Networks Lab(3)

Network topologies with omnet++

Name	Sec	BN	Code	Workload
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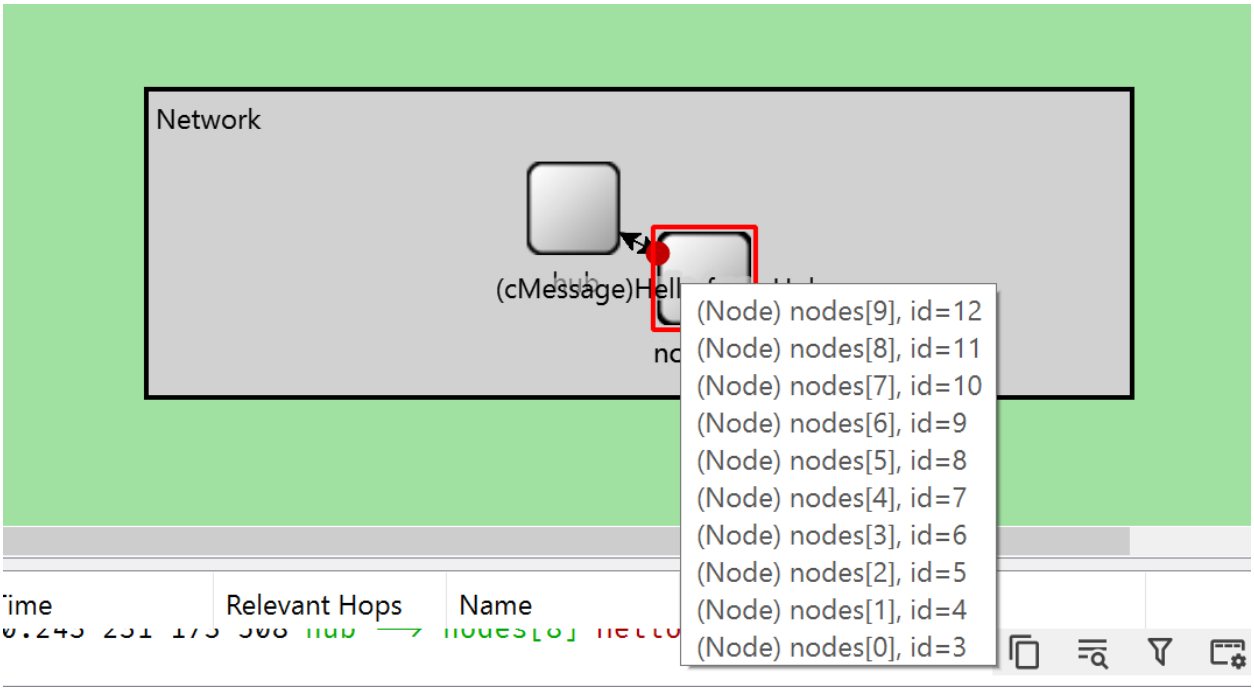
Mohab	2			Mesh

