University of Moratuwa

Department of Electronic and Telecommunication Engineering

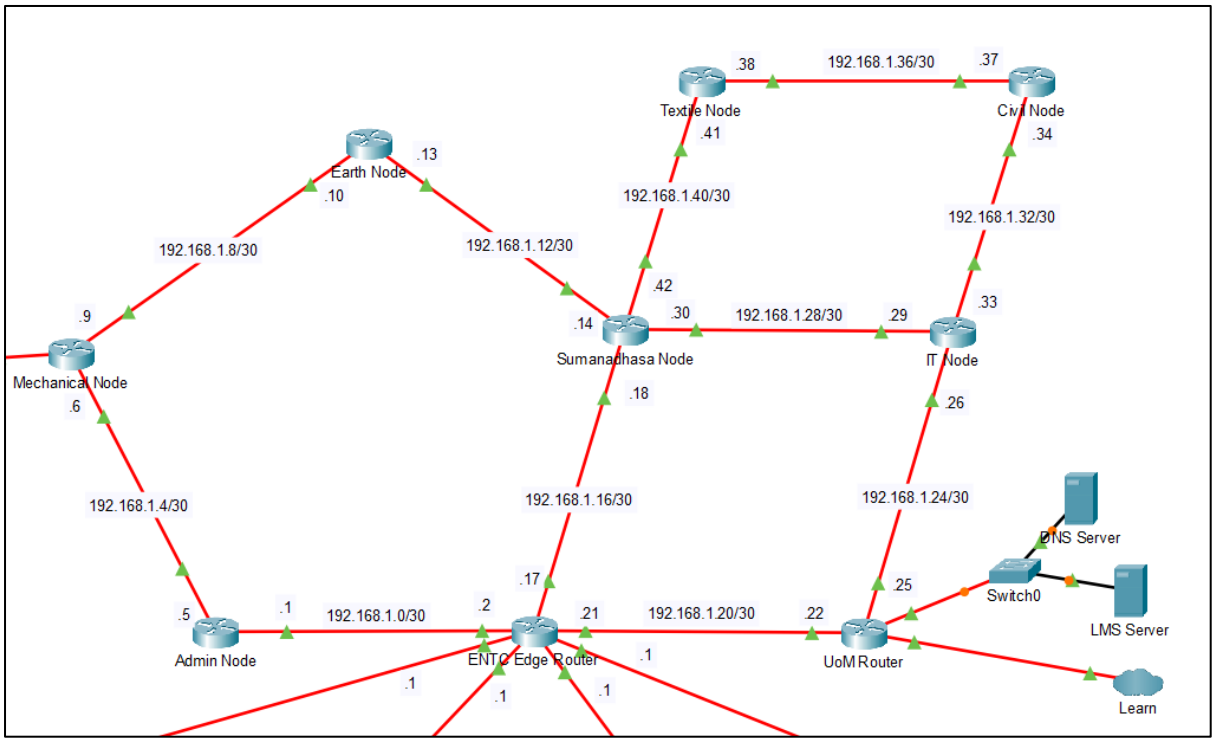
EN2150 – Communication Network Engineering

