North Western University

Title: Introduction to Computer Network Using NS2 Based on the Domain as www.github.com

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1. Bird's Eye View of the project:

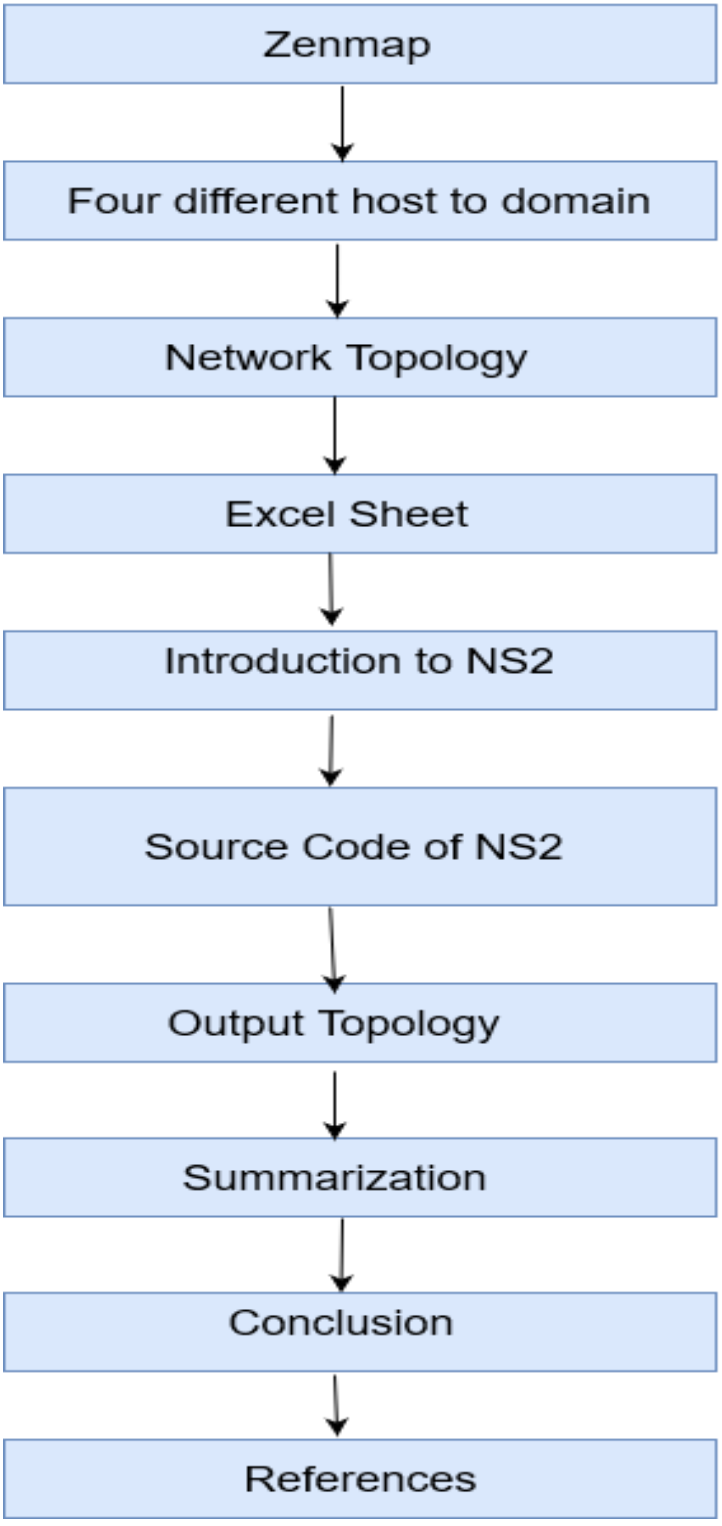


Fig 1: Bird's eye view of the project.

2. Introduction to Zenmap:

Zenmap is an official Nmap Security scanner GUI (graphical user interface), multi-platform, free and open-source application which gives users a friendly interface. It has advanced features for experienced users and a command creator which lets interactive creation of Nmap command lines. Results of scans can be saved to review later and can be compared with one another (results of scans are stored in a database). It is a cross platform application available for Linux, Windows, and OS X. In 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.

Features of 'Zenmap'

- Zenmap keeps track of scans until deleted
- Zenmap command profiles make it easy to run same scan more than once
- No need for a shell script to do common scan

Zenmap analyses and displays the complete details related to hosts such as OS version, installed services, services status and uptime etc.

3. Four different host to domain

Domain name: www.github.com

A domain name is a unique, easy-to-remember address used to access websites, such as 'google.com', and 'github.com'. Users can connect to websites using domain names thanks to the DNS system. Domain Registration.

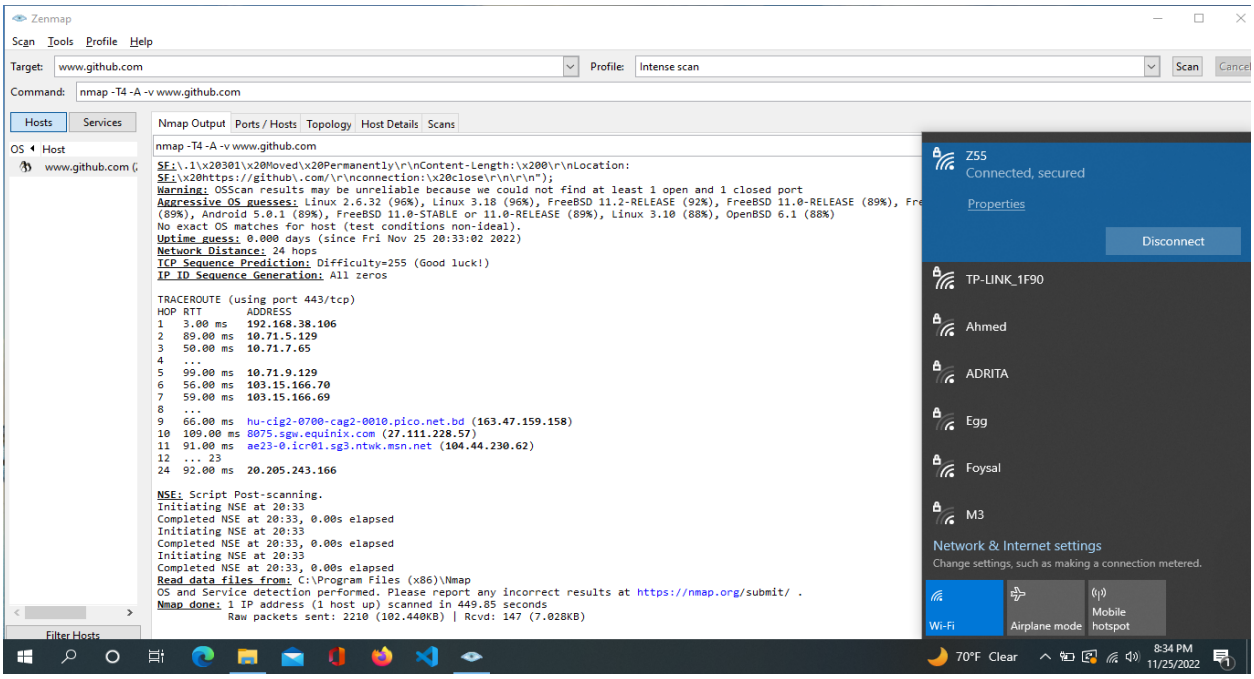


Fig 2: Banglalink network Zen map scan output.

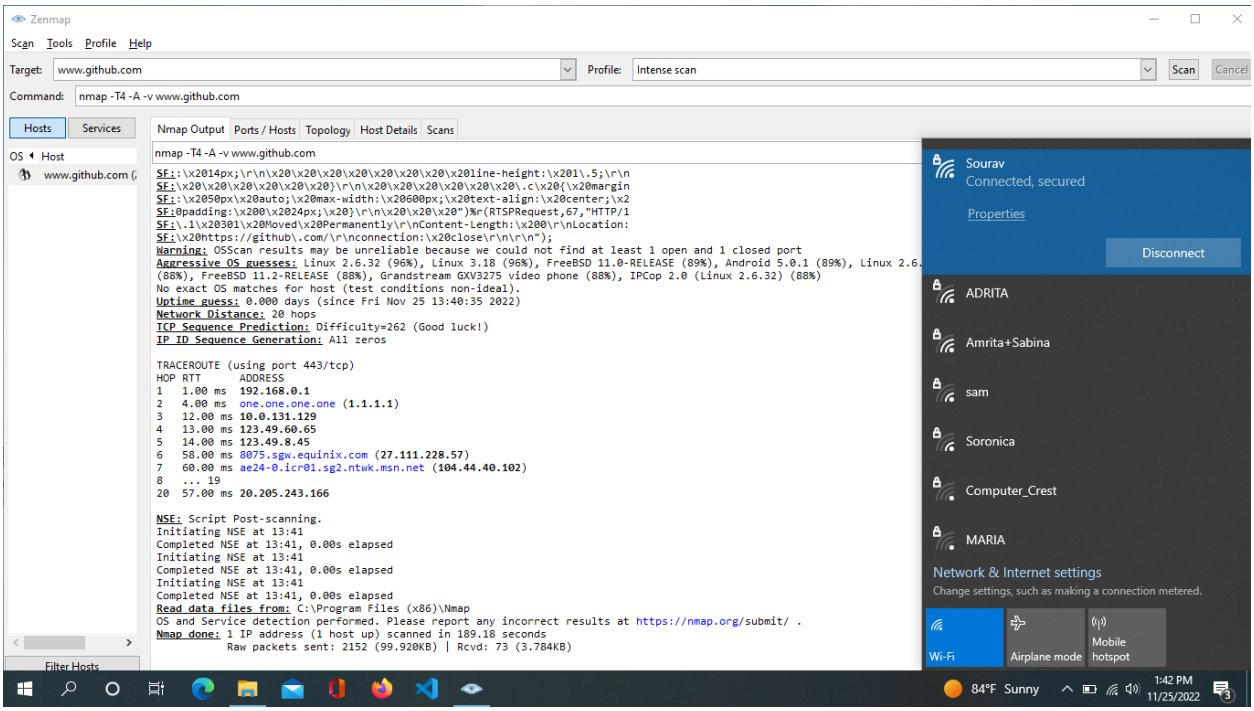


Fig 3: Radiant Network ISP Zen map scan output.

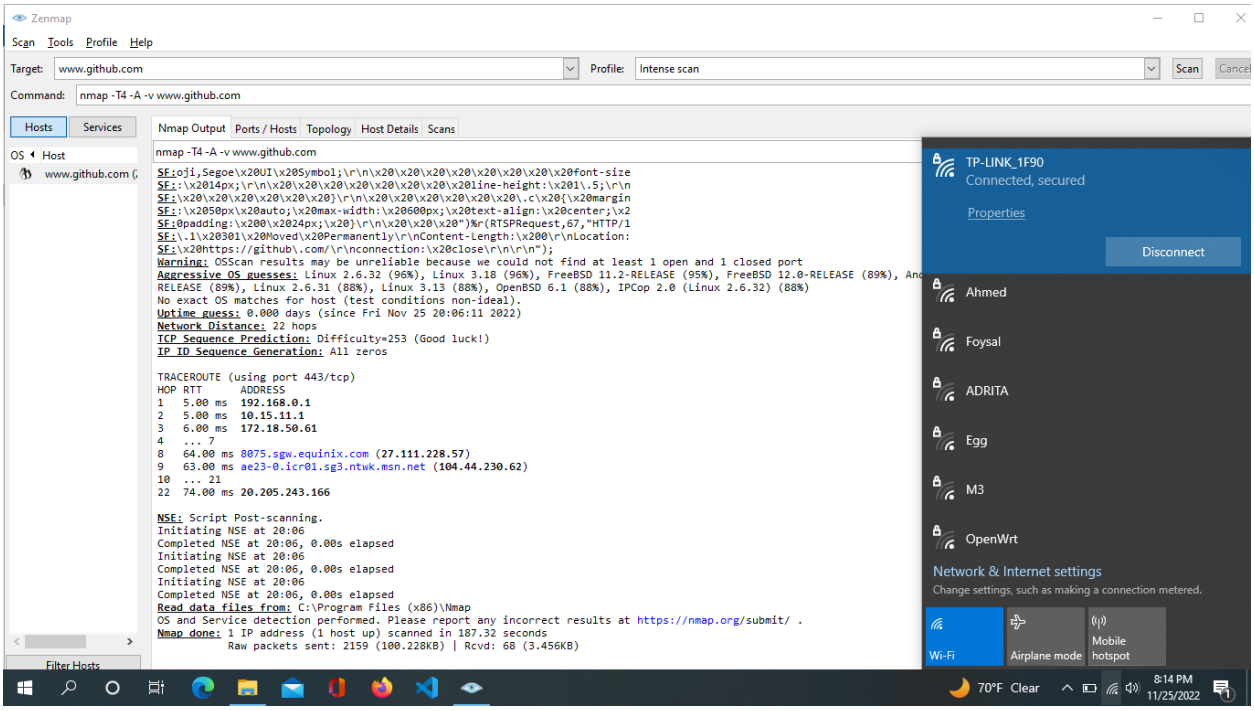


Fig 4: Red Network ISP Zen map scan output.

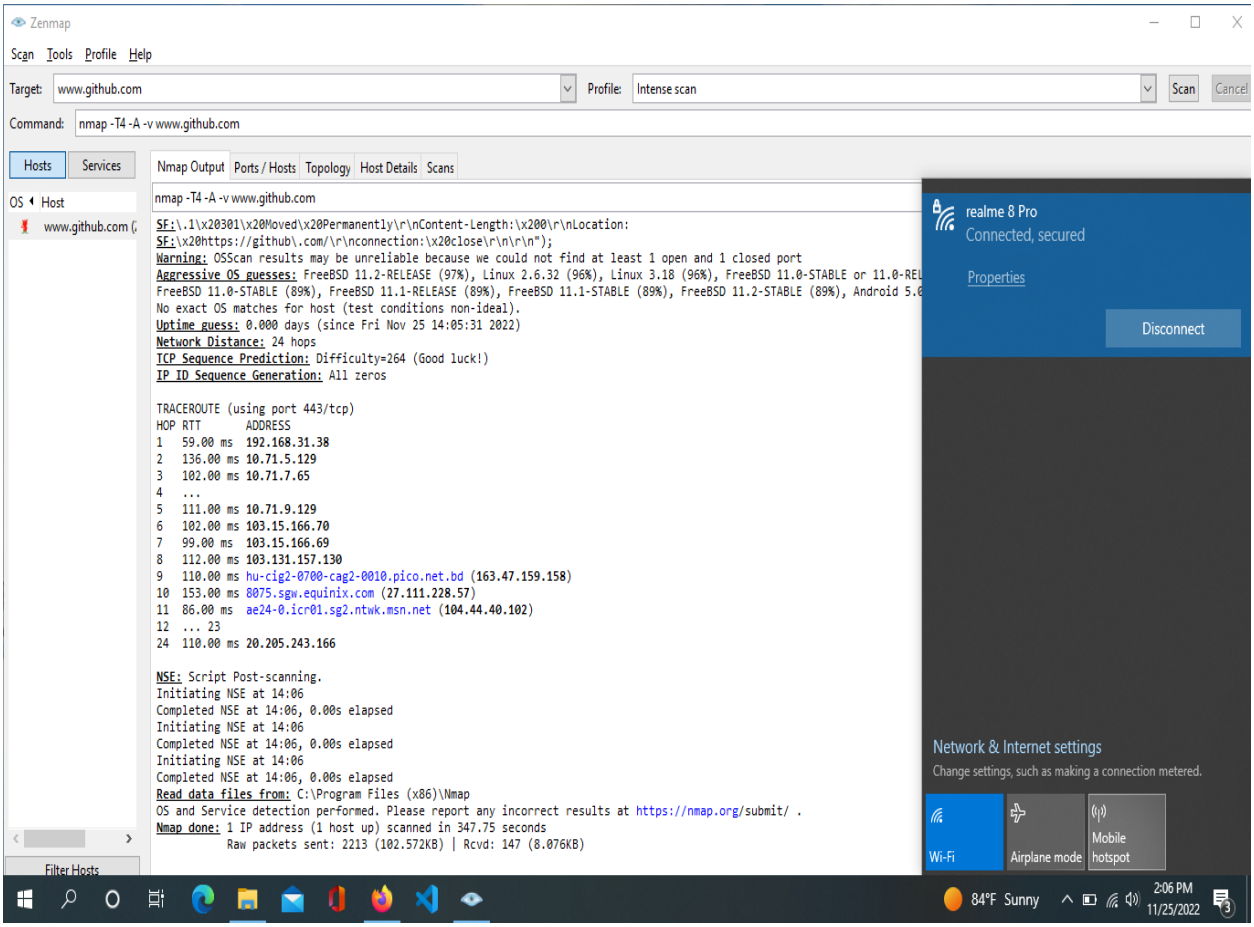


Fig 5: Robi network Zen map scan output.

4. Design Network Topology

A network topology is the physical and logical arrangement of nodes and connections in a network.

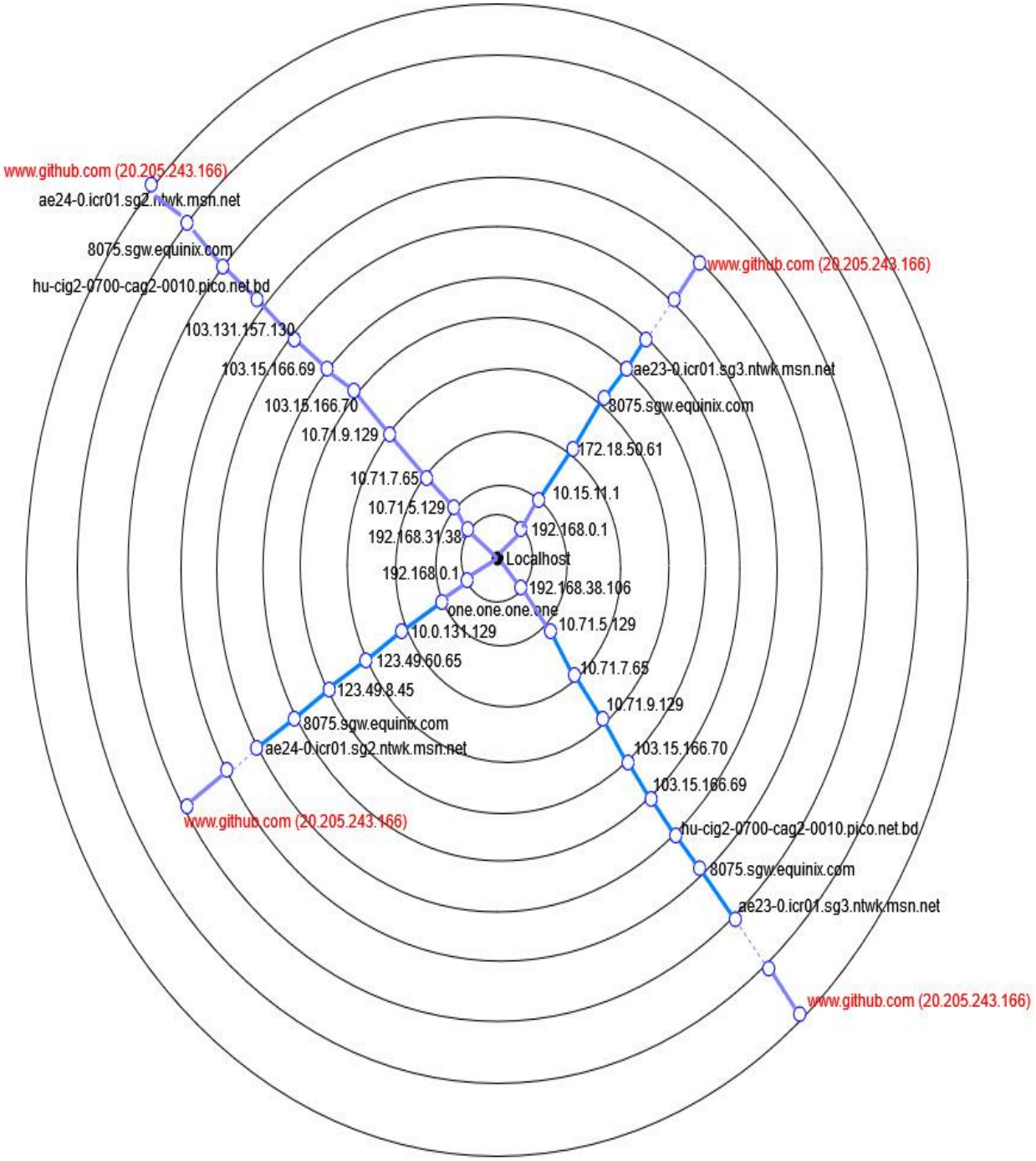
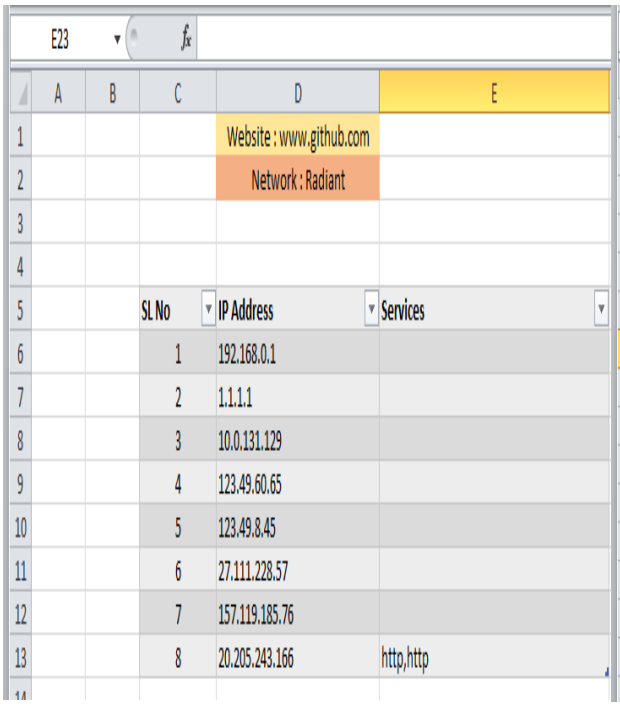


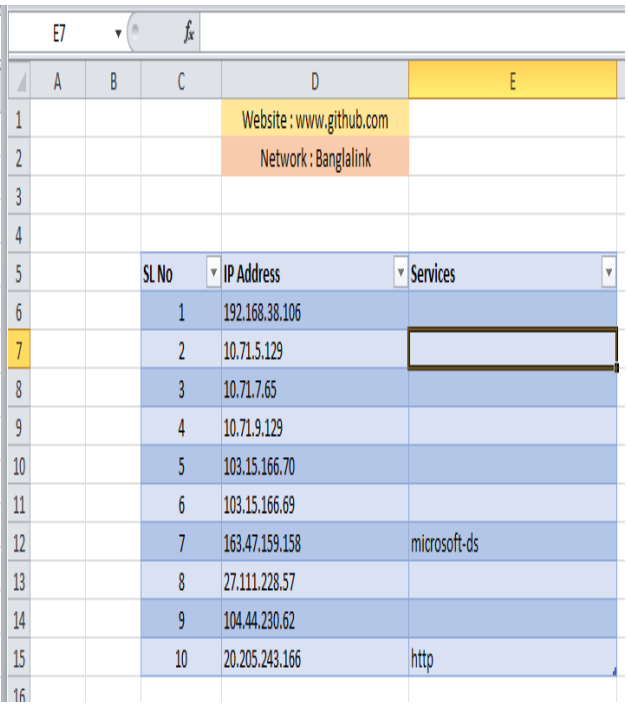
Fig 6: Network topology of Github

5. Excel sheet for Network Diagram:



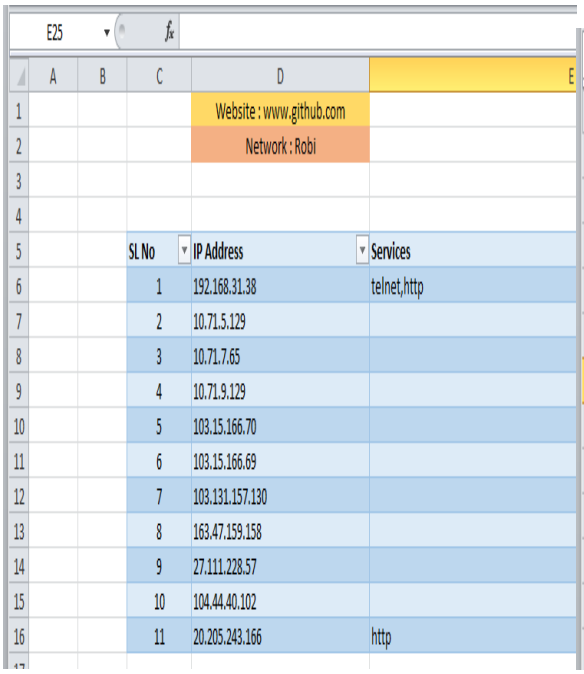
	A	B	C	D	E
1				Website : www.github.com	
2				Network : Radiant	
3					
4					
5			SL No	IP Address	Services
6			1	192.168.0.1	
7			2	1.1.1.1	
8			3	10.0.131.129	
9			4	123.49.60.65	
10			5	123.49.8.45	
11			6	27.111.228.57	
12			7	157.119.185.76	
13			8	20.205.243.166	http,http

Fig 7: Service table of Radiant.



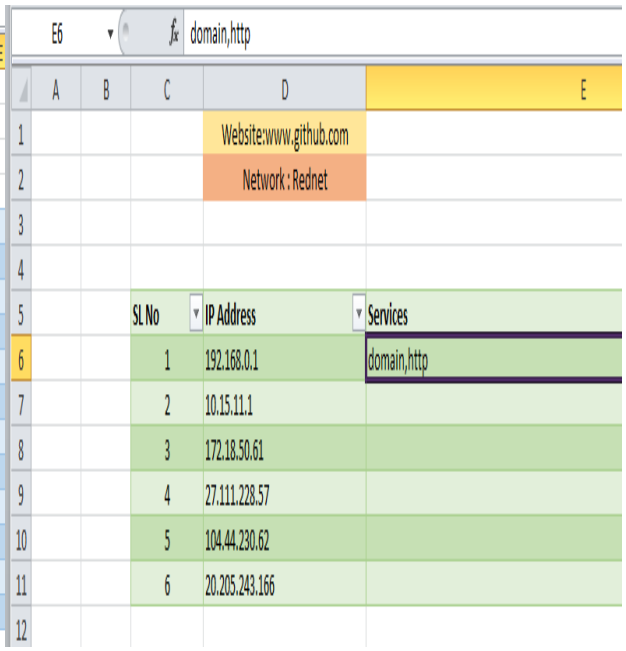
	A	B	C	D	E
1				Website : www.github.com	
2				Network : Banglalink	
3					
4					
5			SL No	IP Address	Services
6			1	192.168.38.106	
7			2	10.71.5.129	
8			3	10.71.7.65	
9			4	10.71.9.129	
10			5	103.15.166.70	
11			6	103.15.166.69	
12			7	163.47.159.158	microsoft-ds
13			8	27.111.228.57	
14			9	104.44.230.62	
15			10	20.205.243.166	http

Fig 8: Service table of Banglalink.



	A	B	C	D	E
1				Website : www.github.com	
2				Network : Robi	
3					
4					
5			SL No	IP Address	Services
6			1	192.168.31.38	telnet,http
7			2	10.71.5.129	
8			3	10.71.7.65	
9			4	10.71.9.129	
10			5	103.15.166.70	
11			6	103.15.166.69	
12			7	103.131.157.130	
13			8	163.47.159.158	
14			9	27.111.228.57	
15			10	104.44.40.102	
16			11	20.205.243.166	http

Fig 9: Service table of Robi.



	A	B	C	D	E
1				Website:www.github.com	
2				Network : Rednet	
3					
4					
5			SL No	IP Address	Services
6			1	192.168.0.1	domain,http
7			2	10.15.11.1	
8			3	172.18.50.61	
9			4	27.111.228.57	
10			5	104.44.230.62	
11			6	20.205.243.166	

Fig 10: Service table of Rednet.

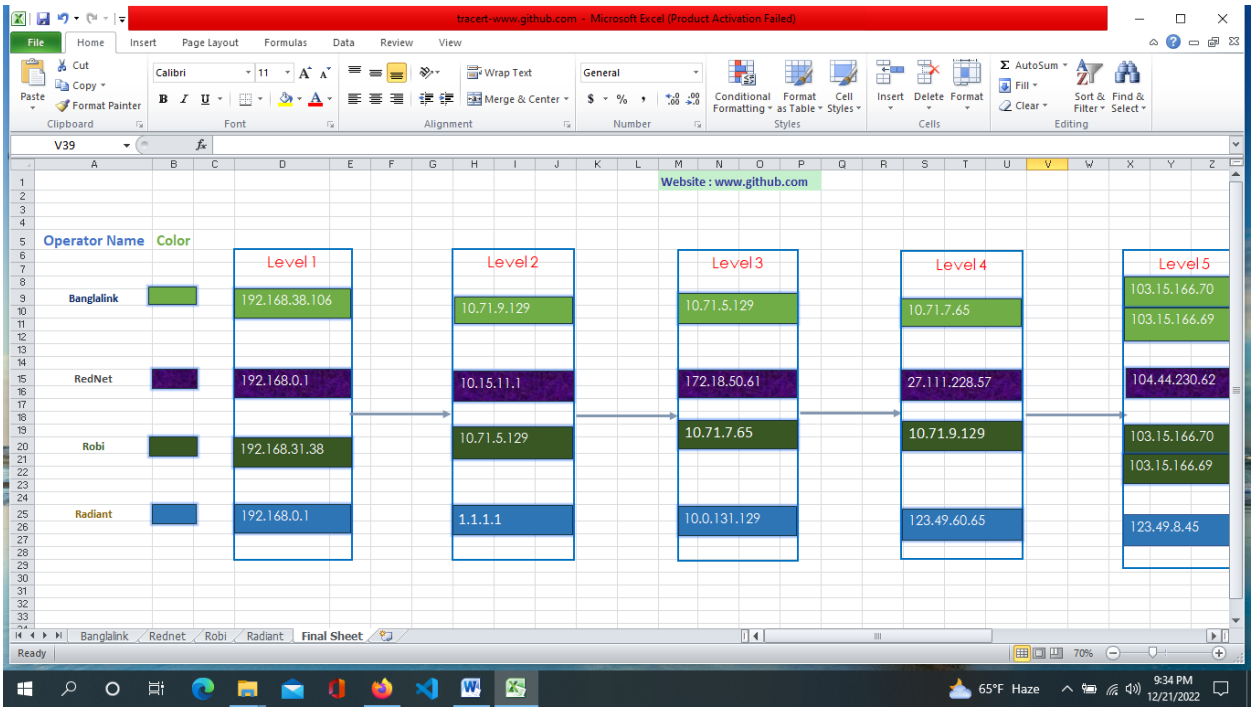


Fig 11: First-half excel sheet tracert.