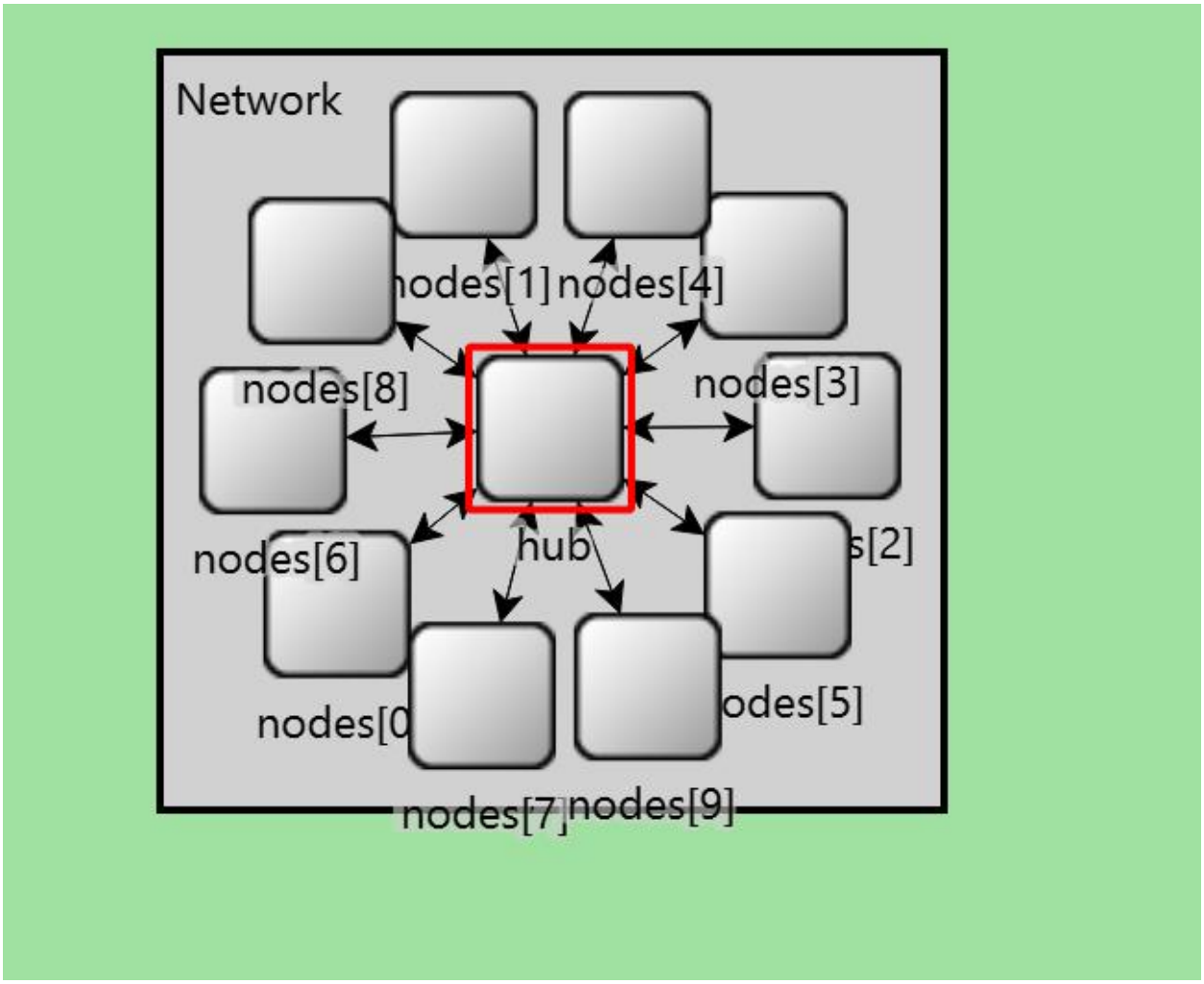
Problem (1) Star network topology:

Demo

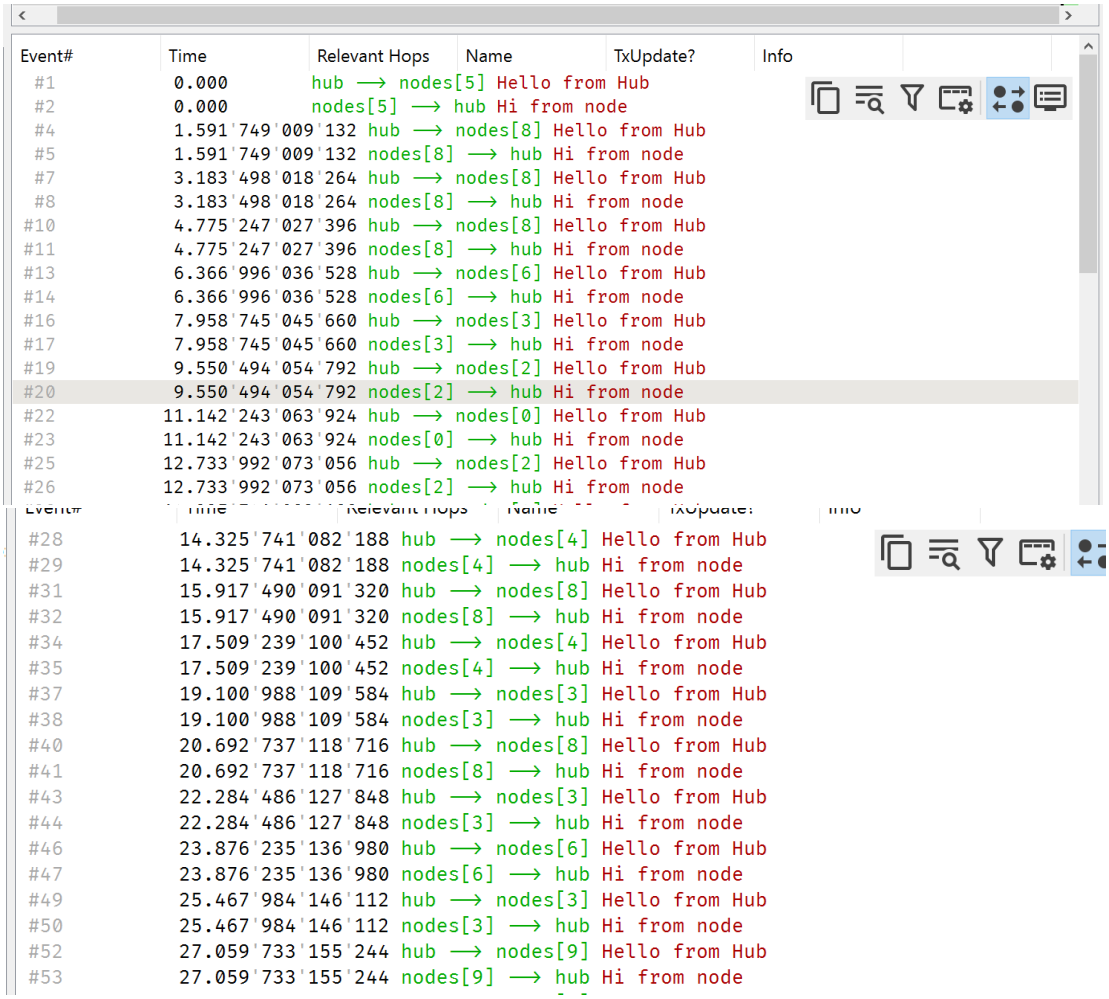
Refer to the Demo_P1 attached.

Typology:




Network
nodes[1]
nodes[4]
nodes[8]
nodes[3]
nodes[6]
hub
s[2]
nodes[0
odes[5]
nodes[7]
nodes[9]

Results:



Event#	Time	Relevant Hops	Name	TxUpdate?	Info
#1	0.000		hub ⟶ nodes[5] Hello from Hub		
#2	0.000		nodes[5] ⟶ hub Hi from node		
#4	1.591'749'009'132		hub ⟶ nodes[8] Hello from Hub		
#5	1.591'749'009'132		nodes[8] ⟶ hub Hi from node		
#7	3.183'498'018'264		hub ⟶ nodes[8] Hello from Hub		
#8	3.183'498'018'264		nodes[8] ⟶ hub Hi from node		
#10	4.775'247'027'396		hub ⟶ nodes[8] Hello from Hub		
#11	4.775'247'027'396		nodes[8] ⟶ hub Hi from node		
#13	6.366'996'036'528		hub ⟶ nodes[6] Hello from Hub		
#14	6.366'996'036'528		nodes[6] ⟶ hub Hi from node		
#16	7.958'745'045'660		hub ⟶ nodes[3] Hello from Hub		
#17	7.958'745'045'660		nodes[3] ⟶ hub Hi from node		
#19	9.550'494'054'792		hub ⟶ nodes[2] Hello from Hub		
#20	9.550'494'054'792		nodes[2] ⟶ hub Hi from node		
#22	11.142'243'063'924		hub ⟶ nodes[0] Hello from Hub		
#23	11.142'243'063'924		nodes[0] ⟶ hub Hi from node		
#25	12.733'992'073'056		hub ⟶ nodes[2] Hello from Hub		
#26	12.733'992'073'056		nodes[2] ⟶ hub Hi from node		
#28	14.325'741'082'188		hub ⟶ nodes[4] Hello from Hub		
#29	14.325'741'082'188		nodes[4] ⟶ hub Hi from node		
#31	15.917'490'091'320		hub ⟶ nodes[8] Hello from Hub		
#32	15.917'490'091'320		nodes[8] ⟶ hub Hi from node		
#34	17.509'239'100'452		hub ⟶ nodes[4] Hello from Hub		
#35	17.509'239'100'452		nodes[4] ⟶ hub Hi from node		
#37	19.100'988'109'584		hub ⟶ nodes[3] Hello from Hub		
#38	19.100'988'109'584		nodes[3] ⟶ hub Hi from node		
#40	20.692'737'118'716		hub ⟶ nodes[8] Hello from Hub		
#41	20.692'737'118'716		nodes[8] ⟶ hub Hi from node		
#43	22.284'486'127'848		hub ⟶ nodes[3] Hello from Hub		
#44	22.284'486'127'848		nodes[3] ⟶ hub Hi from node		
#46	23.876'235'136'980		hub ⟶ nodes[6] Hello from Hub		
#47	23.876'235'136'980		nodes[6] ⟶ hub Hi from node		
#49	25.467'984'146'112		hub ⟶ nodes[3] Hello from Hub		
#50	25.467'984'146'112		nodes[3] ⟶ hub Hi from node		
#52	27.059'733'155'244		hub ⟶ nodes[9] Hello from Hub		
#53	27.059'733'155'244		nodes[9] ⟶ hub Hi from node		

Network Code:

package.ned

```
1  package assigment_3_p1;
2
3  @license(LGPL);
4  //
5  // TODO documentation
6  //
7  network Network
8  {
9      parameters:
10         int N = default(4);
11         double interval=exponential(2.0);
12     submodules:
13         hub: Hub {
14             @display("p=237,65");
15         }
16         nodes[N]: Node {
17             @display("p=310,104");
18         }
19     connections:
20         for i=0..N-1{
21             hub.out++-->nodes[i].in;
22             hub.in++<--nodes[i].out;
23         }
24 }
25
26
```

N : # of Nodes are read from .ini

package.ned | omnetpp.ini

```
1  [General]
2  network = assigment_3_p1.Network
3  Network.N=10
```

Hub Code:

Initialization for the Hub to send a self message now to trugger his handle message handler

```
22
23 void Hub::initialize()
24 {
25     // TODO - Generated method body
26     //Send [now] Self Message to send the first message to the first random node node_n
27     scheduleAt(simTime(),new cMessage(""));
28 }
29
```

Handle Event for Hub

If it is self message [Scheduled message] ➔ Then it is time to choose a new random Node and send to it the Hello Message

If not then it is a message form the node ➔ Then schedule a new empty message to be self messaged after the interval value sampled by the network

```
26
27 void Hub::handleMessage(cMessage *msg)
28 {
29     // TODO - Generated method body
30     if(msg->isSelfMessage()){
31         // Handle Self Messaging
32         //1. Set Content of the message
33         msg->setName("Hello from Hub");
34         //2. Choose new Random Node
35         int new_node=par("node_n");
36         //3. Send message to the Node
37         send(msg,"out",new_node);
38         EV<<"Hub: Sending to Node ("<<int(par("node_n"))<<") ..."<<endl;
39     }
40     else{
41         //Handle Message from the previous Node
42         //Schedule [after the interval set by the network] next Message
43         scheduleAt(simTime()+ getParentModule()->par("interval"),new cMessage(""));
44     }
45 }
46
```