Network routing simulation - OSPF

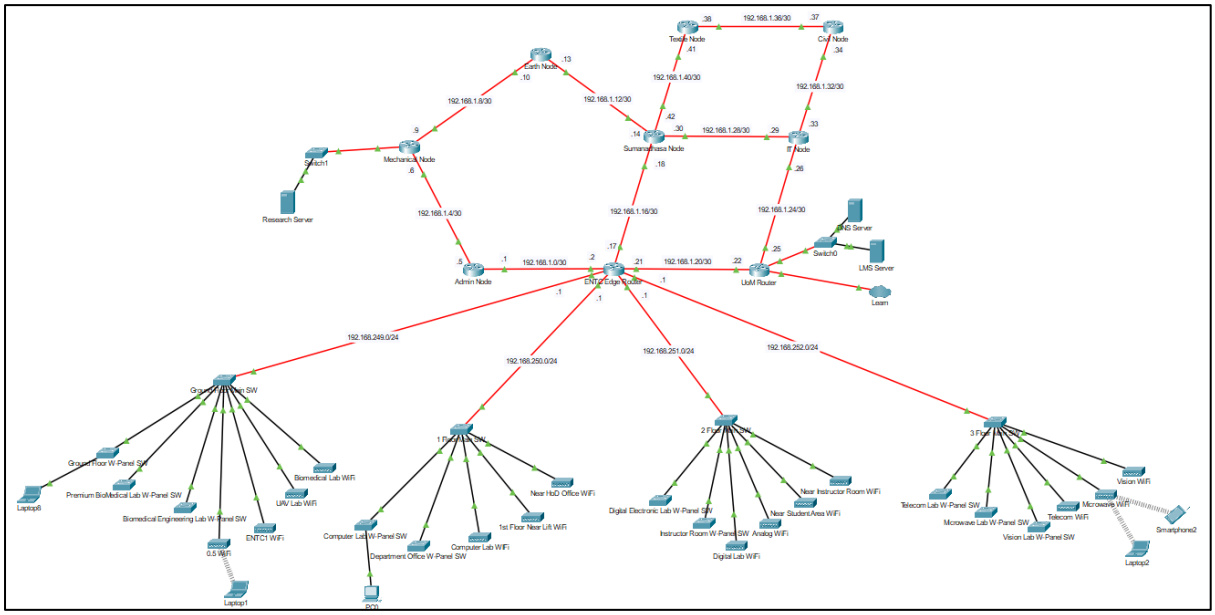
Group Members

CLARANCE L.G.S.	200094R
KURRSHANTH V.	200331T
MIRANDA C.M.C.C.	200396U
NIRUSHTIHAN B.	200431B

The University Backbone



Backbone with ENTC network



IP addressing scheme

Each node in the network can assign a number of /24 ipv4 addressed subnet (mask 255.255.255.0) for each interface. 253 devices beside the router can be connected in a subnet. Each building can lease required number of subnets from available subnets. Links between nodes uses a /30 subnet (mask 255.255.255.252) for their interfaces.

ENTC building has 4 of such subnets assigned for each floor.

OSPF Routing Configuration of Node Routers

The following OSPF routing configuration is done for the ENTC Edge Router. Similar configurations are done for the rest of the nodes.

```
ENTC_edge_RT>en
ENTC_edge_RT#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ENTC_edge_RT(config)#router ospf 10
ENTC_edge_RT(config-router)#router-id 1.1.1.1
ENTC_edge_RT(config-router)#end
ENTC_edge_RT#
%SYS-5-CONFIG_I: Configured from console by console

ENTC_edge_RT#clear ip ospf process
Reset ALL OSPF processes? [no]: y

ENTC_edge_RT#show ip protocols

Routing Protocol is "ospf 10"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Router ID 1.1.1.1
Number of areas in this router is 0. 0 normal 0 stub 0 nssa
Maximum path: 4
Routing for Networks:
Routing Information Sources:
Gateway Distance Last Update
Distance: (default is 110)

ENTC_edge_RT#config t
Enter configuration commands, one per line. End with CNTL/Z.
ENTC_edge_RT(config)#router ospf 10
ENTC_edge_RT(config-router)#network 192.168.249.1 0.0.0.0 area 0
ENTC_edge_RT(config-router)#network 192.168.250.1 0.0.0.0 area 0
ENTC_edge_RT(config-router)#network 192.168.251.1 0.0.0.0 area 0
ENTC_edge_RT(config-router)#network 192.168.252.1 0.0.0.0 area 0
ENTC_edge_RT(config-router)#network 192.168.1.21 0.0.0.0 area 0
ENTC_edge_RT(config-router)#network 192.168.1.17 0.0.0.0 area 0
ENTC_edge_RT(config-router)#network 192.168.1.2 0.0.0.0 area 0
ENTC_edge_RT(config-router)#passive-interface g1/0
ENTC_edge_RT(config-router)#passive-interface g2/0
ENTC_edge_RT(config-router)#passive-interface g3/0
ENTC_edge_RT(config-router)#passive-interface g4/0
ENTC_edge_RT(config-router)#end
ENTC_edge_RT#
%SYS-5-CONFIG_I: Configured from console by console

ENTC_edge_RT#show ip protocols

Routing Protocol is "ospf 10"
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Router ID 1.1.1.1
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Maximum path: 4
Routing for Networks:
192.168.249.1 0.0.0.0 area 0
192.168.250.1 0.0.0.0 area 0
192.168.251.1 0.0.0.0 area 0
192.168.252.1 0.0.0.0 area 0
192.168.1.21 0.0.0.0 area 0
192.168.1.17 0.0.0.0 area 0
```

```
192.168.1.2 0.0.0.0 area 0
Passive Interface(s):
GigabitEthernet1/0
GigabitEthernet2/0
GigabitEthernet3/0
GigabitEthernet4/0
Routing Information Sources:
Gateway Distance Last Update
1.1.1.1 110 00:01:20
Distance: (default is 110)

ENTC_edge_RT#
```

