North Western University

Department of Computer Science and Engineering

Sessional Final Report

Title: Introduction to computer network using NS2 based on the domain as www.wikipedia.org

Submitted To:

Md. Shymon Islam

Lecturer

Department of CSE

North Western University

Submitted By:

Md Habibullah	**Fatima Tuz Jahura**	**Jyoti Biswas**
Id: 20201**136**010	Id: 20201**122**010	Id: 20201**153**010
Department of CSE	Department of CSE	Department of CSE
North Western University	North Western University	North Western University

Date of submission: ***December 22,2022***

Course Code: **CSE-3304**

Course Title: **Computer Network Sessional**

Table of Contents

1.Overview of the project

The Computer Network Lab is a great facility for students interested in exploring the world of network engineering. In this project we try to find a website detailed information about IP address, protocols and services running on the network. After getting detailed about IP address then we simulate IP route tracing. Firstly, we select a web site. The name of selected website is www.wikipedia.org then scan it by Zen map by four different networks. Then we create a topology. Secondly, we created an IP routing by excel sheet. Thirdly, we use NS2 for routing graphical interface. We created a figure on the basis of the excel sheet. By this project work we can find the networks in detail in order to identify potential security vulnerabilities and other problems.

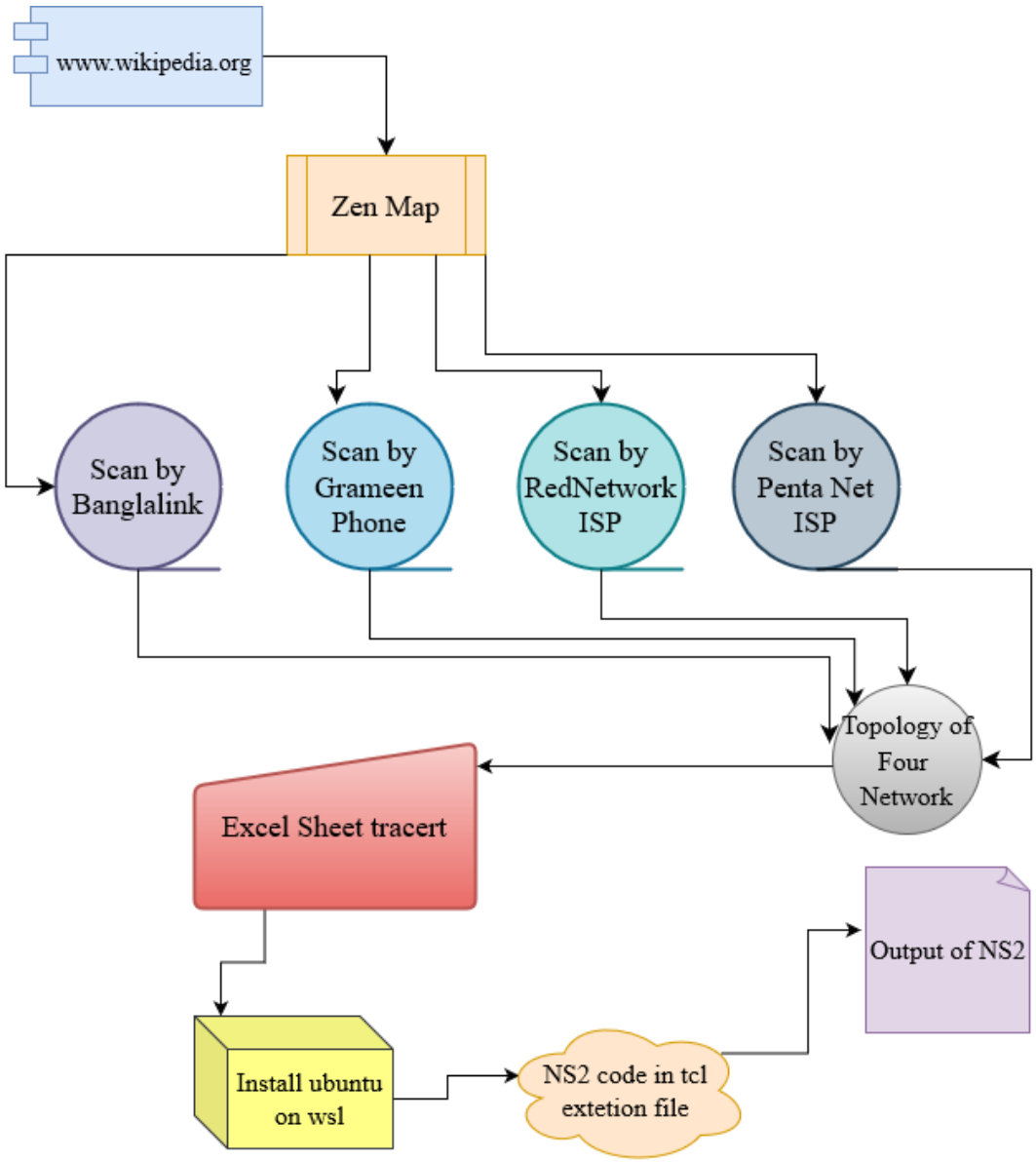


Fig 1: Bird's eye view of the project

2.Introduction to Zen Map

Zen Map is an open source network mapping tool that provides a graphical representation of network topology. It is used to analyze large networks in an efficient and time-saving manner. The tool provides detailed information about the hosts, services, and networks that make up the network, including their geographic location. It also includes support for a variety of data sources such as Nmap scans, traceroutes, and SNMP information. With the help of Zen Map, users can easily identify security risks, identify network weaknesses, and plan network upgrades. It is an interactive graphical network mapping tool that allows users to explore their networks in detail in order to identify potential security vulnerabilities and other problems. The tool includes features such as network discovery, port scanning, route tracing, and more. It also provides detailed information about IP addresses, protocols, and services running on the network. Zen Map is easy to use and provides a comprehensive view of your network, making it an ideal tool for network analysis and management. Computer network lab contains state-of-the-art equipment and resources which allow students to gain hands-on experience in networking and communications. The lab offers a variety of courses and workshops which cover topics such as network design, protocols and technologies, and security. The lab also provides a great opportunity for students to practice and hone their skills in a real-world environment. With the help of experienced instructors and knowledgeable staff, students can gain the knowledge and experience they need to thrive in the field of networking.

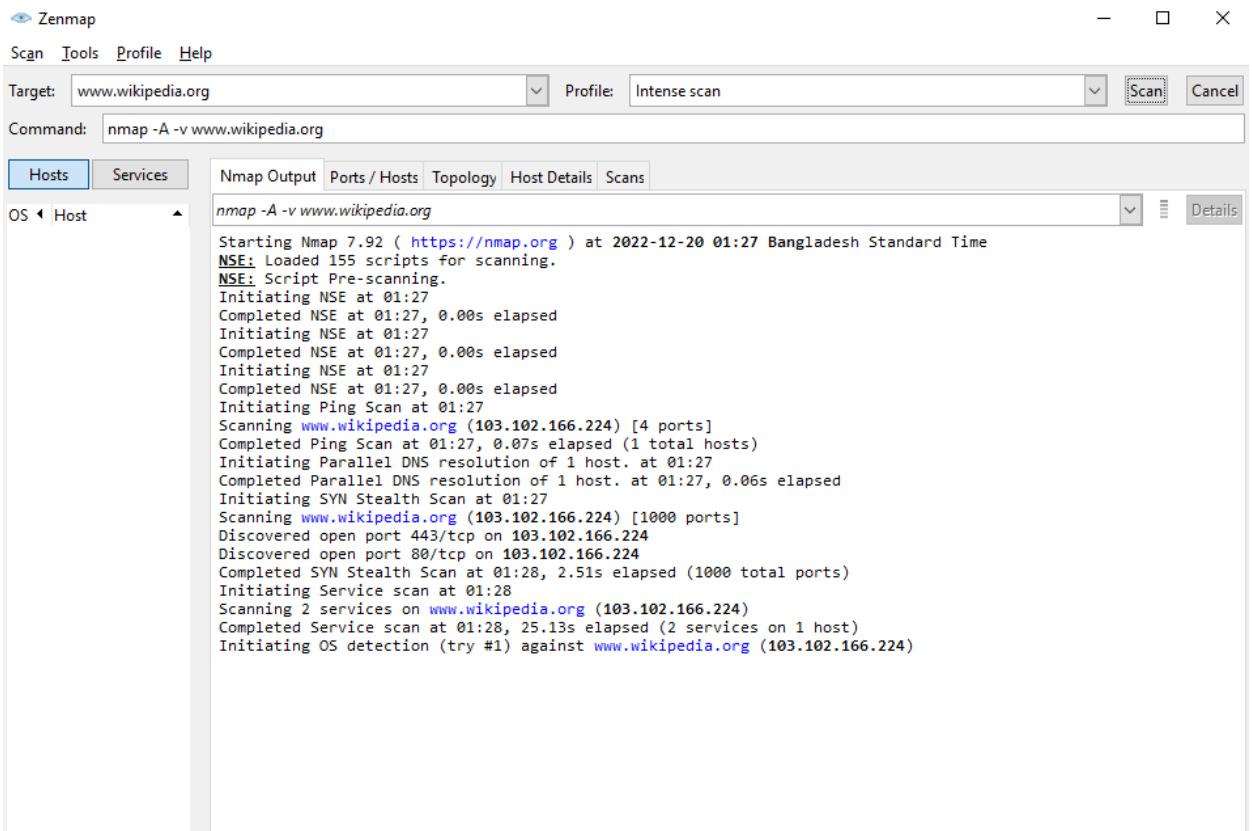


Fig 2: Zen Map interface

3.Different host to domain

In this project we have scan www.wikipedia.org by four different network and find the routing. We scan this website by two cellular network and two are WIFI network. Here we can see the four different network scan instance.