Node Code:

Just Simply Reply to the Hub with Hello from Node Message

```
25 void Node::handleMessage(cMessage *msg)
26 {
27     // TODO - Generated method body
28     //Reply to the HUB
29     //1. Set Content of the message
30     msg->setName("Hi from node");
31     //2. Send Message
32     send(msg,"out");
33     EV<<"Node("<<getIndex()<<"): Sending to Hub ..."<<endl;
34 }
35
```

Problem (2) Mesh network topology:

Demo

Refer to the Demo_P2 attached.

Typology:

Results:

Event#	Time	Relevant Hops	Name	TxUpdate?	Info
#1	0.000		hub ⟶ nodes[5]		Hello from Hub
#2	0.000		nodes[5] ⟶ hub		Hi from node
#4	1.591'749'009'132		hub ⟶ nodes[8]		Hello from Hub
#5	1.591'749'009'132		nodes[8] ⟶ hub		Hi from node
#7	3.183'498'018'264		hub ⟶ nodes[8]		Hello from Hub
#8	3.183'498'018'264		nodes[8] ⟶ hub		Hi from node
#10	4.775'247'027'396		hub ⟶ nodes[8]		Hello from Hub
#11	4.775'247'027'396		nodes[8] ⟶ hub		Hi from node
#13	6.366'996'036'528		hub ⟶ nodes[6]		Hello from Hub
#14	6.366'996'036'528		nodes[6] ⟶ hub		Hi from node
#16	7.958'745'045'660		hub ⟶ nodes[3]		Hello from Hub
#17	7.958'745'045'660		nodes[3] ⟶ hub		Hi from node
#19	9.550'494'054'792		hub ⟶ nodes[2]		Hello from Hub
#20	9.550'494'054'792		nodes[2] ⟶ hub		Hi from node
#22	11.142'243'063'924		hub ⟶ nodes[0]		Hello from Hub
#23	11.142'243'063'924		nodes[0] ⟶ hub		Hi from node
#25	12.733'992'073'056		hub ⟶ nodes[2]		Hello from Hub
#26	12.733'992'073'056		nodes[2] ⟶ hub		Hi from node
#28	14.325'741'082'188		hub ⟶ nodes[4]		Hello from Hub
#29	14.325'741'082'188		nodes[4] ⟶ hub		Hi from node
#31	15.917'490'091'320		hub ⟶ nodes[8]		Hello from Hub
#32	15.917'490'091'320		nodes[8] ⟶ hub		Hi from node
#34	17.509'239'100'452		hub ⟶ nodes[4]		Hello from Hub
#35	17.509'239'100'452		nodes[4] ⟶ hub		Hi from node
#37	19.100'988'109'584		hub ⟶ nodes[3]		Hello from Hub
#38	19.100'988'109'584		nodes[3] ⟶ hub		Hi from node
#40	20.692'737'118'716		hub ⟶ nodes[8]		Hello from Hub
#41	20.692'737'118'716		nodes[8] ⟶ hub		Hi from node
#43	22.284'486'127'848		hub ⟶ nodes[3]		Hello from Hub
#44	22.284'486'127'848		nodes[3] ⟶ hub		Hi from node
#46	23.876'235'136'980		hub ⟶ nodes[6]		Hello from Hub
#47	23.876'235'136'980		nodes[6] ⟶ hub		Hi from node
#49	25.467'984'146'112		hub ⟶ nodes[3]		Hello from Hub
#50	25.467'984'146'112		nodes[3] ⟶ hub		Hi from node
#52	27.059'733'155'244		hub ⟶ nodes[9]		Hello from Hub
#53	27.059'733'155'244		nodes[9] ⟶ hub		Hi from node

Network Code:

N : # of Nodes are read from .ini

Hub Code:

Node Code: