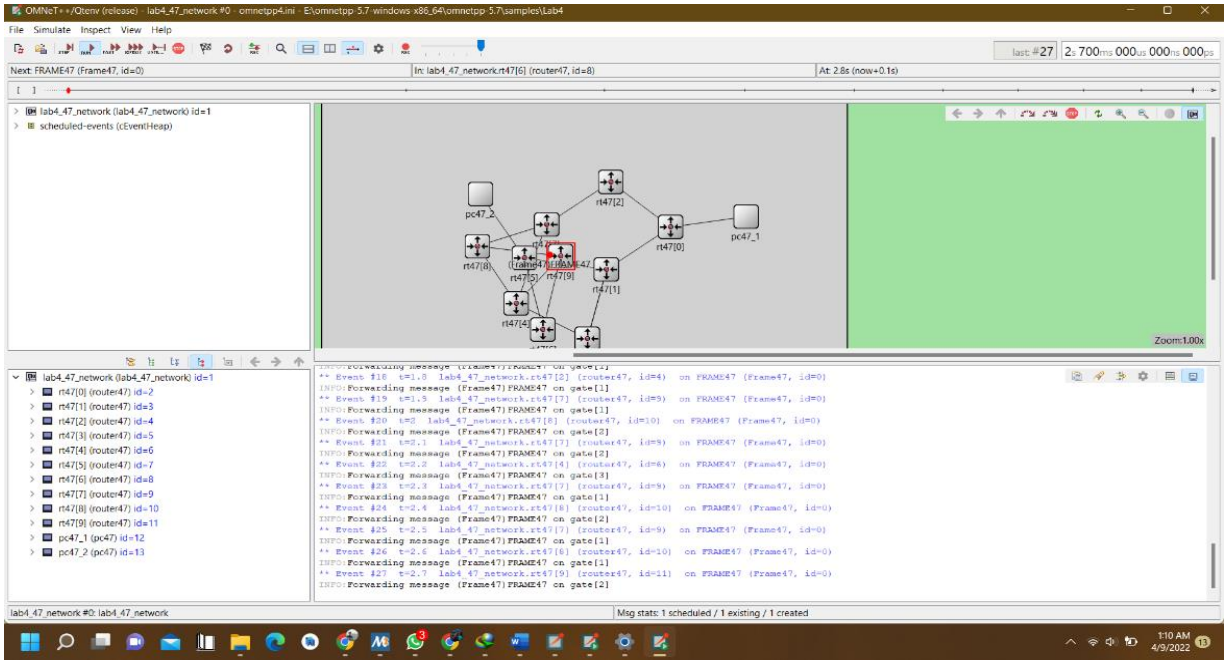


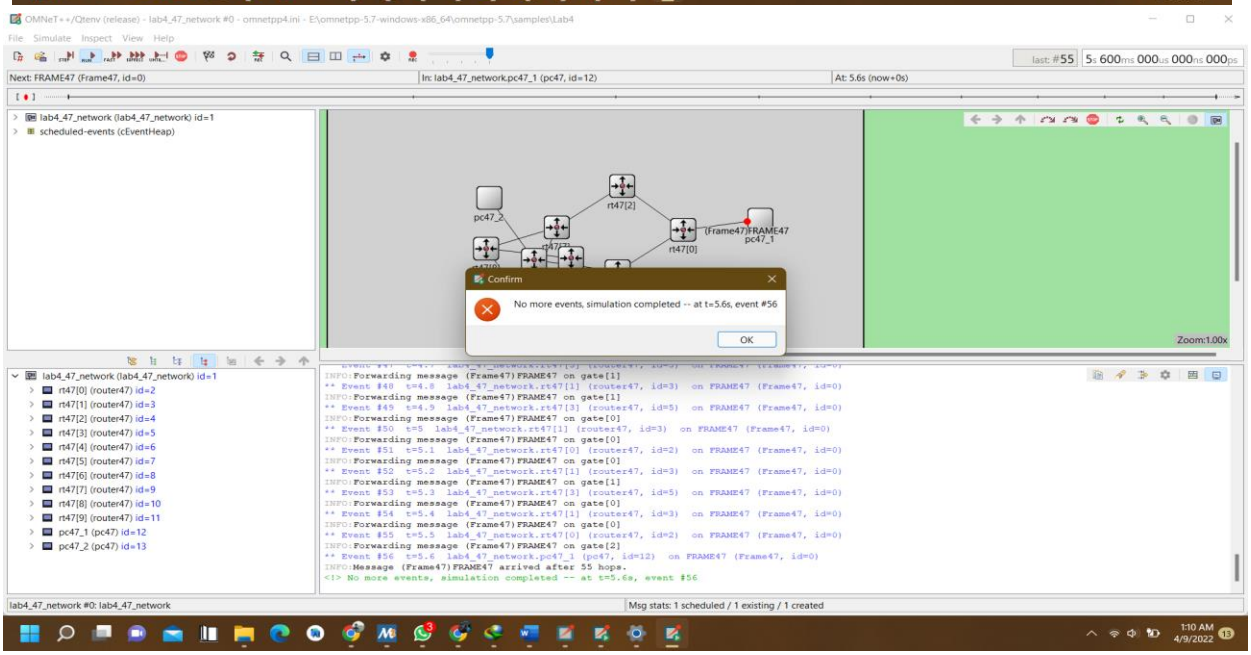
11. Build and Simulation:





12. Result Analysis


OMNeT++/Qtenv (release) - lab4_47_network #0 - omnetpp4.ini - E:\omnetpp-5.7-windows-x86_64\omnetpp-5.7\samples\Lab4
File Simulate Inspect View Help
Next: FRAME47 (Frame47, id=0)
In: lab4_47_network.rt47[6] (router47, id=8)
At: 2.8s (now+0.1s)
lab4_47_network (lab4_47_network) id=1
scheduled-events (cEventHeap)
pc47_2
rt47[2]
rt47[0]
pc47_1
rt47[8]
rt47[5]
rt47[9]
rt47[1]
rt47[4]
Zoom:1.00x
lab4_47_network (lab4_47_network) id=1
rt47[0] (router47) id=2
rt47[1] (router47) id=3
rt47[2] (router47) id=4
rt47[3] (router47) id=5
rt47[4] (router47) id=6
rt47[5] (router47) id=7
rt47[6] (router47) id=8
rt47[7] (router47) id=9
rt47[8] (router47) id=10
rt47[9] (router47) id=11
pc47_1 (pc47) id=12
pc47_2 (pc47) id=13
lab4_47_network #0: lab4_47_network
Msg stats: 1 scheduled / 1 existing / 1 created
1:10 AM
4/9/2022


OMNeT++/Qtenv (release) - lab4_47_network #0 - omnetpp4.ini - E:\omnetpp-5.7-windows-x86_64\omnetpp-5.7\samples\Lab4
File Simulate Inspect View Help
Next: FRAME47 (Frame47, id=0)
In: lab4_47_network.pc47_1 (pc47, id=12)
At: 5.6s (now+0s)
lab4_47_network (lab4_47_network) id=1
scheduled-events (cEventHeap)
pc47_2
rt47[2]
rt47[0]
(Frame47) FRAME47
pc47_1
Confirm
No more events, simulation completed -- at t=5.6s, event #56
OK
Zoom:1.00x
lab4_47_network (lab4_47_network) id=1
rt47[0] (router47) id=2
rt47[1] (router47) id=3
rt47[2] (router47) id=4
rt47[3] (router47) id=5
rt47[4] (router47) id=6
rt47[5] (router47) id=7
rt47[6] (router47) id=8
rt47[7] (router47) id=9
rt47[8] (router47) id=10
rt47[9] (router47) id=11
pc47_1 (pc47) id=12
pc47_2 (pc47) id=13
INFO:Message (Frame47) FRAME47 arrived after 55 hops.
<!> No more events, simulation completed -- at t=5.6s, event #56
lab4_47_network #0: lab4_47_network
Msg stats: 1 scheduled / 1 existing / 1 created
1:10 AM
4/9/2022

12 . Conclusion: Here from result analysis u can see that my project is successfully completed, for more confirmation we can see the build from manual given up there.In result analysis we can see the massage is forwarding from PC47_2 to router_47[9] and following router_47[9] to router_47[1] and finally the will be reached at 56 event later at PC47_1 & there is no bug,no error .

And finally lab4 is successfully complete.