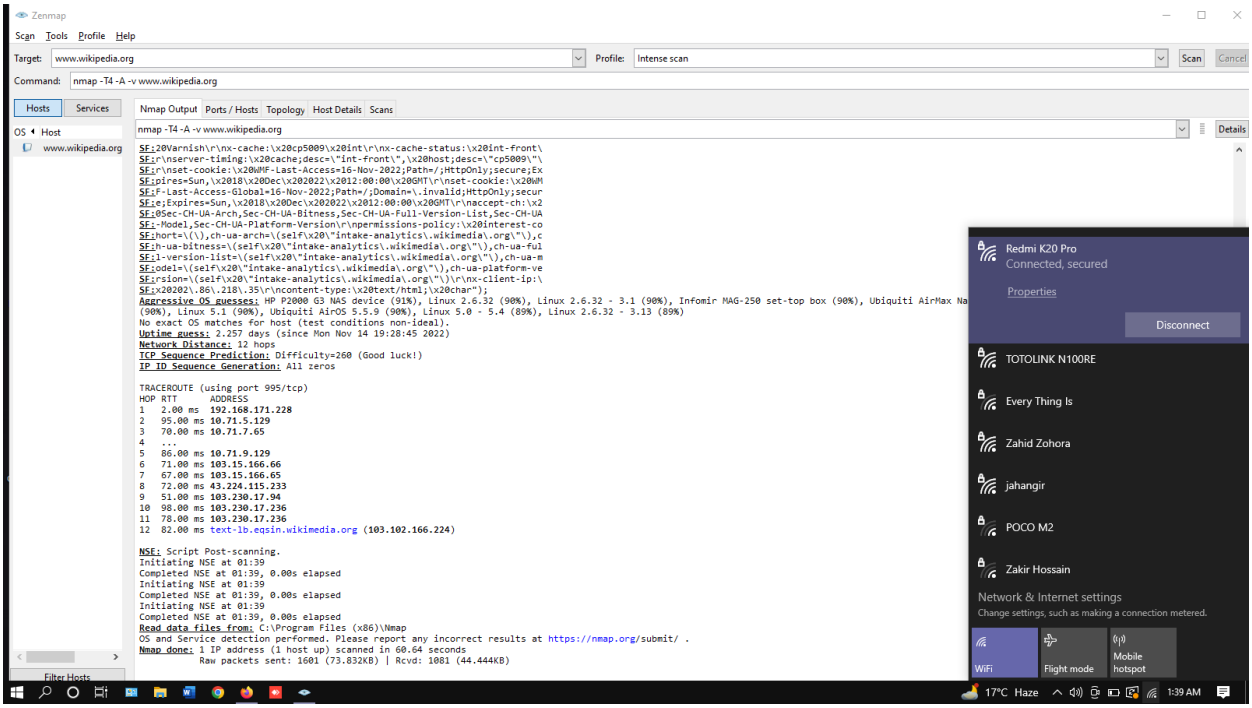


Fig 3: Banglalink network Zen map scan output

Here Fig 3 is the Banglalink cellular network output. In this scan output we can see that there are 11 different IP address from host to domain.

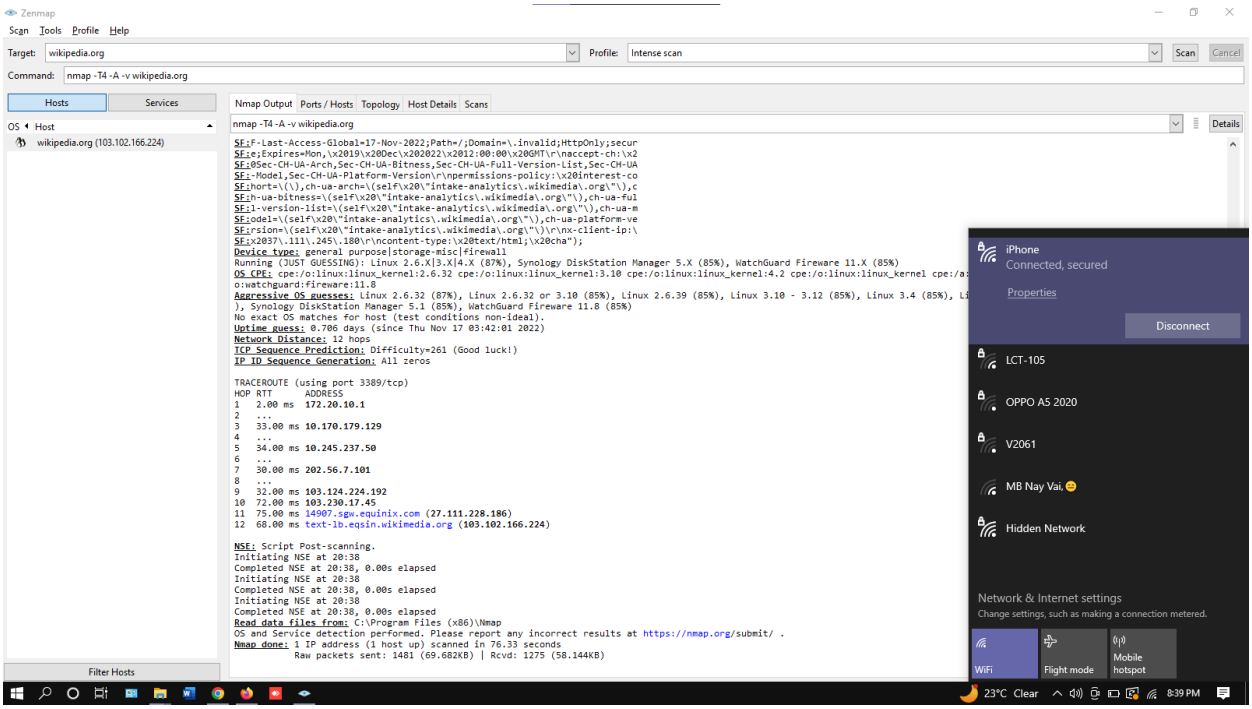


Fig 4: Grameen phone network Zen map scan output

Here Fig 4 is the Grameen phone cellular network output. In this scan output we can see that there are 8 different IP address from host to domain.

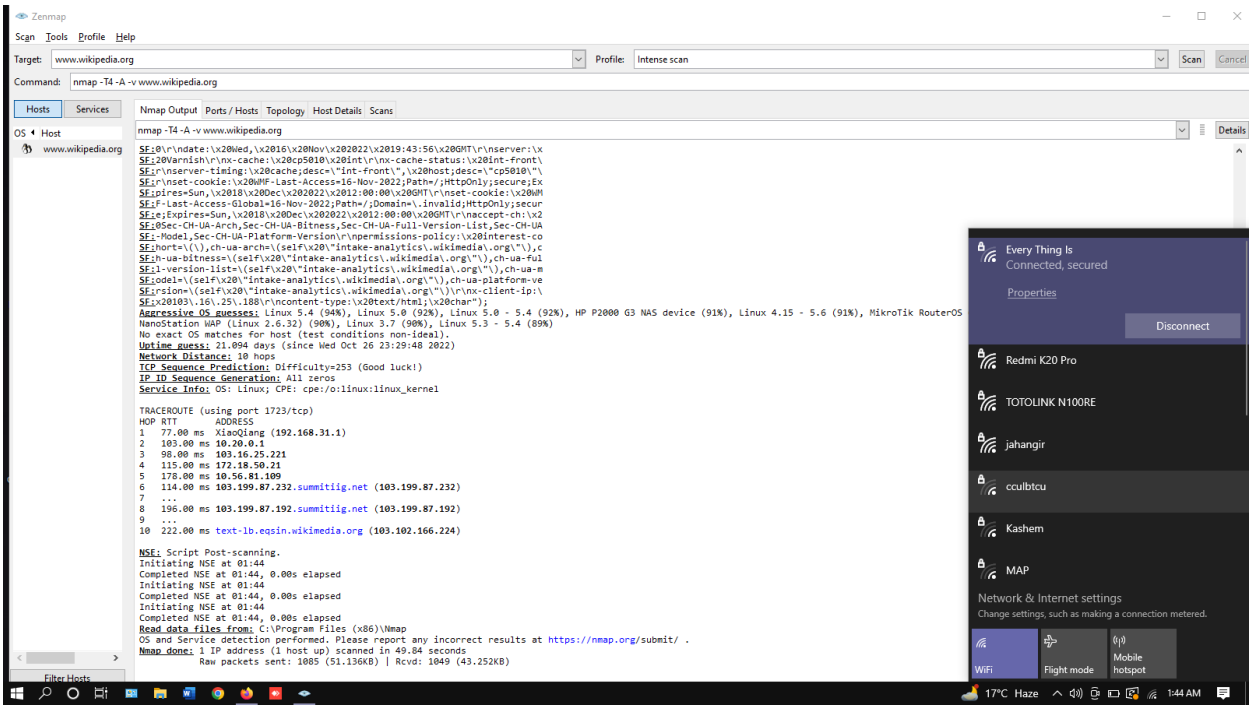


Fig 5: RedNetwork ISP Zen map scan output

Here Fig 5 is the RednetNetwork ISP output. In this scan output we can see that there are 8 different IP address from host to domain.