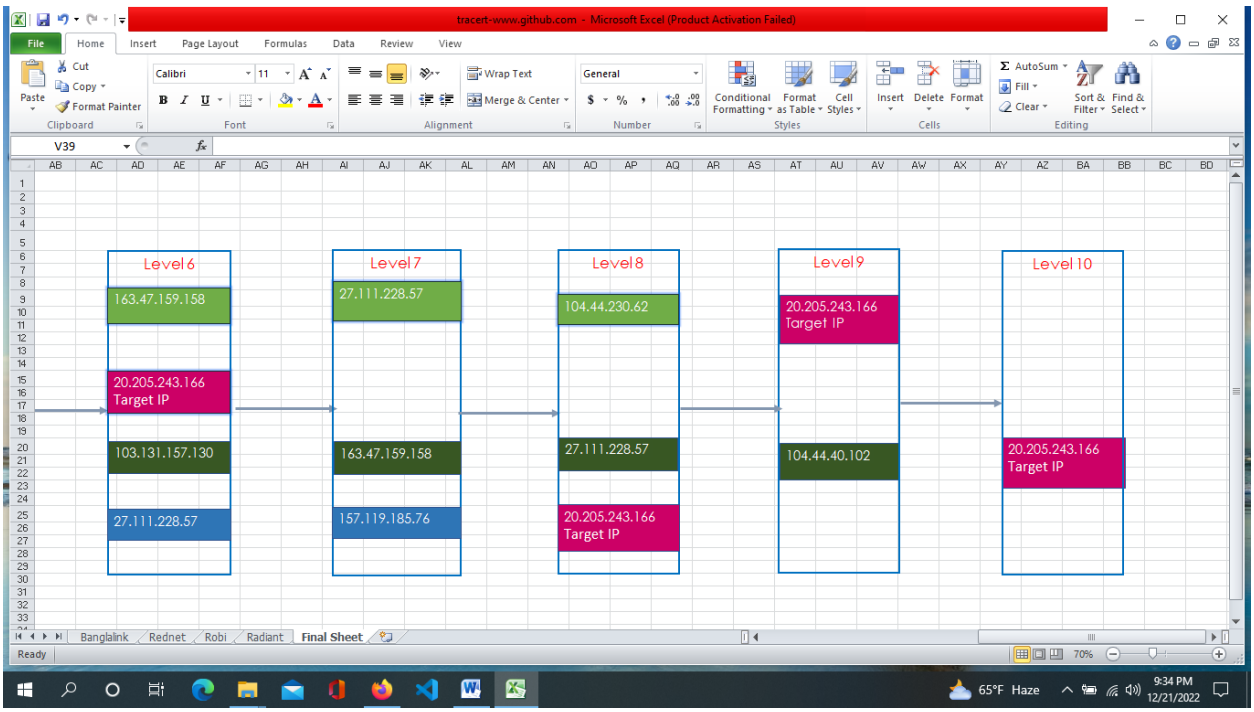


Fig 12: Last-half excel sheet tracert.

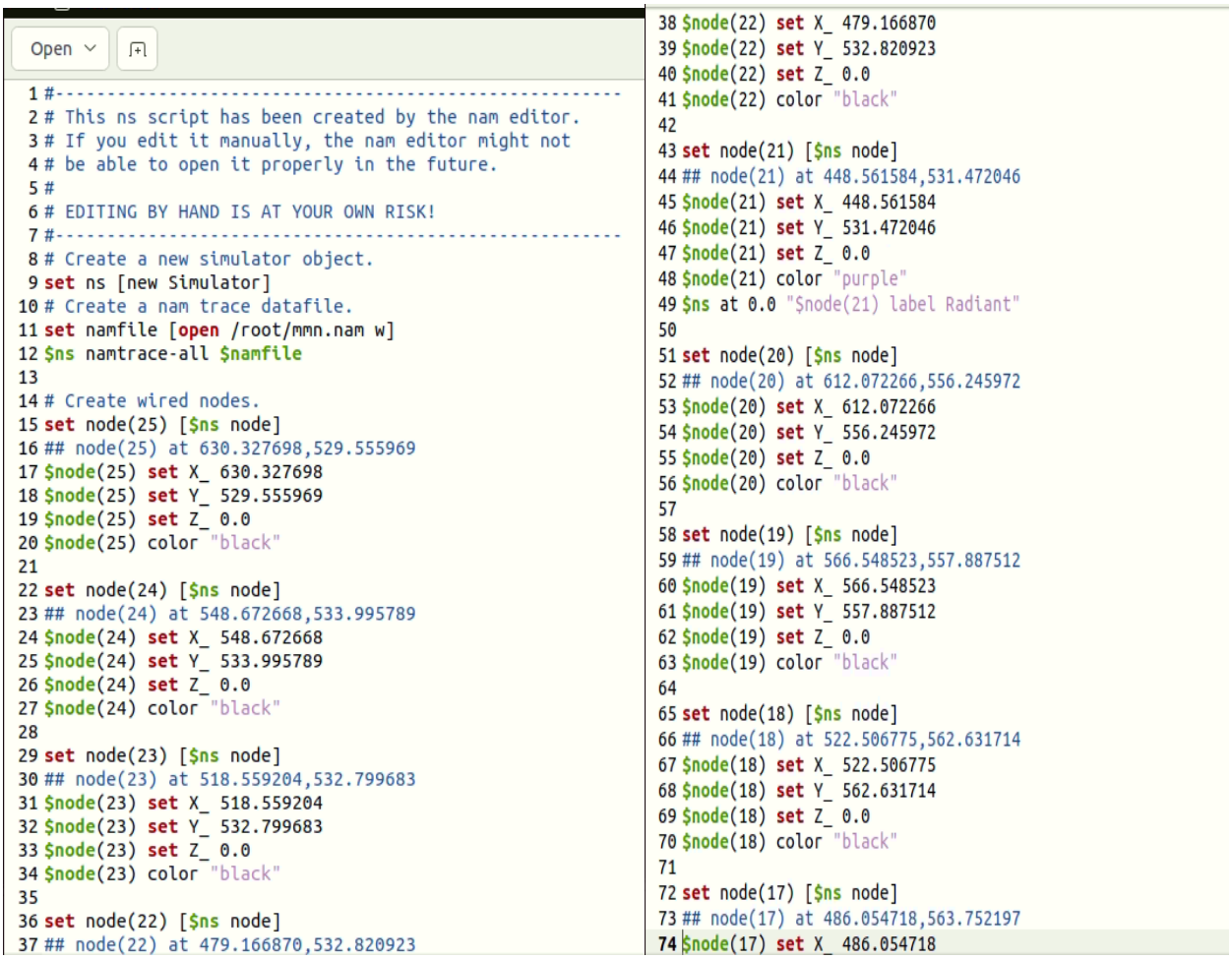
6. Introduction to NS2:

Network Simulator (Version 2), widely known as NS2, is simply an event driven simulation tool that has proved useful in studying the dynamic nature of communication networks. Simulation of wired as well as wireless network functions and protocols (e.g., routing algorithms, TCP, UDP) can be done using NS2. In general, NS2 provides users with a way of specifying such network protocols and simulating their corresponding behaviors.

The idea of the component-wise approach is to obtain the above pieces and install them individually. This option saves considerable amount of downloading time and memory space. However, it could be troublesome for the beginners, and is therefore recommended only for experienced users.

7. Source Code of NS2 based on network diagram:

NS2 Simulation Source Code – Network simulator 2 is a simulating tool. NS2 provides users with executable command ns which take on input argument, the name of a Tcl simulation scripting 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 /root/mmn.nam w]
$ns namtrace-all $namfile

# Create wired nodes.
set node(25) [$ns node]
## node(25) at 630.327698,529.555969
$node(25) set X_ 630.327698
$node(25) set Y_ 529.555969
$node(25) set Z_ 0.0
$node(25) color "black"

set node(24) [$ns node]
## node(24) at 548.672668,533.995789
$node(24) set X_ 548.672668
$node(24) set Y_ 533.995789
$node(24) set Z_ 0.0
$node(24) color "black"

set node(23) [$ns node]
## node(23) at 518.559204,532.799683
$node(23) set X_ 518.559204
$node(23) set Y_ 532.799683
$node(23) set Z_ 0.0
$node(23) color "black"

set node(22) [$ns node]
## node(22) at 479.166870,532.820923
$node(22) set X_ 479.166870
$node(22) set Y_ 532.820923
$node(22) set Z_ 0.0
$node(22) color "black"

set node(21) [$ns node]
## node(21) at 448.561584,531.472046
$node(21) set X_ 448.561584
$node(21) set Y_ 531.472046
$node(21) set Z_ 0.0
$node(21) color "purple"
$ns at 0.0 "$node(21) label Radiant"

set node(20) [$ns node]
## node(20) at 612.072266,556.245972
$node(20) set X_ 612.072266
$node(20) set Y_ 556.245972
$node(20) set Z_ 0.0
$node(20) color "black"

set node(19) [$ns node]
## node(19) at 566.548523,557.887512
$node(19) set X_ 566.548523
$node(19) set Y_ 557.887512
$node(19) set Z_ 0.0
$node(19) color "black"

set node(18) [$ns node]
## node(18) at 522.506775,562.631714
$node(18) set X_ 522.506775
$node(18) set Y_ 562.631714
$node(18) set Z_ 0.0
$node(18) color "black"

set node(17) [$ns node]
## node(17) at 486.054718,563.752197
$node(17) set X_ 486.054718
```

```
$node(17) set Y_ 563.752197
$node(17) set Z_ 0.0
$node(17) color "black"

set node(16) [$ns node]
## node(16) at 442.320740,563.586243
$node(16) set X_ 442.320740
$node(16) set Y_ 563.586243
$node(16) set Z_ 0.0
$node(16) color "blue"
$ns at 0.0 "$node(16) label Rednet"

set node(15) [$ns node]
## node(15) at 664.460205,577.830017
$node(15) set X_ 664.460205
$node(15) set Y_ 577.830017
$node(15) set Z_ 0.0
$node(15) color "black"

set node(14) [$ns node]
## node(14) at 632.847717,578.813965
$node(14) set X_ 632.847717
$node(14) set Y_ 578.813965
$node(14) set Z_ 0.0
$node(14) color "black"

set node(13) [$ns node]
## node(13) at 600.554016,580.954468
$node(13) set X_ 600.554016
$node(13) set Y_ 580.954468
$node(13) set Z_ 0.0
$node(13) color "black"

set node(12) [$ns node]
## node(12) at 532.440247,591.346008
$node(12) set X_ 532.440247
$node(12) set Y_ 591.346008
```

```
$node(12) set Z_ 0.0
$node(12) color "black"

set node(11) [$ns node]
## node(11) at 437.037567,591.530884
$node(11) set X_ 437.037567
$node(11) set Y_ 591.530884
$node(11) set Z_ 0.0
$node(11) color "red"
$ns at 0.0 "$node(11) label Robi"

set node(10) [$ns node]
## node(10) at 696.664001,560.614136
$node(10) set X_ 696.664001
$node(10) set Y_ 560.614136
$node(10) set Z_ 0.0
$node(10) color "black"
$ns at 0.0 "$node(10) label Tergat"

set node(9) [$ns node]
## node(9) at 674.662476,606.086426
$node(9) set X_ 674.662476
$node(9) set Y_ 606.086426
$node(9) set Z_ 0.0
$node(9) color "black"

set node(8) [$ns node]
## node(8) at 636.306152,609.369568
$node(8) set X_ 636.306152
$node(8) set Y_ 609.369568
$node(8) set Z_ 0.0
$node(8) color "black"

set node(7) [$ns node]
## node(7) at 605.281738,609.842651
$node(7) set X_ 605.281738
$node(7) set Y_ 609.842651
```

```
$node(7) set Z_ 0.0
$node(7) color "black"

set node(6) [$ns node]
## node(6) at 574.951294,598.416809
$node(6) set X_ 574.951294
$node(6) set Y_ 598.416809
$node(6) set Z_ 0.0
$node(6) color "black"

set node(5) [$ns node]
## node(5) at 565.550049,619.798218
$node(5) set X_ 565.550049
$node(5) set Y_ 619.798218
$node(5) set Z_ 0.0
$node(5) color "black"

set node(4) [$ns node]
## node(4) at 527.287170,610.483582
$node(4) set X_ 527.287170
$node(4) set Y_ 610.483582
$node(4) set Z_ 0.0
$node(4) color "black"

set node(3) [$ns node]
## node(3) at 500.431519,609.275635
$node(3) set X_ 500.431519
$node(3) set Y_ 609.275635
$node(3) set Z_ 0.0
$node(3) color "black"

set node(2) [$ns node]
## node(2) at 472.979309,606.079712
$node(2) set X_ 472.979309
$node(2) set Y_ 606.079712
$node(2) set Z_ 0.0
$node(2) color "black"
```

```

set node(1) [$ns node]
## node(1) at 435.048920,623.543518
$node(1) set X_ 435.048920
$node(1) set Y_ 623.543518
$node(1) set Z_ 0.0
$node(1) color "green"
$ns at 0.0 "$node(1) label Banglalink"


# Create links between nodes.
$ns simplex-link $node(25) $node(10) 1.000000Mb 20.000000m
$ns simplex-link-op $node(25) $node(10) queuePos 0.5
$ns simplex-link-op $node(25) $node(10) color black
$ns simplex-link-op $node(25) $node(10) orient 25.1deg
# Set Queue Properties for link 25->10
[[$ns link $node(25) $node(10)] queue] set limit_ 20

$ns simplex-link $node(25) $node(19) 1.000000Mb 20.000000m
$ns simplex-link-op $node(25) $node(19) queuePos 0.5
$ns simplex-link-op $node(25) $node(19) color black
$ns simplex-link-op $node(25) $node(19) orient 156.0deg
# Set Queue Properties for link 25->19
[[$ns link $node(25) $node(19)] queue] set limit_ 20

$ns simplex-link $node(24) $node(19) 1.000000Mb 20.000000m
$ns simplex-link-op $node(24) $node(19) queuePos 0.5
$ns simplex-link-op $node(24) $node(19) color black
$ns simplex-link-op $node(24) $node(19) orient 53.2deg
# Set Queue Properties for link 24->19
[[$ns link $node(24) $node(19)] queue] set limit_ 20

$ns simplex-link $node(24) $node(23) 1.000000Mb 20.000000m
$ns simplex-link-op $node(24) $node(23) queuePos 0.5
$ns simplex-link-op $node(24) $node(23) color black
$ns simplex-link-op $node(24) $node(23) orient 182.3deg
# Set Queue Properties for link 24->23
```

```
223 [[$ns link $node(24) $node(23)] queue] set limit_ 20
224
225 $ns simplex-link $node(23) $node(24) 1.000000Mb 20.000000m
226 $ns simplex-link-op $node(23) $node(24) queuePos 0.5
227 $ns simplex-link-op $node(23) $node(24) color black
228 $ns simplex-link-op $node(23) $node(24) orient 2.3deg
229 # Set Queue Properties for link 23->24
230 [[$ns link $node(23) $node(24)] queue] set limit_ 20
231
232 $ns simplex-link $node(23) $node(22) 1.000000Mb 20.000000m
233 $ns simplex-link-op $node(23) $node(22) queuePos 0.5
234 $ns simplex-link-op $node(23) $node(22) color black
235 $ns simplex-link-op $node(23) $node(22) orient 180.0deg
236 # Set Queue Properties for link 23->22
237 [[$ns link $node(23) $node(22)] queue] set limit_ 20
238
239 $ns simplex-link $node(22) $node(23) 1.000000Mb 20.000000m
240 $ns simplex-link-op $node(22) $node(23) queuePos 0.5
241 $ns simplex-link-op $node(22) $node(23) color black
242 $ns simplex-link-op $node(22) $node(23) orient 360.0deg
243 # Set Queue Properties for link 22->23
244 [[$ns link $node(22) $node(23)] queue] set limit_ 20
245
246 $ns simplex-link $node(22) $node(21) 1.000000Mb 20.000000m
247 $ns simplex-link-op $node(22) $node(21) queuePos 0.5
248 $ns simplex-link-op $node(22) $node(21) color black
249 $ns simplex-link-op $node(22) $node(21) orient 182.5deg
250 # Set Queue Properties for link 22->21
251 [[$ns link $node(22) $node(21)] queue] set limit_ 20
252
253 $ns simplex-link $node(21) $node(22) 1.000000Mb 20.000000m
254 $ns simplex-link-op $node(21) $node(22) queuePos 0.5
255 $ns simplex-link-op $node(21) $node(22) color black
256 $ns simplex-link-op $node(21) $node(22) orient 2.5deg
257 # Set Queue Properties for link 21->22
258 [[$ns link $node(21) $node(22)] queue] set limit_ 20
259
```

```
260 $ns simplex-link $node(20) $node(10) 1.000000Mb 20.000000m
261 $ns simplex-link-op $node(20) $node(10) queuePos 0.5
262 $ns simplex-link-op $node(20) $node(10) color black
263 $ns simplex-link-op $node(20) $node(10) orient 3.0deg
264 # Set Queue Properties for link 20->10
265 [[$ns link $node(20) $node(10)] queue] set limit_ 20
266
267 $ns simplex-link $node(20) $node(19) 1.000000Mb 20.000000m
268 $ns simplex-link-op $node(20) $node(19) queuePos 0.5
269 $ns simplex-link-op $node(20) $node(19) color black
270 $ns simplex-link-op $node(20) $node(19) orient 177.9deg
271 # Set Queue Properties for link 20->19
272 [[$ns link $node(20) $node(19)] queue] set limit_ 20
273
274 $ns simplex-link $node(19) $node(25) 1.000000Mb 20.000000m
275 $ns simplex-link-op $node(19) $node(25) queuePos 0.5
276 $ns simplex-link-op $node(19) $node(25) color black
277 $ns simplex-link-op $node(19) $node(25) orient 336.0deg
278 # Set Queue Properties for link 19->25
279 [[$ns link $node(19) $node(25)] queue] set limit_ 20
280
281 $ns simplex-link $node(19) $node(24) 1.000000Mb 20.000000m
282 $ns simplex-link-op $node(19) $node(24) queuePos 0.5
283 $ns simplex-link-op $node(19) $node(24) color black
284 $ns simplex-link-op $node(19) $node(24) orient 233.2deg
285 # Set Queue Properties for link 19->24
286 [[$ns link $node(19) $node(24)] queue] set limit_ 20
287
288 $ns simplex-link $node(19) $node(20) 1.000000Mb 20.000000m
289 $ns simplex-link-op $node(19) $node(20) queuePos 0.5
290 $ns simplex-link-op $node(19) $node(20) color black
291 $ns simplex-link-op $node(19) $node(20) orient 357.9deg
292 # Set Queue Properties for link 19->20
293 [[$ns link $node(19) $node(20)] queue] set limit_ 20
294
295 $ns simplex-link $node(19) $node(18) 1.000000Mb 20.000000m
```

```
296 $ns simplex-link-op $node(19) $node(18) queuePos 0.5
297 $ns simplex-link-op $node(19) $node(18) color black
298 $ns simplex-link-op $node(19) $node(18) orient 173.9deg
299 # Set Queue Properties for link 19->18
300 [[$ns link $node(19) $node(18)] queue] set limit_ 20
301
302 $ns simplex-link $node(18) $node(19) 1.000000Mb 20.000000m
303 $ns simplex-link-op $node(18) $node(19) queuePos 0.5
304 $ns simplex-link-op $node(18) $node(19) color black
305 $ns simplex-link-op $node(18) $node(19) orient 353.9deg
306 # Set Queue Properties for link 18->19
307 [[$ns link $node(18) $node(19)] queue] set limit_ 20
308
309 $ns simplex-link $node(18) $node(17) 1.000000Mb 20.000000m
310 $ns simplex-link-op $node(18) $node(17) queuePos 0.5
311 $ns simplex-link-op $node(18) $node(17) color black
312 $ns simplex-link-op $node(18) $node(17) orient 178.2deg
313 # Set Queue Properties for link 18->17
314 [[$ns link $node(18) $node(17)] queue] set limit_ 20
315
316 $ns simplex-link $node(17) $node(18) 1.000000Mb 20.000000m
317 $ns simplex-link-op $node(17) $node(18) queuePos 0.5
318 $ns simplex-link-op $node(17) $node(18) color black
319 $ns simplex-link-op $node(17) $node(18) orient 358.2deg
320 # Set Queue Properties for link 17->18
321 [[$ns link $node(17) $node(18)] queue] set limit_ 20
322
323 $ns simplex-link $node(17) $node(16) 1.000000Mb 20.000000m
324 $ns simplex-link-op $node(17) $node(16) queuePos 0.5
325 $ns simplex-link-op $node(17) $node(16) color black
326 $ns simplex-link-op $node(17) $node(16) orient 180.2deg
327 # Set Queue Properties for link 17->16
328 [[$ns link $node(17) $node(16)] queue] set limit_ 20
329
330 $ns simplex-link $node(16) $node(17) 1.000000Mb 20.000000m
331 $ns simplex-link-op $node(16) $node(17) queuePos 0.5
332 $ns simplex-link-op $node(16) $node(17) color black
```

```
332 $ns simplex-link-op $node(16) $node(17) color black
333 $ns simplex-link-op $node(16) $node(17) orient 0.2deg
334 # Set Queue Properties for link 16->17
335 [[$ns link $node(16) $node(17)] queue] set limit_ 20
336
337 $ns simplex-link $node(15) $node(10) 1.000000Mb 20.000000m
338 $ns simplex-link-op $node(15) $node(10) queuePos 0.5
339 $ns simplex-link-op $node(15) $node(10) color black
340 $ns simplex-link-op $node(15) $node(10) orient 331.9deg
341 # Set Queue Properties for link 15->10
342 [[$ns link $node(15) $node(10)] queue] set limit_ 20
343
344 $ns simplex-link $node(15) $node(14) 1.000000Mb 20.000000m
345 $ns simplex-link-op $node(15) $node(14) queuePos 0.5
346 $ns simplex-link-op $node(15) $node(14) color black
347 $ns simplex-link-op $node(15) $node(14) orient 178.2deg
348 # Set Queue Properties for link 15->14
349 [[$ns link $node(15) $node(14)] queue] set limit_ 20
350
351 $ns simplex-link $node(14) $node(15) 1.000000Mb 20.000000m
352 $ns simplex-link-op $node(14) $node(15) queuePos 0.5
353 $ns simplex-link-op $node(14) $node(15) color black
354 $ns simplex-link-op $node(14) $node(15) orient 358.2deg
355 # Set Queue Properties for link 14->15
356 [[$ns link $node(14) $node(15)] queue] set limit_ 20
357
358 $ns simplex-link $node(14) $node(13) 1.000000Mb 20.000000m
359 $ns simplex-link-op $node(14) $node(13) queuePos 0.5
360 $ns simplex-link-op $node(14) $node(13) color black
361 $ns simplex-link-op $node(14) $node(13) orient 176.2deg
362 # Set Queue Properties for link 14->13
363 [[$ns link $node(14) $node(13)] queue] set limit_ 20
364
365 $ns simplex-link $node(13) $node(14) 1.000000Mb 20.000000m
366 $ns simplex-link-op $node(13) $node(14) queuePos 0.5
367 $ns simplex-link-op $node(13) $node(14) color black
368 $ns simplex-link-op $node(13) $node(14) orient 356.2deg
```

```
$ns simplex-link-op $node(13) $node(14) orient 356.2deg
# Set Queue Properties for link 13->14
[[$ns link $node(13) $node(14)] queue] set limit_ 20

$ns simplex-link $node(13) $node(12) 1.000000Mb 20.000000m
$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) $node(12) orient 171.3deg
# Set Queue Properties for link 13->12
[[$ns link $node(13) $node(12)] queue] set limit_ 20

$ns simplex-link $node(12) $node(13) 1.000000Mb 20.000000m
$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) $node(13) orient 351.3deg
# Set Queue Properties for link 12->13
[[$ns link $node(12) $node(13)] queue] set limit_ 20

$ns simplex-link $node(12) $node(6) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(12) $node(6) queuePos 0.5
$ns simplex-link-op $node(12) $node(6) color black
$ns simplex-link-op $node(12) $node(6) orient 9.4deg
# Set Queue Properties for link 12->6
[[$ns link $node(12) $node(6)] queue] set limit_ 20

$ns simplex-link $node(12) $node(5) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(12) $node(5) queuePos 0.5
$ns simplex-link-op $node(12) $node(5) color black
$ns simplex-link-op $node(12) $node(5) orient 40.7deg
# Set Queue Properties for link 12->5
[[$ns link $node(12) $node(5)] queue] set limit_ 20

$ns simplex-link $node(11) $node(2) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(11) $node(2) queuePos 0.5
$ns simplex-link-op $node(11) $node(2) color black
$ns simplex-link-op $node(11) $node(2) orient 22.0deg
# Set Queue Properties for link 11->2
```

```
[[$ns link $node(11) $node(2)] queue] set limit_ 20

$ns simplex-link $node(10) $node(25) 1.000000Mb 20.000000m
$ns simplex-link-op $node(10) $node(25) queuePos 0.5
$ns simplex-link-op $node(10) $node(25) color black
$ns simplex-link-op $node(10) $node(25) orient 205.1deg
# Set Queue Properties for link 10->25
[[$ns link $node(10) $node(25)] queue] set limit_ 20

$ns simplex-link $node(10) $node(20) 1.000000Mb 20.000000m
$ns simplex-link-op $node(10) $node(20) queuePos 0.5
$ns simplex-link-op $node(10) $node(20) color black
$ns simplex-link-op $node(10) $node(20) orient 183.0deg
# Set Queue Properties for link 10->20
[[$ns link $node(10) $node(20)] queue] set limit_ 20

$ns simplex-link $node(10) $node(15) 1.000000Mb 20.000000m
$ns simplex-link-op $node(10) $node(15) queuePos 0.5
$ns simplex-link-op $node(10) $node(15) color black
$ns simplex-link-op $node(10) $node(15) orient 151.9deg
# Set Queue Properties for link 10->15
[[$ns link $node(10) $node(15)] queue] set limit_ 20

$ns simplex-link $node(10) $node(9) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(10) $node(9) queuePos 0.5
$ns simplex-link-op $node(10) $node(9) color black
$ns simplex-link-op $node(10) $node(9) orient 115.8deg
# Set Queue Properties for link 10->9
[[$ns link $node(10) $node(9)] queue] set limit_ 20

$ns simplex-link $node(9) $node(10) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(9) $node(10) queuePos 0.5
$ns simplex-link-op $node(9) $node(10) color black
$ns simplex-link-op $node(9) $node(10) orient 295.8deg
# Set Queue Properties for link 9->10
[[$ns link $node(9) $node(10)] queue] set limit_ 20
```

```
[[$ns link $node(9) $node(10)] queue] set limit_ 20

$ns simplex-link $node(9) $node(8) 1.000000Mb 20.000000ms
$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) $node(8) orient 175.1deg
# Set Queue Properties for link 9->8
[[$ns link $node(9) $node(8)] queue] set limit_ 20

$ns simplex-link $node(8) $node(9) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(8) $node(9) queuePos 0.5
$ns simplex-link-op $node(8) $node(9) color black
$ns simplex-link-op $node(8) $node(9) orient 355.1deg
# Set Queue Properties for link 8->9
[[$ns link $node(8) $node(9)] queue] set limit_ 20

$ns simplex-link $node(8) $node(7) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(8) $node(7) queuePos 0.5
$ns simplex-link-op $node(8) $node(7) color black
$ns simplex-link-op $node(8) $node(7) orient 179.1deg
# Set Queue Properties for link 8->7
[[$ns link $node(8) $node(7)] queue] set limit_ 20

$ns simplex-link $node(7) $node(8) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(7) $node(8) queuePos 0.5
$ns simplex-link-op $node(7) $node(8) color black
$ns simplex-link-op $node(7) $node(8) orient 359.1deg
# Set Queue Properties for link 7->8
[[$ns link $node(7) $node(8)] queue] set limit_ 20

$ns simplex-link $node(7) $node(6) 1.000000Mb 20.000000ms
$ns simplex-link-op $node(7) $node(6) queuePos 0.5
$ns simplex-link-op $node(7) $node(6) color black
$ns simplex-link-op $node(7) $node(6) orient 200.6deg
# Set Queue Properties for link 7->6
[[$ns link $node(7) $node(6)] queue] set limit_ 20
```

```
$ns simplex-link $node(7) $node(5) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(7) $node(5) queuePos 0.5
$ns simplex-link-op $node(7) $node(5) color black
$ns simplex-link-op $node(7) $node(5) orient 165.9deg
# Set Queue Properties for link 7->5
[[$ns link $node(7) $node(5)] queue] set limit_ 20

$ns simplex-link $node(6) $node(12) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(6) $node(12) queuePos 0.5
$ns simplex-link-op $node(6) $node(12) color black
$ns simplex-link-op $node(6) $node(12) orient 189.4deg
# Set Queue Properties for link 6->12
[[$ns link $node(6) $node(12)] queue] set limit_ 20

$ns simplex-link $node(6) $node(7) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(6) $node(7) queuePos 0.5
$ns simplex-link-op $node(6) $node(7) color black
$ns simplex-link-op $node(6) $node(7) orient 20.6deg
# Set Queue Properties for link 6->7
[[$ns link $node(6) $node(7)] queue] set limit_ 20

$ns simplex-link $node(6) $node(4) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(6) $node(4) queuePos 0.5
$ns simplex-link-op $node(6) $node(4) color black
$ns simplex-link-op $node(6) $node(4) orient 165.8deg
# Set Queue Properties for link 6->4
[[$ns link $node(6) $node(4)] queue] set limit_ 20

$ns simplex-link $node(5) $node(12) 1.000000Mb 20.000000ms DropTail
$ns simplex-link-op $node(5) $node(12) queuePos 0.5
$ns simplex-link-op $node(5) $node(12) color black
$ns simplex-link-op $node(5) $node(12) orient 220.7deg
# Set Queue Properties for link 5->12
[[$ns link $node(5) $node(12)] queue] set limit_ 20
```

```
510 [[$ns link $node(5) $node(12)] queue] set limit_ 20
511
512 $ns simplex-link $node(5) $node(7) 1.000000Mb 20.000000ms DropTail
513 $ns simplex-link-op $node(5) $node(7) queuePos 0.5
514 $ns simplex-link-op $node(5) $node(7) color black
515 $ns simplex-link-op $node(5) $node(7) orient 345.9deg
516 # Set Queue Properties for link 5->7
517 [[$ns link $node(5) $node(7)] queue] set limit_ 20
518
519 $ns simplex-link $node(5) $node(4) 1.000000Mb 20.000000ms DropTail
520 $ns simplex-link-op $node(5) $node(4) queuePos 0.5
521 $ns simplex-link-op $node(5) $node(4) color black
522 $ns simplex-link-op $node(5) $node(4) orient 193.7deg
523 # Set Queue Properties for link 5->4
524 [[$ns link $node(5) $node(4)] queue] set limit_ 20
525
526 $ns simplex-link $node(4) $node(6) 1.000000Mb 20.000000ms DropTail
527 $ns simplex-link-op $node(4) $node(6) queuePos 0.5
528 $ns simplex-link-op $node(4) $node(6) color black
529 $ns simplex-link-op $node(4) $node(6) orient 345.8deg
530 # Set Queue Properties for link 4->6
531 [[$ns link $node(4) $node(6)] queue] set limit_ 20
532
533 $ns simplex-link $node(4) $node(5) 1.000000Mb 20.000000ms DropTail
534 $ns simplex-link-op $node(4) $node(5) queuePos 0.5
535 $ns simplex-link-op $node(4) $node(5) color black
536 $ns simplex-link-op $node(4) $node(5) orient 13.7deg
537 # Set Queue Properties for link 4->5
538 [[$ns link $node(4) $node(5)] queue] set limit_ 20
539
540 $ns simplex-link $node(4) $node(3) 1.000000Mb 20.000000ms DropTail
541 $ns simplex-link-op $node(4) $node(3) queuePos 0.5
542 $ns simplex-link-op $node(4) $node(3) color black
543 $ns simplex-link-op $node(4) $node(3) orient 182.6deg
544 # Set Queue Properties for link 4->3
```

```
544 # Set Queue Properties for link 4->3
545 [[$ns link $node(4) $node(3)] queue] set limit_ 20
546
547 $ns simplex-link $node(3) $node(4) 1.000000Mb 20.000000ms DropTail
548 $ns simplex-link-op $node(3) $node(4) queuePos 0.5
549 $ns simplex-link-op $node(3) $node(4) color black
550 $ns simplex-link-op $node(3) $node(4) orient 2.6deg
551 # Set Queue Properties for link 3->4
552 [[$ns link $node(3) $node(4)] queue] set limit_ 20
553
554 $ns simplex-link $node(3) $node(2) 1.000000Mb 20.000000ms DropTail
555 $ns simplex-link-op $node(3) $node(2) queuePos 0.5
556 $ns simplex-link-op $node(3) $node(2) color black
557 $ns simplex-link-op $node(3) $node(2) orient 186.6deg
558 # Set Queue Properties for link 3->2
559 [[$ns link $node(3) $node(2)] queue] set limit_ 20
560
561 $ns simplex-link $node(2) $node(11) 1.000000Mb 20.000000ms DropTail
562 $ns simplex-link-op $node(2) $node(11) queuePos 0.5
563 $ns simplex-link-op $node(2) $node(11) color black
564 $ns simplex-link-op $node(2) $node(11) orient 202.0deg
565 # Set Queue Properties for link 2->11
566 [[$ns link $node(2) $node(11)] queue] set limit_ 20
567
568 $ns simplex-link $node(2) $node(3) 1.000000Mb 20.000000ms DropTail
569 $ns simplex-link-op $node(2) $node(3) queuePos 0.5
570 $ns simplex-link-op $node(2) $node(3) color black
571 $ns simplex-link-op $node(2) $node(3) orient 6.6deg
572 # Set Queue Properties for link 2->3
573 [[$ns link $node(2) $node(3)] queue] set limit_ 20
574
575 $ns simplex-link $node(2) $node(1) 1.000000Mb 20.000000ms DropTail
576 $ns simplex-link-op $node(2) $node(1) queuePos 0.5
577 $ns simplex-link-op $node(2) $node(1) color black
578 $ns simplex-link-op $node(2) $node(1) orient 155.3deg
```

```
578 $ns simplex-link-op $node(2) $node(1) orient 155.3deg
579 # Set Queue Properties for link 2->1
580 [[$ns link $node(2) $node(1)] queue] set limit_ 20
581
582 $ns simplex-link $node(1) $node(2) 1.000000Mb 20.000000ms DropTail
583 $ns simplex-link-op $node(1) $node(2) queuePos 0.5
584 $ns simplex-link-op $node(1) $node(2) color black
585 $ns simplex-link-op $node(1) $node(2) orient 335.3deg
586 # Set Queue Properties for link 1->2
587 [[$ns link $node(1) $node(2)] queue] set limit_ 20
588
589 # Add Link Loss Models
590
591 # Create agents.
592 set agent(21) [new Agent/TCP]
593 $ns attach-agent $node(21) $agent(21)
594
595 $ns color 21 "purple"
596 $agent(21) set fid_ 21
597 $agent(21) set packetSize_ 210
598 $agent(21) set window_ 20
599 $agent(21) set windowInit_ 1
600 $agent(21) set maxcwnd_ 0
601
602 # Create traffic sources and add them to the agent.
603 set traffic_source(8) [new Application/FTP]
604 $traffic_source(8) attach-agent $agent(21)
605 $traffic_source(8) set maxpkts_ 256
606 set agent(19) [new Agent/TCP]
607 $ns attach-agent $node(16) $agent(19)
608
609 $ns color 19 "blue"
610 $agent(19) set fid_ 19
611 $agent(19) set packetSize_ 210
612 $agent(19) set window_ 20
```

```
612 $agent(19) set window_ 20
613 $agent(19) set windowInit_ 1
614 $agent(19) set maxcwnd_ 0
615
616 # Create traffic sources and add them to the agent.
617 set traffic_source(7) [new Application/FTP]
618 $traffic_source(7) attach-agent $agent(19)
619 $traffic_source(7) set maxpkts_ 256
620 set agent(17) [new Agent/TCP]
621 $ns attach-agent $node(11) $agent(17)
622
623 $ns color 17 "red"
624 $agent(17) set fid_ 17
625 $agent(17) set packetSize_ 210
626 $agent(17) set window_ 20
627 $agent(17) set windowInit_ 1
628 $agent(17) set maxcwnd_ 0
629
630 # Create traffic sources and add them to the agent.
631 set traffic_source(6) [new Application/FTP]
632 $traffic_source(6) attach-agent $agent(17)
633 $traffic_source(6) set maxpkts_ 256
634 set agent(22) [new Agent/TCPSink]
635 $ns attach-agent $node(10) $agent(22)
636 $agent(22) set packetSize_ 210
637 set agent(20) [new Agent/TCPSink]
638 $ns attach-agent $node(10) $agent(20)
639 $agent(20) set packetSize_ 210
640 set agent(18) [new Agent/TCPSink]
641 $ns attach-agent $node(10) $agent(18)
642 $agent(18) set packetSize_ 210
643 set agent(16) [new Agent/TCPSink]
644 $ns attach-agent $node(10) $agent(16)
645 $agent(16) set packetSize_ 210
646 set agent(15) [new Agent/TCP]
```

```
set agent(15) [new Agent/TCP]
$ns attach-agent $node(1) $agent(15)

$ns color 15 "green"
$agent(15) set fid_ 15
$agent(15) set packetSize_ 210
$agent(15) set window_ 20
$agent(15) set windowInit_ 1
$agent(15) set maxcwnd_ 0

# Create traffic sources and add them to the agent.
set traffic_source(5) [new Application/FTP]
$traffic_source(5) attach-agent $agent(15)
$traffic_source(5) set maxpkts_ 256

# Connect agents.
$ns connect $agent(21) $agent(22)


# Traffic Source actions.
$ns at 0.000000 "$traffic_source(8) start"
$ns at 60.000000 "$traffic_source(8) stop"

$ns connect $agent(19) $agent(20)


# Traffic Source actions.
$ns at 0.000000 "$traffic_source(7) start"
$ns at 60.000000 "$traffic_source(7) stop"

$ns connect $agent(17) $agent(18)


# Traffic Source actions.
$ns at 0.000000 "$traffic_source(6) start"
$ns at 60.000000 "$traffic_source(6) stop"

$ns connect $agent(15) $agent(16)