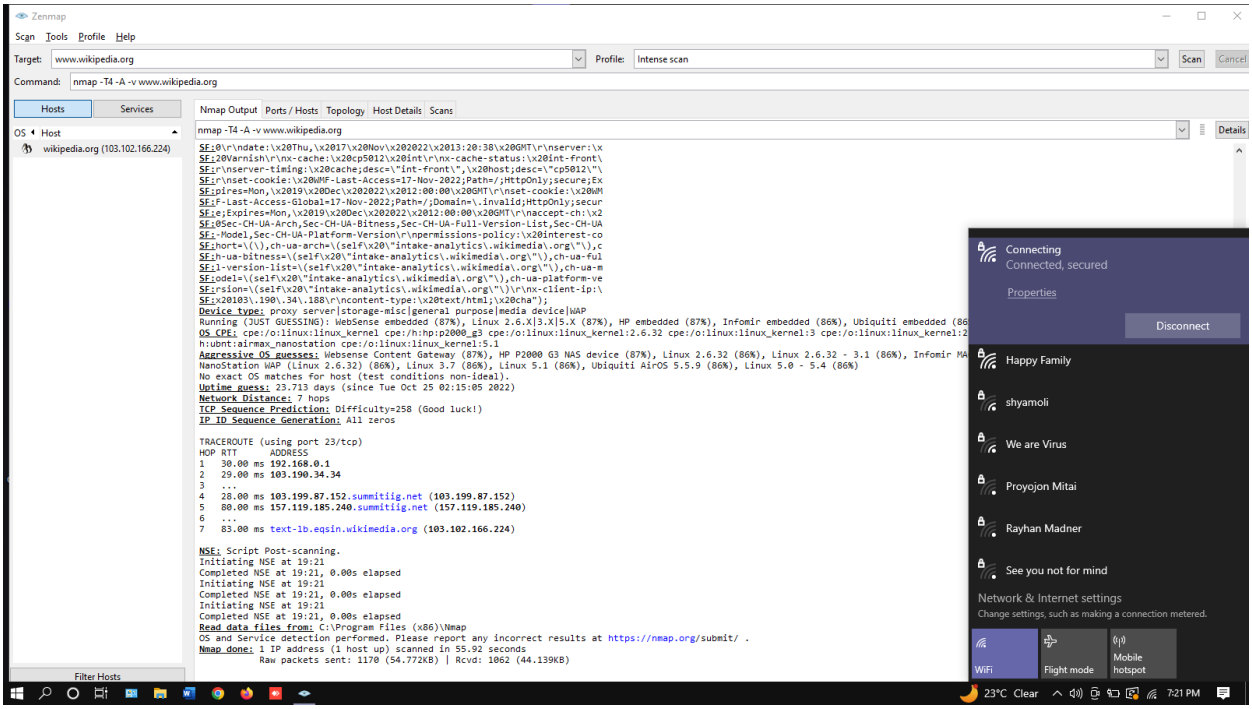


Fig 6: PentaNetwork ISP Zen map scan output

Here Fig 6 is the PentaNetwork ISP output. In this scan output we can see that there are 5 different IP address from host to domain.

4.Design network topology

Network topology is the arrangement of computers, network devices and other components of a network. It describes how various devices in a network are connected to one another and how they communicate. Network topology can be either physical or logical. Physical topology describes the physical layout of a network and the location of the various devices, while logical topology describes how data is transferred between the different nodes.

In our project our targets Ip is same but hosts Ip is different. After scanning by Zen map, we can draw a network topology.

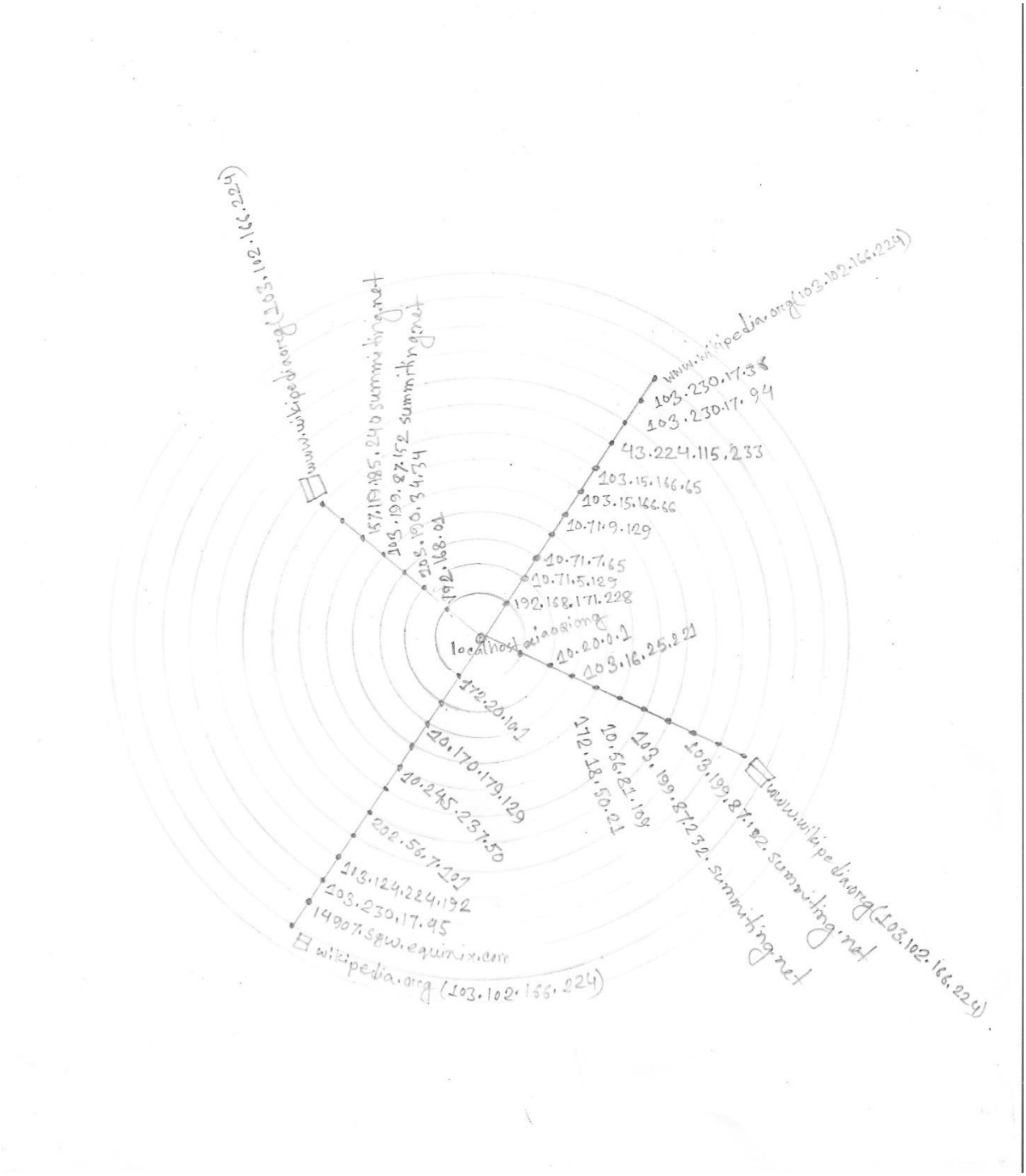
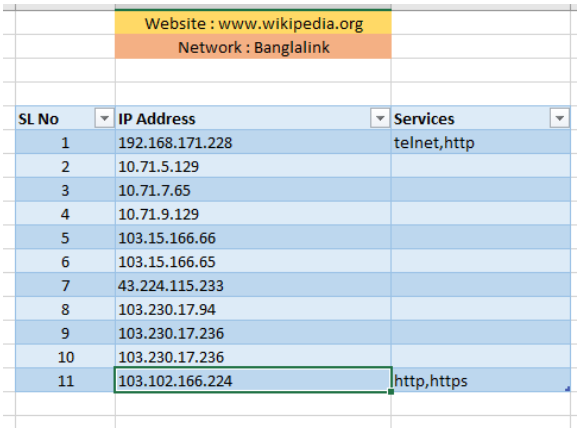


Fig 7: Network topology of Wikipedia

Fig 7 is the network topology of Wikipedia. Here we can see that host IP address are different but the target IP address are same.

5.Prepare excel sheet for network diagram

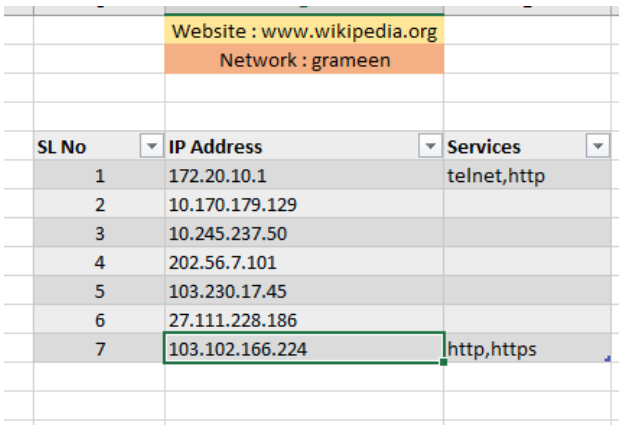
After Creating network topology by Zen map now we have to ready a excel sheet for simulation. First, we need to prepare four service table by serial by serial Ip address. Then we need to put it into a another excel sheet by serial by serial. Bellow there is a sample of excel sheet.



Website : www.wikipedia.org
Network : Banglalink

SL No	IP Address	Services
1	192.168.171.228	telnet,http
2	10.71.5.129	
3	10.71.7.65	
4	10.71.9.129	
5	103.15.166.66	
6	103.15.166.65	
7	43.224.115.233	
8	103.230.17.94	
9	103.230.17.236	
10	103.230.17.236	
11	103.102.166.224	http,https

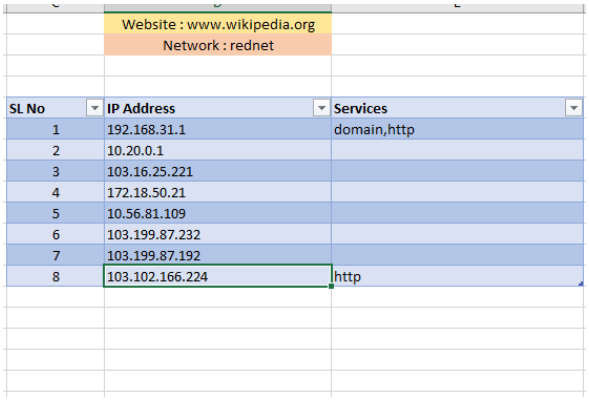
Fig 8: Service table of Banglalink



Website : www.wikipedia.org
Network : grameen

SL No	IP Address	Services
1	172.20.10.1	telnet,http
2	10.170.179.129	
3	10.245.237.50	
4	202.56.7.101	
5	103.230.17.45	
6	27.111.228.186	
7	103.102.166.224	http,https

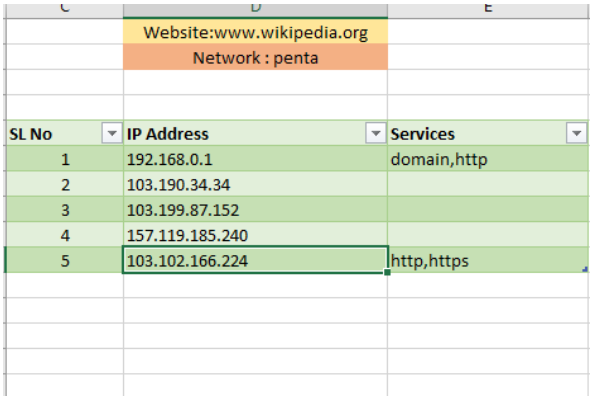
Fig 9: Service table of Grameen phone



Website : www.wikipedia.org
Network : rednet

SL No	IP Address	Services
1	192.168.31.1	domain,http
2	10.20.0.1	
3	103.16.25.221	
4	172.18.50.21	
5	10.56.81.109	
6	103.199.87.232	
7	103.199.87.192	
8	103.102.166.224	http

Fig 10: Service table of RedNet ISP



Website:www.wikipedia.org
Network : penta

SL No	IP Address	Services
1	192.168.0.1	domain,http
2	103.190.34.34	
3	103.199.87.152	
4	157.119.185.240	
5	103.102.166.224	http,https

Fig 11: Service table of Penta ISP

These four figures are the serial wise Ip address table. We get this information from Zen map by scanning www.wikipedia.org website. Four different network goes to target address by many different Ip address. Now we will create a excel tracert for visualize the simulation process.

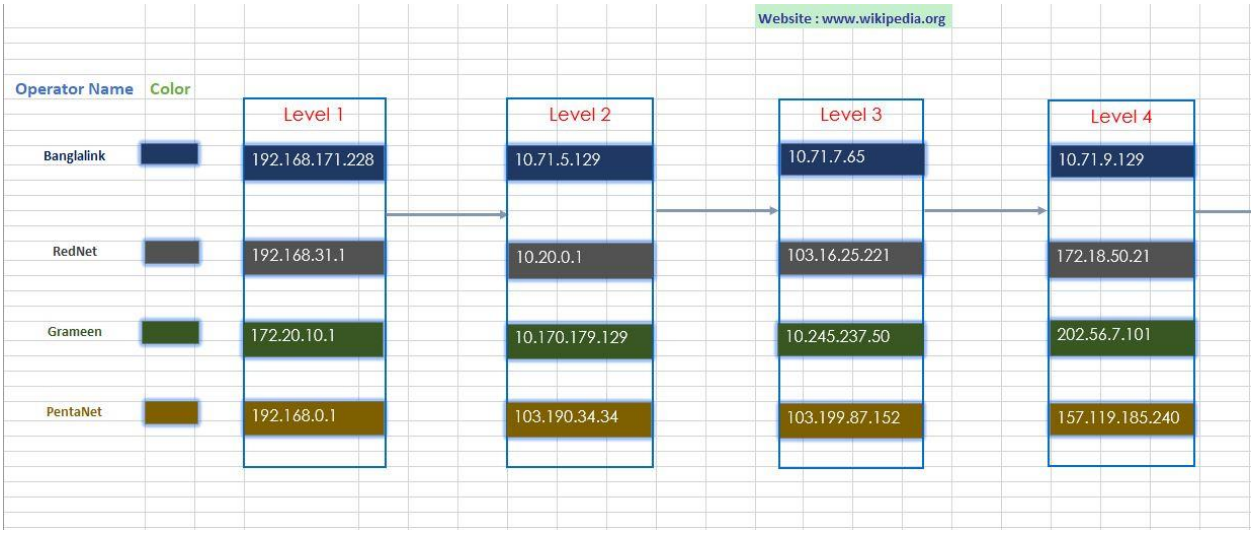


Fig 12: First-half excel sheet tracert

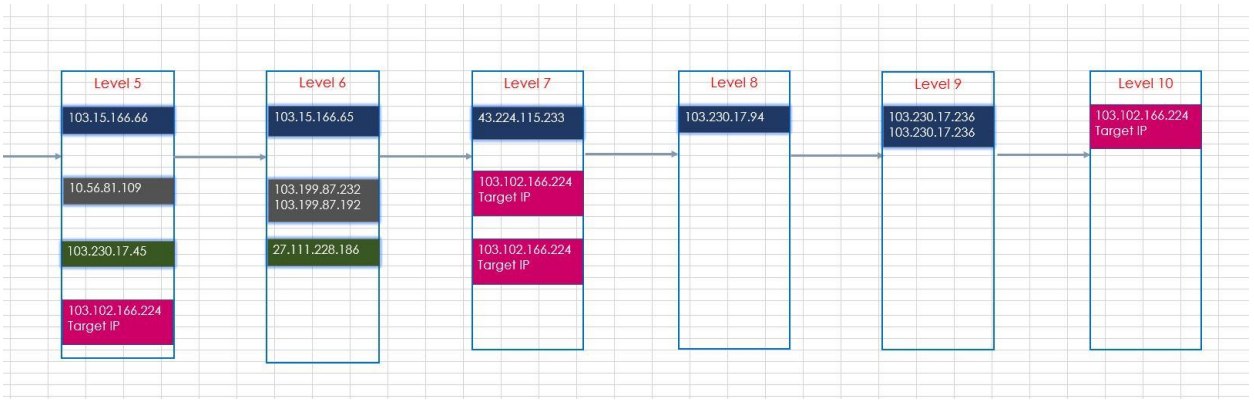


Fig 13: Last-half excel sheet tracert

Fig 14: Full excel sheet tracert

Fig 12-14 are the visualization of the Ip address and is drown in excel file.

6.Introduction to NS2

Network Simulator 2 (NS2) is a powerful and widely used open source discrete event network simulator. It is widely used in academic and research institutions as well as in industry for simulation and modeling of computer networks, communication networks, and other distributed systems. NS2 is capable of simulating wired, wireless and mobile networks, and offers a wide range of features, including routing protocols, traffic models, and an extensive library of simulation scripts. It also provides an extensible and easy-to-use programming interface for experimentation and development. NS2 is an ideal platform for network design, evaluation, and exploration.

Network simulator 2 is a Linux based software. For running ns2 in windows we need to install ubuntu operating system in windows PowerShell on WSL. After installing ubuntu we need to install nam, gedit, Xlunch and NS2. After installing this software into ubuntu then the ns2 will run.

7.Source code of NS2

The source code of NS2 are edit and store in TCL extension file.

```
#---------------------------------------------------
# This ns script has been created by the nam editor.
# If you edit it manually, the nam editor might not
# be able to open it properly in the future.
#
# EDITING BY HAND IS AT YOUR OWN RISK!
#---------------------------------------------------
# Create a new simulator object.
set ns [new Simulator]
# Create a nam trace datafile.
set namfile [open /home/h/output.nam w]
$ns namtrace-all $namfile

# Create wired nodes.
set node(28) [$ns node]
## node(28) at 531.389099,511.294434
$node(28) set X_ 531.389099
$node(28) set Y_ 511.294434
$node(28) set Z_ 0.0
$node(28) color "black"

set node(27) [$ns node]
## node(27) at 496.096039,512.314514
$node(27) set X_ 496.096039
$node(27) set Y_ 512.314514
$node(27) set Z_ 0.0
$node(27) color "black"

set node(26) [$ns node]
## node(26) at 462.231079,512.722534
$node(26) set X_ 462.231079
$node(26) set Y_ 512.722534
$node(26) set Z_ 0.0
$node(26) color "black"

set node(25) [$ns node]
## node(25) at 437.750336,514.150574
$node(25) set X_ 437.750336
$node(25) set Y_ 514.150574
$node(25) set Z_ 0.0
$node(25) color "purple"
$ns at 0.0 "$node(25) label penta"

set node(24) [$ns node]
## node(24) at 584.022583,538.223267
$node(24) set X_ 584.022583
$node(24) set Y_ 538.223267
$node(24) set Z_ 0.0
$node(24) color "black"

set node(23) [$ns node]
## node(23) at 556.889832,537.815308
$node(23) set X_ 556.889832
$node(23) set Y_ 537.815308
$node(23) set Z_ 0.0
$node(23) color "black"

set node(22) [$ns node]
## node(22) at 531.389099,537.407288
$node(22) set X_ 531.389099
$node(22) set Y_ 537.407288
$node(22) set Z_ 0.0
$node(22) color "black"

set node(21) [$ns node]
## node(21) at 486.915802,537.815308
$node(21) set X_ 486.915802
$node(21) set Y_ 537.815308
$node(21) set Z_ 0.0
$node(21) color "black"

set node(20) [$ns node]
## node(20) at 462.639099,538.427307
$node(20) set X_ 462.639099
$node(20) set Y_ 538.427307
$node(20) set Z_ 0.0
$node(20) color "black"

set node(19) [$ns node]
## node(19) at 432.854218,538.631287
$node(19) set X_ 432.854218
$node(19) set Y_ 538.631287
$node(19) set Z_ 0.0
$node(19) color "green"
$ns at 0.0 "$node(19) label grameen"

set node(18) [$ns node]
## node(18) at 548.525574,562.703979
$node(18) set X_ 548.525574
$node(18) set Y_ 562.703979
$node(18) set Z_ 0.0
$node(18) color "black"
```

```
 93
 94 set node(17) [$ns node]
 95 ## node(17) at 551.177673,581.676575
 96 $node(17) set X_ 551.177673
 97 $node(17) set Y_ 581.676575
 98 $node(17) set Z_ 0.0
 99 $node(17) color "black"
100
101 set node(16) [$ns node]
102 ## node(16) at 531.797119,576.168335
103 $node(16) set X_ 531.797119
104 $node(16) set Y_ 576.168335
105 $node(16) set Z_ 0.0
106 $node(16) color "black"
107
108 set node(15) [$ns node]
109 ## node(15) at 506.092346,576.576355
110 $node(15) set X_ 506.092346
111 $node(15) set Y_ 576.576355
112 $node(15) set Z_ 0.0
113 $node(15) color "black"
114
115 set node(14) [$ns node]
116 ## node(14) at 476.715485,577.188416
117 $node(14) set X_ 476.715485
118 $node(14) set Y_ 577.188416
119 $node(14) set Z_ 0.0
120 $node(14) color "black"
121
122 set node(13) [$ns node]
123 ## node(13) at 452.234772,578.004456
124 $node(13) set X_ 452.234772
125 $node(13) set Y_ 578.004456
126 $node(13) set Z_ 0.0
127 $node(13) color "black"
128
129 set node(12) [$ns node]
130 ## node(12) at 429.386108,578.208435
131 $node(12) set X_ 429.386108
132 $node(12) set Y_ 578.208435
133 $node(12) set Z_ 0.0
134 $node(12) color "red"
135 $ns at 0.0 "$node(12) label RedNet"
136
137 set node(11) [$ns node]
138 ## node(11) at 655.220947,559.644104
```

```
139 $node(11) set X_ 655.220947
140 $node(11) set Y_ 559.644104
141 $node(11) set Z_ 0.0
142 $node(11) color "black"
143
144 set node(10) [$ns node]
145 ## node(10) at 605.851257,597.180969
146 $node(10) set X_ 605.851257
147 $node(10) set Y_ 597.180969
148 $node(10) set Z_ 0.0
149 $node(10) color "black"
150
151 set node(9) [$ns node]
152 ## node(9) at 605.851257,615.949524
153 $node(9) set X_ 605.851257
154 $node(9) set Y_ 615.949524
155 $node(9) set Z_ 0.0
156 $node(9) color "black"
157
158 set node(8) [$ns node]
159 ## node(8) at 582.186523,607.585327
160 $node(8) set X_ 582.186523
161 $node(8) set Y_ 607.585327
162 $node(8) set Z_ 0.0
163 $node(8) color "black"
164
165 set node(7) [$ns node]
166 ## node(7) at 559.541870,607.789307
167 $node(7) set X_ 559.541870
168 $node(7) set Y_ 607.789307
169 $node(7) set Z_ 0.0
170 $node(7) color "black"
171
172 set node(6) [$ns node]
173 ## node(6) at 534.653198,607.585327
174 $node(6) set X_ 534.653198
175 $node(6) set Y_ 607.585327
176 $node(6) set Z_ 0.0
177 $node(6) color "black"
178
179 set node(5) [$ns node]
180 ## node(5) at 517.312683,607.789307
181 $node(5) set X_ 517.312683
182 $node(5) set Y_ 607.789307
183 $node(5) set Z_ 0.0
184 $node(5) color "black"
```

```
184 $node(5) color "black"
185
186 set node(4) [$ns node]
187 ## node(4) at 497.932098,607.993286
188 $node(4) set X_ 497.932098
189 $node(4) set Y_ 607.993286
190 $node(4) set Z_ 0.0
191 $node(4) color "black"
192
193 set node(3) [$ns node]
194 ## node(3) at 473.247375,609.625366
195 $node(3) set X_ 473.247375
196 $node(3) set Y_ 609.625366
197 $node(3) set Z_ 0.0
198 $node(3) color "black"
199
200 set node(2) [$ns node]
201 ## node(2) at 454.070831,609.829346
202 $node(2) set X_ 454.070831
203 $node(2) set Y_ 609.829346
204 $node(2) set Z_ 0.0
205 $node(2) color "black"
206
207 set node(1) [$ns node]
208 ## node(1) at 428.978088,611.461426
209 $node(1) set X_ 428.978088
210 $node(1) set Y_ 611.461426
211 $node(1) set Z_ 0.0
212 $node(1) color "blue"
213 $ns at 0.0 "$node(1) label Banglalink"
214
215
216 # Create links between nodes.
217 $ns simplex-link $node(28) $node(11) 1.000000Mb 20.000000ms DropTail
218 $ns simplex-link-op $node(28) $node(11) queuePos 0.5
219 $ns simplex-link-op $node(28) $node(11) color black
220 $ns simplex-link-op $node(28) $node(11) orient 21.3deg
221 # Set Queue Properties for link 28->11
222 [[$ns link $node(28) $node(11)] queue] set limit_ 20
223
224 $ns simplex-link $node(28) $node(27) 1.000000Mb 20.000000ms DropTail
225 $ns simplex-link-op $node(28) $node(27) queuePos 0.5
226 $ns simplex-link-op $node(28) $node(27) color black
227 $ns simplex-link-op $node(28) $node(27) orient 178.3deg
228 # Set Queue Properties for link 28->27
229 [[$ns link $node(28) $node(27)] queue] set limit_ 20
```

```
230
231 $ns simplex-link $node(27) $node(28) 1.000000Mb 20.000000ms DropTail
232 $ns simplex-link-op $node(27) $node(28) queuePos 0.5
233 $ns simplex-link-op $node(27) $node(28) color black
234 $ns simplex-link-op $node(27) $node(28) orient 358.3deg
235 # Set Queue Properties for link 27->28
236 [[$ns link $node(27) $node(28)] queue] set limit_ 20
237
238 $ns simplex-link $node(27) $node(26) 1.000000Mb 20.000000ms DropTail
239 $ns simplex-link-op $node(27) $node(26) queuePos 0.5
240 $ns simplex-link-op $node(27) $node(26) color black
241 $ns simplex-link-op $node(27) $node(26) orient 179.3deg
242 # Set Queue Properties for link 27->26
243 [[$ns link $node(27) $node(26)] queue] set limit_ 20
244
245 $ns simplex-link $node(26) $node(27) 1.000000Mb 20.000000ms DropTail
246 $ns simplex-link-op $node(26) $node(27) queuePos 0.5
247 $ns simplex-link-op $node(26) $node(27) color black
248 $ns simplex-link-op $node(26) $node(27) orient 359.3deg
249 # Set Queue Properties for link 26->27
250 [[$ns link $node(26) $node(27)] queue] set limit_ 20
251
252 $ns simplex-link $node(26) $node(25) 1.000000Mb 20.000000ms DropTail
253 $ns simplex-link-op $node(26) $node(25) queuePos 0.5
254 $ns simplex-link-op $node(26) $node(25) color black
255 $ns simplex-link-op $node(26) $node(25) orient 176.7deg
256 # Set Queue Properties for link 26->25
257 [[$ns link $node(26) $node(25)] queue] set limit_ 20
258
259 $ns simplex-link $node(25) $node(26) 1.000000Mb 20.000000ms DropTail
260 $ns simplex-link-op $node(25) $node(26) queuePos 0.5
261 $ns simplex-link-op $node(25) $node(26) color black
262 $ns simplex-link-op $node(25) $node(26) orient 356.7deg
263 # Set Queue Properties for link 25->26
264 [[$ns link $node(25) $node(26)] queue] set limit_ 20
265
266 $ns simplex-link $node(24) $node(11) 1.000000Mb 20.000000ms DropTail
267 $ns simplex-link-op $node(24) $node(11) queuePos 0.5
268 $ns simplex-link-op $node(24) $node(11) color black
269 $ns simplex-link-op $node(24) $node(11) orient 16.7deg
270 # Set Queue Properties for link 24->11
271 [[$ns link $node(24) $node(11)] queue] set limit_ 20
272
273 $ns simplex-link $node(24) $node(23) 1.000000Mb 20.000000ms DropTail
274 $ns simplex-link-op $node(24) $node(23) queuePos 0.5
275 $ns simplex-link-op $node(24) $node(23) color black
```

```
278 [[$ns link $node(24) $node(23)] queue] set limit_ 20
279
280 $ns simplex-link $node(23) $node(24) 1.000000Mb 20.000000ms DropTail
281 $ns simplex-link-op $node(23) $node(24) queuePos 0.5
282 $ns simplex-link-op $node(23) $node(24) color black
283 $ns simplex-link-op $node(23) $node(24) orient 0.9deg
284 # Set Queue Properties for link 23->24
285 [[$ns link $node(23) $node(24)] queue] set limit_ 20
286
287 $ns simplex-link $node(23) $node(22) 1.000000Mb 20.000000ms DropTail
288 $ns simplex-link-op $node(23) $node(22) queuePos 0.5
289 $ns simplex-link-op $node(23) $node(22) color black
290 $ns simplex-link-op $node(23) $node(22) orient 180.9deg
291 # Set Queue Properties for link 23->22
292 [[$ns link $node(23) $node(22)] queue] set limit_ 20
293
294 $ns simplex-link $node(22) $node(23) 1.000000Mb 20.000000ms DropTail
295 $ns simplex-link-op $node(22) $node(23) queuePos 0.5
296 $ns simplex-link-op $node(22) $node(23) color black
297 $ns simplex-link-op $node(22) $node(23) orient 0.9deg
298 # Set Queue Properties for link 22->23
299 [[$ns link $node(22) $node(23)] queue] set limit_ 20
300
301 $ns simplex-link $node(22) $node(21) 1.000000Mb 20.000000ms DropTail
302 $ns simplex-link-op $node(22) $node(21) queuePos 0.5
303 $ns simplex-link-op $node(22) $node(21) color black
304 $ns simplex-link-op $node(22) $node(21) orient 179.5deg
305 # Set Queue Properties for link 22->21
306 [[$ns link $node(22) $node(21)] queue] set limit_ 20
307
308 $ns simplex-link $node(21) $node(22) 1.000000Mb 20.000000ms DropTail
309 $ns simplex-link-op $node(21) $node(22) queuePos 0.5
310 $ns simplex-link-op $node(21) $node(22) color black
311 $ns simplex-link-op $node(21) $node(22) orient 359.5deg
312 # Set Queue Properties for link 21->22
313 [[$ns link $node(21) $node(22)] queue] set limit_ 20
314
315 $ns simplex-link $node(21) $node(20) 1.000000Mb 20.000000ms DropTail
316 $ns simplex-link-op $node(21) $node(20) queuePos 0.5
317 $ns simplex-link-op $node(21) $node(20) color black
318 $ns simplex-link-op $node(21) $node(20) orient 178.6deg
319 # Set Queue Properties for link 21->20
320 [[$ns link $node(21) $node(20)] queue] set limit_ 20
321
322 $ns simplex-link $node(20) $node(21) 1.000000Mb 20.000000ms DropTail
```

```
$ns simplex-link $node(20) $node(21) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(20) $node(21) queuePos 0.5
$ns simplex-link-op $node(20) $node(21) color black
$ns simplex-link-op $node(20) $node(21) orient 358.6deg
# Set Queue Properties for link 20->21
[[$ns link $node(20) $node(21)] queue] set limit_ 20

$ns simplex-link $node(20) $node(19) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(20) $node(19) queuePos 0.5
$ns simplex-link-op $node(20) $node(19) color black
$ns simplex-link-op $node(20) $node(19) orient 179.6deg
# Set Queue Properties for link 20->19
[[$ns link $node(20) $node(19)] queue] set limit_ 20

$ns simplex-link $node(19) $node(20) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(19) $node(20) queuePos 0.5
$ns simplex-link-op $node(19) $node(20) color black
$ns simplex-link-op $node(19) $node(20) orient 359.6deg
# Set Queue Properties for link 19->20
[[$ns link $node(19) $node(20)] queue] set limit_ 20

$ns simplex-link $node(18) $node(11) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(18) $node(11) queuePos 0.5
$ns simplex-link-op $node(18) $node(11) color black
$ns simplex-link-op $node(18) $node(11) orient 358.4deg
# Set Queue Properties for link 18->11
[[$ns link $node(18) $node(11)] queue] set limit_ 20

$ns simplex-link $node(18) $node(16) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(18) $node(16) queuePos 0.5
$ns simplex-link-op $node(18) $node(16) color black
$ns simplex-link-op $node(18) $node(16) orient 141.2deg
# Set Queue Properties for link 18->16
[[$ns link $node(18) $node(16)] queue] set limit_ 20

$ns simplex-link $node(17) $node(11) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(17) $node(11) queuePos 0.5
$ns simplex-link-op $node(17) $node(11) color black
$ns simplex-link-op $node(17) $node(11) orient 348.0deg
# Set Queue Properties for link 17->11
[[$ns link $node(17) $node(11)] queue] set limit_ 20

$ns simplex-link $node(17) $node(16) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(17) $node(16) queuePos 0.5
$ns simplex-link-op $node(17) $node(16) color black
$ns simplex-link-op $node(17) $node(16) orient 195.9deg
```

```
$ns simplex-link-op $node(17) $node(16) orient 195.9deg
# Set Queue Properties for link 17->16
[[$ns link $node(17) $node(16)] queue] set limit_ 20

$ns simplex-link $node(16) $node(18) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(16) $node(18) queuePos 0.5
$ns simplex-link-op $node(16) $node(18) color black
$ns simplex-link-op $node(16) $node(18) orient 321.2deg
# Set Queue Properties for link 16->18
[[$ns link $node(16) $node(18)] queue] set limit_ 20

$ns simplex-link $node(16) $node(17) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(16) $node(17) queuePos 0.5
$ns simplex-link-op $node(16) $node(17) color black
$ns simplex-link-op $node(16) $node(17) orient 15.9deg
# Set Queue Properties for link 16->17
[[$ns link $node(16) $node(17)] queue] set limit_ 20

$ns simplex-link $node(16) $node(15) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(16) $node(15) queuePos 0.5
$ns simplex-link-op $node(16) $node(15) color black
$ns simplex-link-op $node(16) $node(15) orient 179.1deg
# Set Queue Properties for link 16->15
[[$ns link $node(16) $node(15)] queue] set limit_ 20

$ns simplex-link $node(15) $node(16) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(15) $node(16) queuePos 0.5
$ns simplex-link-op $node(15) $node(16) color black
$ns simplex-link-op $node(15) $node(16) orient 359.1deg
# Set Queue Properties for link 15->16
[[$ns link $node(15) $node(16)] queue] set limit_ 20

$ns simplex-link $node(15) $node(14) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(15) $node(14) queuePos 0.5
$ns simplex-link-op $node(15) $node(14) color black
$ns simplex-link-op $node(15) $node(14) orient 178.8deg
# Set Queue Properties for link 15->14
[[$ns link $node(15) $node(14)] queue] set limit_ 20

$ns simplex-link $node(14) $node(15) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(14) $node(15) queuePos 0.5
$ns simplex-link-op $node(14) $node(15) color black
$ns simplex-link-op $node(14) $node(15) orient 358.8deg
# Set Queue Properties for link 14->15
[[$ns link $node(14) $node(15)] queue] set limit_ 20

```

```

$ns simplex-link $node(14) $node(13) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(14) $node(13) queuePos 0.5
$ns simplex-link-op $node(14) $node(13) color black
$ns simplex-link-op $node(14) $node(13) orient 178.1deg
# Set Queue Properties for link 14->13
[[$ns link $node(14) $node(13)] queue] set limit_ 20

$ns simplex-link $node(13) $node(14) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(13) $node(14) queuePos 0.5
$ns simplex-link-op $node(13) $node(14) color black
$ns simplex-link-op $node(13) $node(14) orient 358.1deg
# Set Queue Properties for link 13->14
[[$ns link $node(13) $node(14)] queue] set limit_ 20

$ns simplex-link $node(13) $node(12) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(13) $node(12) queuePos 0.5
$ns simplex-link-op $node(13) $node(12) color black
$ns simplex-link-op $node(13) $node(12) orient 179.5deg
# Set Queue Properties for link 13->12
[[$ns link $node(13) $node(12)] queue] set limit_ 20

$ns simplex-link $node(12) $node(13) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(12) $node(13) queuePos 0.5
$ns simplex-link-op $node(12) $node(13) color black
$ns simplex-link-op $node(12) $node(13) orient 359.5deg
# Set Queue Properties for link 12->13
[[$ns link $node(12) $node(13)] queue] set limit_ 20

$ns simplex-link $node(11) $node(28) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(11) $node(28) queuePos 0.5
$ns simplex-link-op $node(11) $node(28) color black
$ns simplex-link-op $node(11) $node(28) orient 201.3deg
# Set Queue Properties for link 11->28
[[$ns link $node(11) $node(28)] queue] set limit_ 20

$ns simplex-link $node(11) $node(24) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(11) $node(24) queuePos 0.5
$ns simplex-link-op $node(11) $node(24) color black
$ns simplex-link-op $node(11) $node(24) orient 196.7deg
# Set Queue Properties for link 11->24
[[$ns link $node(11) $node(24)] queue] set limit_ 20

$ns simplex-link $node(11) $node(18) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(11) $node(18) queuePos 0.5
$ns simplex-link-op $node(11) $node(18) color black
```

```
[[$ns link $node(11) $node(17)] queue] set limit_ 20

$ns simplex-link $node(11) $node(10) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(11) $node(10) queuePos 0.5
$ns simplex-link-op $node(11) $node(10) color black
$ns simplex-link-op $node(11) $node(10) orient 142.8deg
# Set Queue Properties for link 11->10
[[$ns link $node(11) $node(10)] queue] set limit_ 20

$ns simplex-link $node(11) $node(9) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(11) $node(9) queuePos 0.5
$ns simplex-link-op $node(11) $node(9) color black
$ns simplex-link-op $node(11) $node(9) orient 131.2deg
# Set Queue Properties for link 11->9
[[$ns link $node(11) $node(9)] queue] set limit_ 20

$ns simplex-link $node(10) $node(11) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(10) $node(11) queuePos 0.5
$ns simplex-link-op $node(10) $node(11) color black
$ns simplex-link-op $node(10) $node(11) orient 322.8deg
# Set Queue Properties for link 10->11
[[$ns link $node(10) $node(11)] queue] set limit_ 20

$ns simplex-link $node(10) $node(8) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(10) $node(8) queuePos 0.5
$ns simplex-link-op $node(10) $node(8) color black
$ns simplex-link-op $node(10) $node(8) orient 156.3deg
# Set Queue Properties for link 10->8
[[$ns link $node(10) $node(8)] queue] set limit_ 20

$ns simplex-link $node(9) $node(11) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(9) $node(11) queuePos 0.5
$ns simplex-link-op $node(9) $node(11) color black
$ns simplex-link-op $node(9) $node(11) orient 311.2deg
# Set Queue Properties for link 9->11
[[$ns link $node(9) $node(11)] queue] set limit_ 20

$ns simplex-link $node(9) $node(8) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(9) $node(8) queuePos 0.5
$ns simplex-link-op $node(9) $node(8) color black
$ns simplex-link-op $node(9) $node(8) orient 199.5deg
# Set Queue Properties for link 9->8
[[$ns link $node(9) $node(8)] queue] set limit_ 20

$ns simplex-link $node(8) $node(10) 1.000000Mb 20.000000ms DropTail
```

```
561 $ns simplex-link-op $node(5) $node(6) queuePos 0.5
562 $ns simplex-link-op $node(5) $node(6) color black
563 $ns simplex-link-op $node(5) $node(6) orient 359.3deg
564 # Set Queue Properties for link 5->6
565 [[$ns link $node(5) $node(6)] queue] set limit_ 20
566
567 $ns simplex-link $node(5) $node(4) 1.000000Mb 20.000000ms DropTail
568 $ns simplex-link-op $node(5) $node(4) queuePos 0.5
569 $ns simplex-link-op $node(5) $node(4) color black
570 $ns simplex-link-op $node(5) $node(4) orient 179.4deg
571 # Set Queue Properties for link 5->4
572 [[$ns link $node(5) $node(4)] queue] set limit_ 20
573
574 $ns simplex-link $node(4) $node(5) 1.000000Mb 20.000000ms DropTail
575 $ns simplex-link-op $node(4) $node(5) queuePos 0.5
576 $ns simplex-link-op $node(4) $node(5) color black
577 $ns simplex-link-op $node(4) $node(5) orient 359.4deg
578 # Set Queue Properties for link 4->5
579 [[$ns link $node(4) $node(5)] queue] set limit_ 20
580
581 $ns simplex-link $node(4) $node(3) 1.000000Mb 20.000000ms DropTail
582 $ns simplex-link-op $node(4) $node(3) queuePos 0.5
583 $ns simplex-link-op $node(4) $node(3) color black
584 $ns simplex-link-op $node(4) $node(3) orient 176.2deg
585 # Set Queue Properties for link 4->3
586 [[$ns link $node(4) $node(3)] queue] set limit_ 20
587
588 $ns simplex-link $node(3) $node(4) 1.000000Mb 20.000000ms DropTail
589 $ns simplex-link-op $node(3) $node(4) queuePos 0.5
590 $ns simplex-link-op $node(3) $node(4) color black
591 $ns simplex-link-op $node(3) $node(4) orient 356.2deg
592 # Set Queue Properties for link 3->4
593 [[$ns link $node(3) $node(4)] queue] set limit_ 20
594
595 $ns simplex-link $node(3) $node(2) 1.000000Mb 20.000000ms DropTail
596 $ns simplex-link-op $node(3) $node(2) queuePos 0.5
597 $ns simplex-link-op $node(3) $node(2) color black
598 $ns simplex-link-op $node(3) $node(2) orient 179.4deg
599 # Set Queue Properties for link 3->2
600 [[$ns link $node(3) $node(2)] queue] set limit_ 20
601
602 $ns simplex-link $node(2) $node(3) 1.000000Mb 20.000000ms DropTail
603 $ns simplex-link-op $node(2) $node(3) queuePos 0.5
604 $ns simplex-link-op $node(2) $node(3) color black
605 $ns simplex-link-op $node(2) $node(3) orient 359.4deg
606 # Set Queue Properties for link 2->3
```

```
631 $agent(7) set packetSize_ 210
632 $agent(7) set window_ 20
633 $agent(7) set windowInit_ 1
634 $agent(7) set maxcwnd_ 0
635
636 # Create traffic sources and add them to the agent.
637 set traffic_source(4) [new Application/FTP]
638 $traffic_source(4) attach-agent $agent(7)
639 $traffic_source(4) set maxpkts_ 256
640 set agent(5) [new Agent/TCP]
641 $ns attach-agent $node(19) $agent(5)
642
643 $ns color 5 "#00cc66"
644 $agent(5) set fid_ 5
645 $agent(5) set packetSize_ 210
646 $agent(5) set window_ 20
647 $agent(5) set windowInit_ 1
648 $agent(5) set maxcwnd_ 0
649
650 # Create traffic sources and add them to the agent.
651 set traffic_source(3) [new Application/FTP]
652 $traffic_source(3) attach-agent $agent(5)
653 $traffic_source(3) set maxpkts_ 256
654 set agent(3) [new Agent/TCP]
655 $ns attach-agent $node(12) $agent(3)
656
657 $ns color 3 "#990099"
658 $agent(3) set fid_ 3
659 $agent(3) set packetSize_ 210
660 $agent(3) set window_ 20
661 $agent(3) set windowInit_ 1
662 $agent(3) set maxcwnd_ 0
663
664 # Create traffic sources and add them to the agent.
665 set traffic_source(2) [new Application/FTP]
666 $traffic_source(2) attach-agent $agent(3)
667 $traffic_source(2) set maxpkts_ 256
668 set agent(8) [new Agent/TCPSink]
669 $ns attach-agent $node(11) $agent(8)
670 $agent(8) set packetSize_ 210
671 set agent(6) [new Agent/TCPSink]
672 $ns attach-agent $node(11) $agent(6)
673 $agent(6) set packetSize_ 210
674 set agent(4) [new Agent/TCPSink]
675 $ns attach-agent $node(11) $agent(4)
```

```
679 $agent(2) set packetSize_ 210
680 set agent(1) [new Agent/TCP]
681 $ns attach-agent $node(1) $agent(1)
682
683 $ns color 1 "#0000cc"
684 $agent(1) set fid_ 1
685 $agent(1) set packetSize_ 210
686 $agent(1) set window_ 20
687 $agent(1) set windowInit_ 1
688 $agent(1) set maxcwnd_ 0
689
690 # Create traffic sources and add them to the agent.
691 set traffic_source(1) [new Application/FTP]
692 $traffic_source(1) attach-agent $agent(1)
693 $traffic_source(1) set maxpkts_ 256
694
695 # Connect agents.
696 $ns connect $agent(7) $agent(8)
697
698
699 # Traffic Source actions.
700 $ns at 1.000000 "$traffic_source(4) start"
701 $ns connect $agent(5) $agent(6)
702
703
704 # Traffic Source actions.
705 $ns at 1.000000 "$traffic_source(3) start"
706 $ns connect $agent(3) $agent(4)
707
708
709 # Traffic Source actions.
710 $ns at 1.000000 "$traffic_source(2) start"
711 $ns connect $agent(1) $agent(2)
712
713
714 # Traffic Source actions.
715 $ns at 1.000000 "$traffic_source(1) start"
716 # Run the simulation
717 proc finish {} {
718         global ns namfile
719         $ns flush-trace
720         close $namfile
721         exec nam -r 2000.000000us /home/h/output.nam &
722         exit 0
723         }
724 $ns at 60.000000 "finish"
```

Fig 15: Source code of NS2

8.Output topology of NS2

After completing the coding into TCL file then running the code then this graphical inter face will be shown.

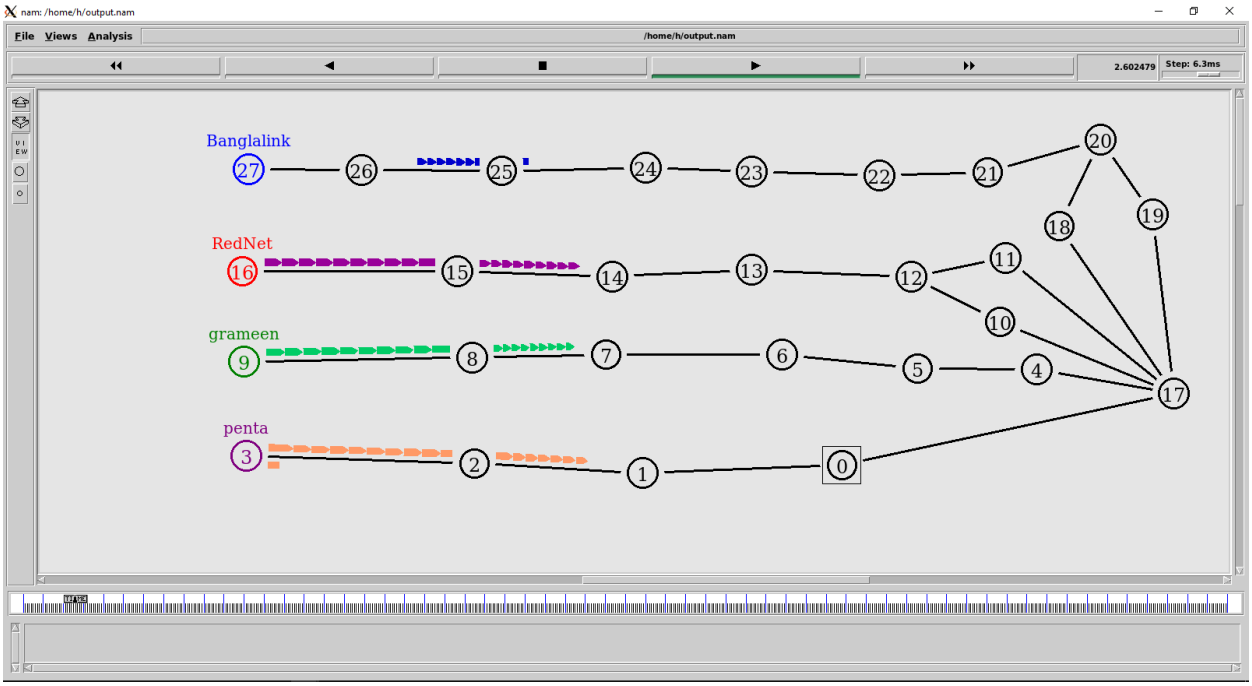


Fig 16: Fast output of NS2

Fig 16 is the starting position of the NS2. Here we can see that the data packet is very small and they are started to going to the target point. The data packet is going serially by one by one.

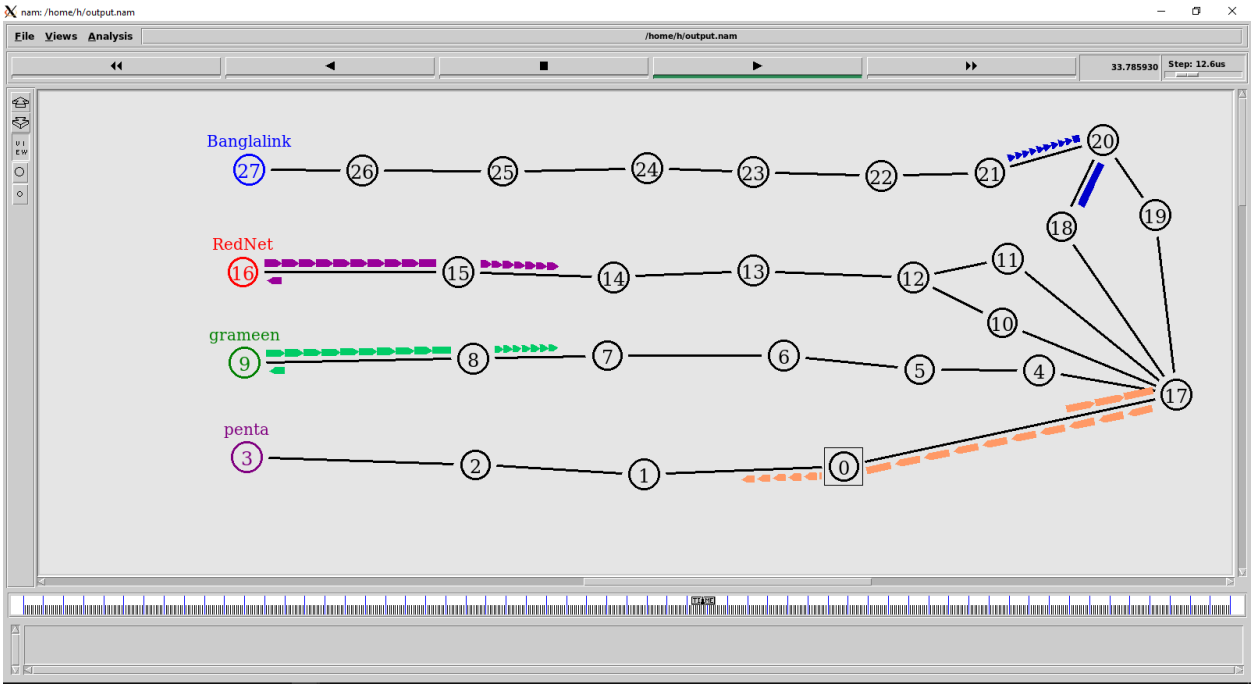


Fig 17: Second output of NS2

Fig 17 is the middle position of the ns2. In this position we can see that the data packets are going to the target point and the target point are sending back the data. It called hand shaking method.