# Traffic Source actions.
$ns at 0.000000 "$traffic_source(5) start"
$ns at 60.000000 "$traffic_source(5) stop"

# Run the simulation
proc finish {} {
        global ns namfile
        $ns flush-trace
        close $namfile
        exec nam -r 2000.000000us /root/mmn.nam &
        exit 0
        }
$ns at 60.000000 "finish"
$ns run
```

Fig 13: Source code of NS2.

8. Output topology of NS2:

There are three figures in this output topology of NS2. All the three figures show the network simulation. The first figure is about before run the network simulator. After pressing the start button the simulation will start. The second figure is the middle point of the running simulator. The third and last figure is about after finish the simulation. Now, the full simulation of network is complete.

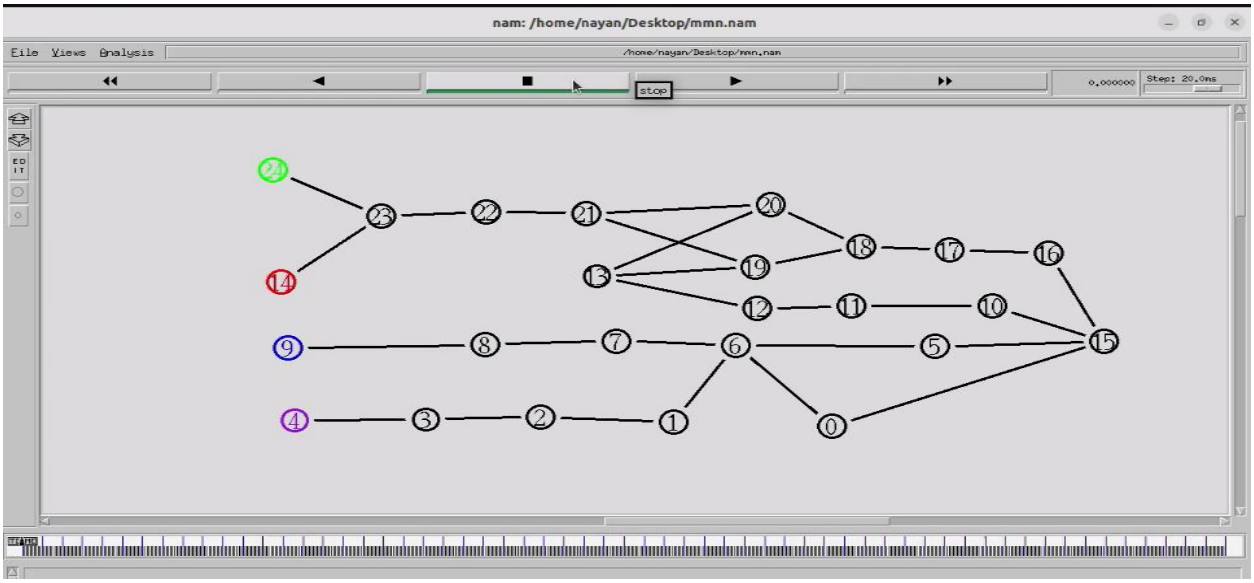


Figure 14: Network topology for simulation (Before Run).

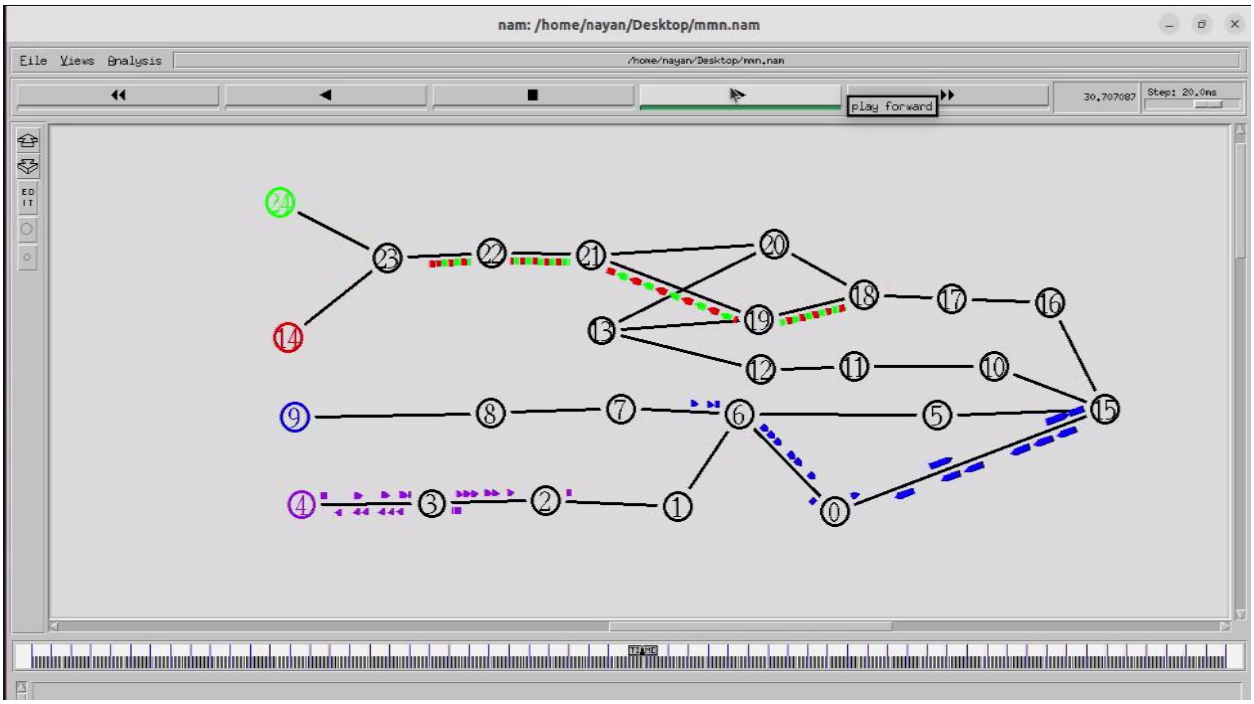


Figure 15: Network topology for simulation (Running).

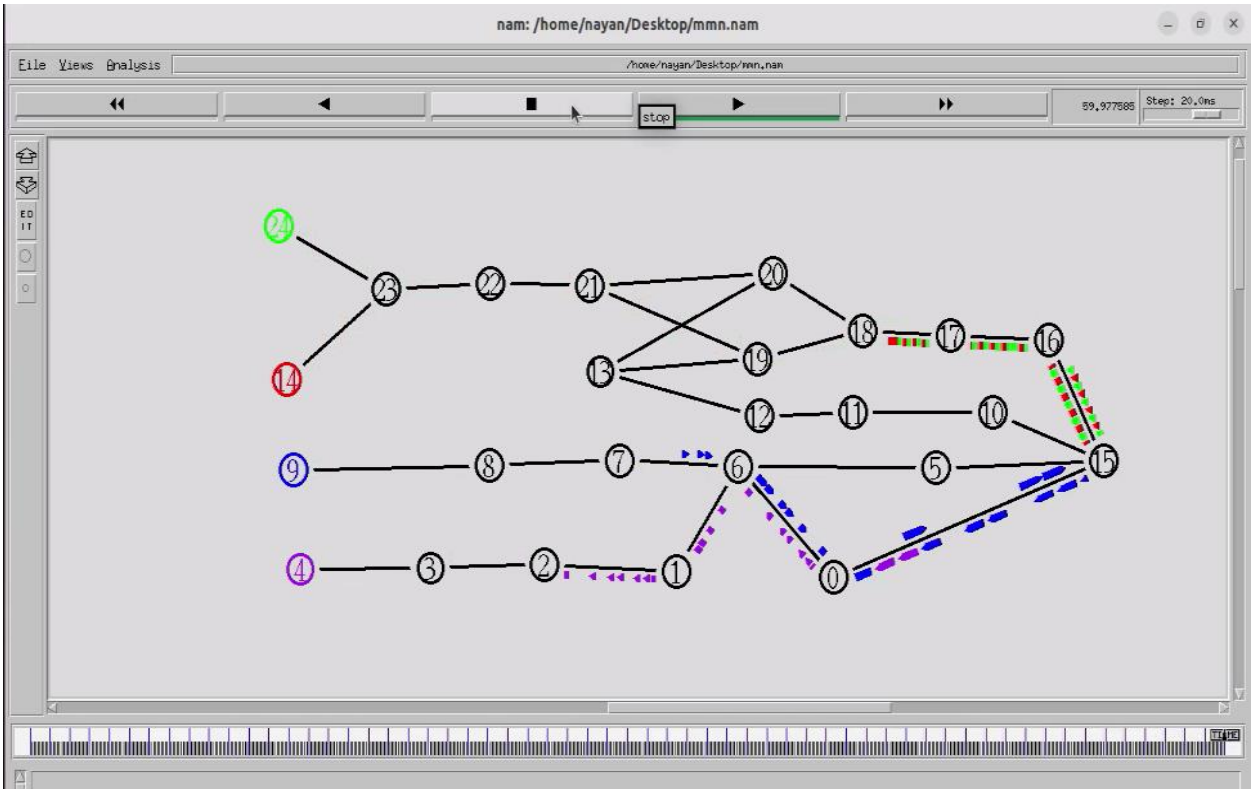


Figure 16: Network topology for simulation (After Run).

9. Summarization of the Designed Network:

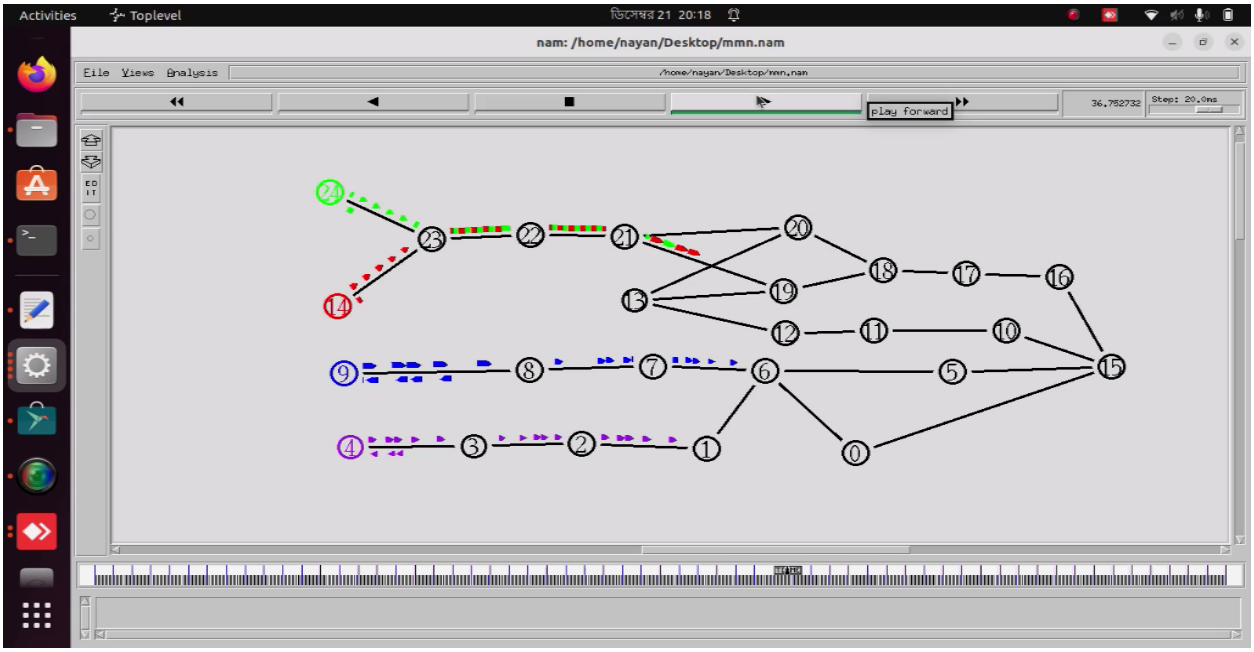


Figure 17: traffic flow for packet from source to receiver

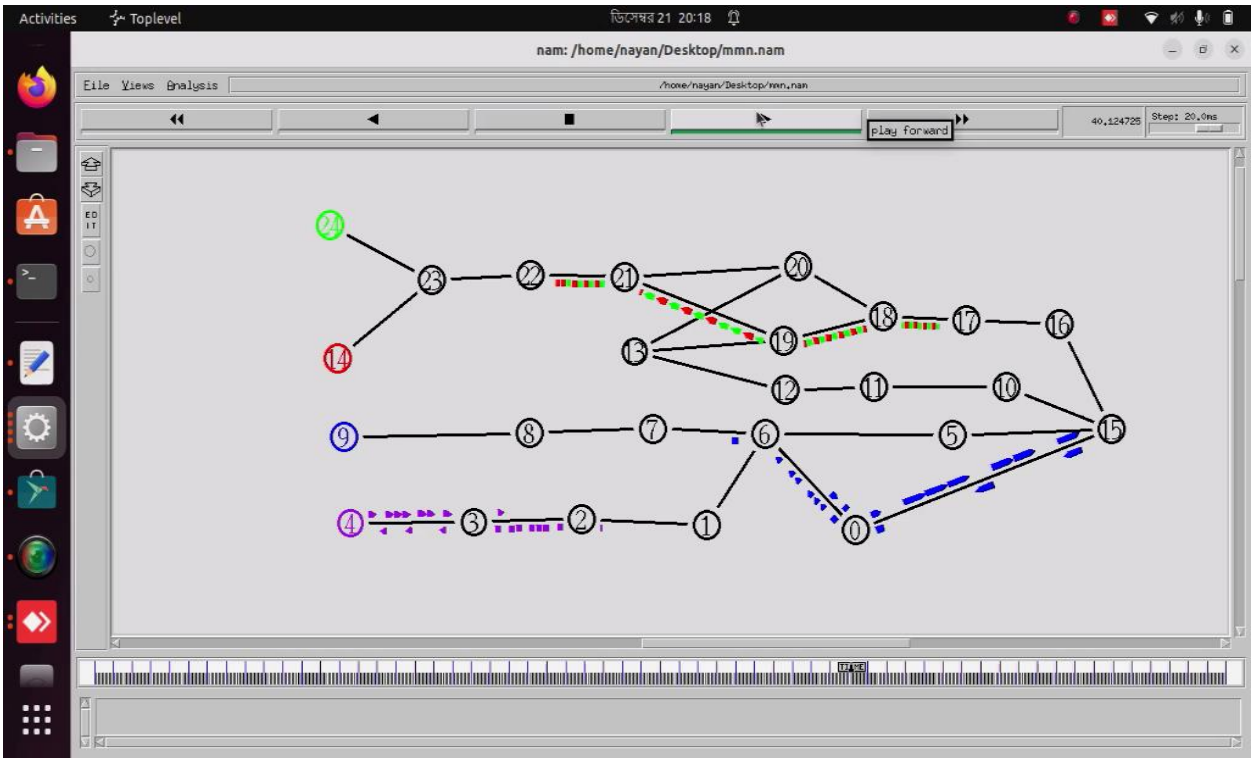


Figure 18: Packet drop at gateway when buffer is full.

10. Conclusion:

The codes have been compiled and run based on the network simulation software of NS2. The aim and objectives of the project has been achieved through learning the basic on how to use NS2 software and Ubuntu operating system, which helped in clarifying and identifying different queuing mechanism as a basic of understanding the basis for more complicated network simulation, and give more light towards understanding network performance like queuing delay and packet loss where various session of queuing mechanism behavior were observed and analyzed. The nam (NS2 network animator or GUI) that receive some of the NS2 command to display the result help a lot in our discussion and analysis.

11. References:

1.

https://ipwithease.com/introduction-to-zenmap-nmap-network-mapper/?fbclid=IwAR3oWRPd6svfLvL9pfiadHZbVsQP7BttySOiCja0fWb8SVd_yxgv70rDC6U

2.

https://www.google.com/search?q=Different%20host%20to%20domain%20and%20domain%20name&rlz=1C1CHBF_enBD1021BD1021&hl=en&sxsrf=ALiCzsawGfvYQ37i_cdfgGdbHy_kTmP9nQ%3A1671630644728&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiA6pi27Yr8AhVuTmwGHVXFDxMQ_AUoAnoECAEQBA&biw=1920&bih=937&dpr=1&fbclid=IwAR1uxooNzyaKWpbAIauvfT-dR-8tmQB5lR-WbOecghIgjY8css5EXR4i4Oo

3.

https://www.google.com/search?q=domain%20name%20describe&fbclid=IwAR3EicWLDwP4Qnaw-EDfklq1XRJNnXRoskQzNQO5DGm_QIsWvRw0khFAqEo

4.

https://www.researchgate.net/publication/264158147_Communication_and_Computer_Networks_Simulator_NS2/link/57acb7ff08ae0932c974ac3f/download