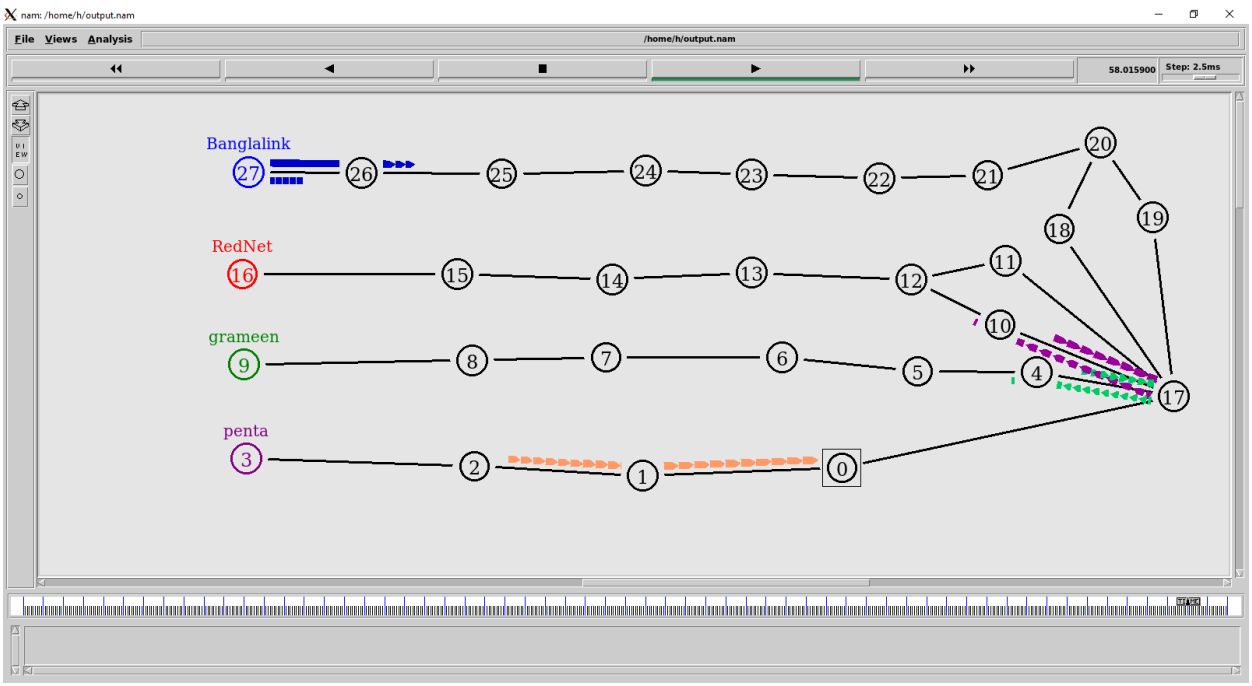


Fig 18: Third output of NS2

Fig 18 is the last position of the ns2. In this position we can see that the data packets are going to the target point but the data packets are very smaller and they are return into starting point.

9.Summarization of the designed network

When we run the code of NS2 its look like this. But it not clear and not visible. For a clear visibility we need to re-position the node.

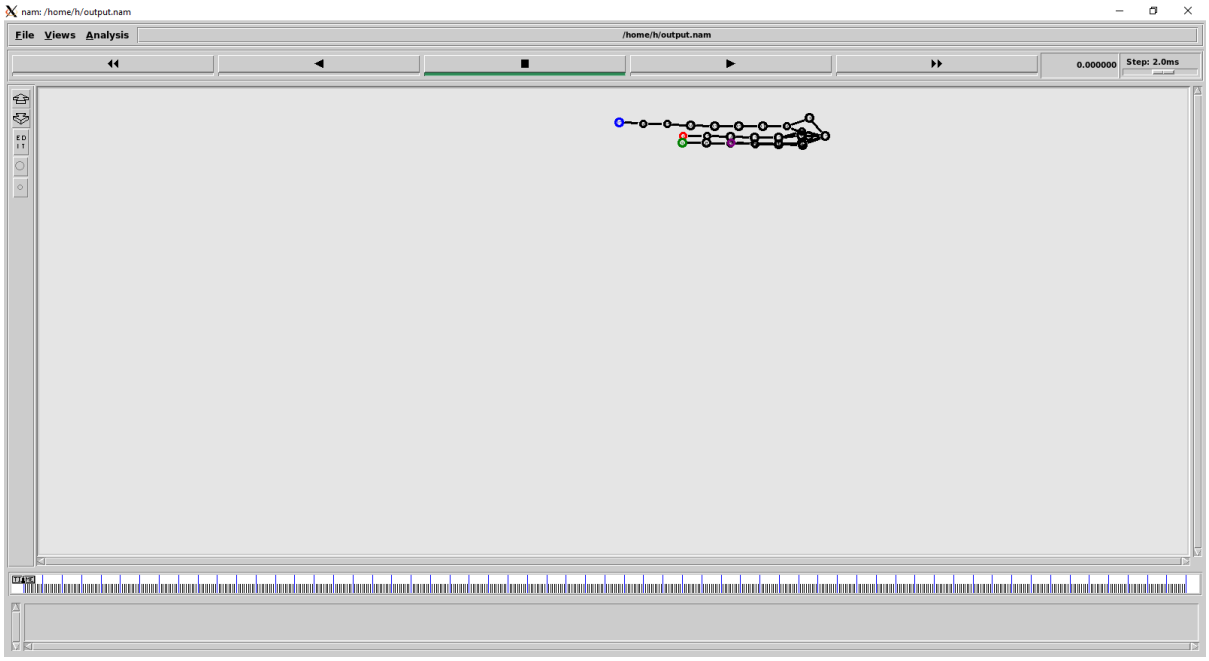


Fig 19: After Run the code

Here, Fig 19 we see that node are not visible. For visualizing this first we need to zoom in the size of the node then need to be press the edit button then the node is can be move able and clear.

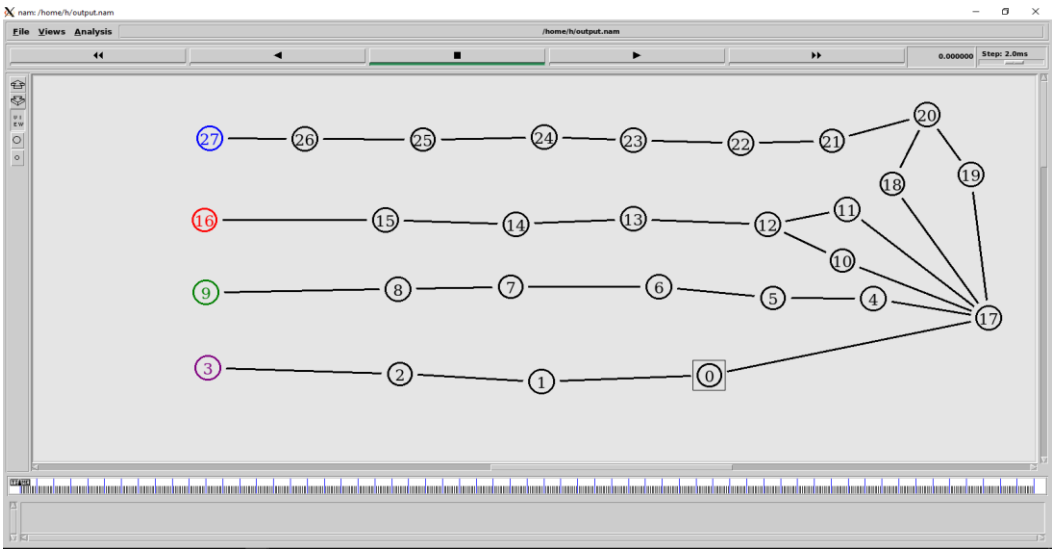


Fig 20: After Resurrection the node

Fig 20 is the clear view of the output. After editing the node these is the view of output.

10.Conclusion

The network lab was a great learning experience for everyone involved. We were able to gain a better understanding of networking concepts and how to apply them in different scenarios. We also learned about different tools and techniques used to troubleshoot and configure networks. This lab was a great opportunity to practice the skills we have been learning in the classroom and to gain hands-on experience with networking. With the knowledge gained from this lab, we can now more confidently configure, maintain, and troubleshoot networks.

Zen map and Network Simulator 2 are powerful tools for network administrators to use in order to test and troubleshoot network configurations. Zen map provides a graphical user interface for network scanning and security auditing, while Network Simulator 2 allows users to model and simulate networks for testing purposes. Both tools are easy to use and can help administrators to quickly identify and resolve network issues. Additionally, both tools are free and open source, making them accessible to a wide range of users.

11.Reference

[1] https://beta.openai.com/playground