Routing path taken by a network session of student at ENTC who is accessing LMS server

LMS server and DNS server are connected to the UoM Router.

The student accessing the LMS server is connected through a computer in the vision lab at ENTC. The URL of the website is *lms.mrt.ac.lk*

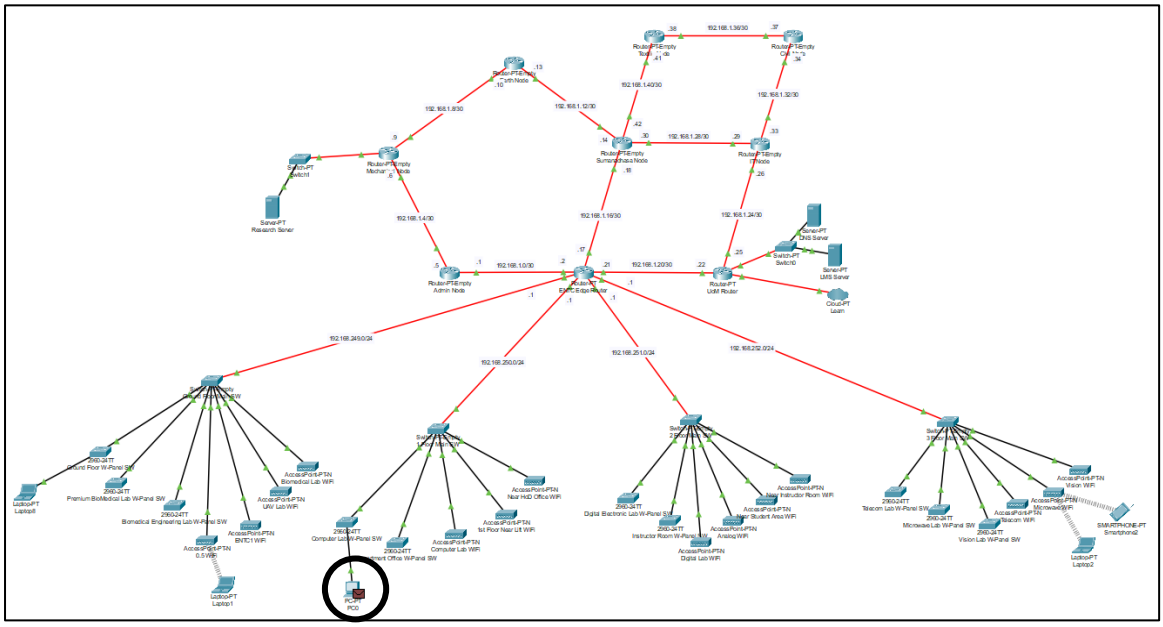


Figure 1: Packet at the end PC

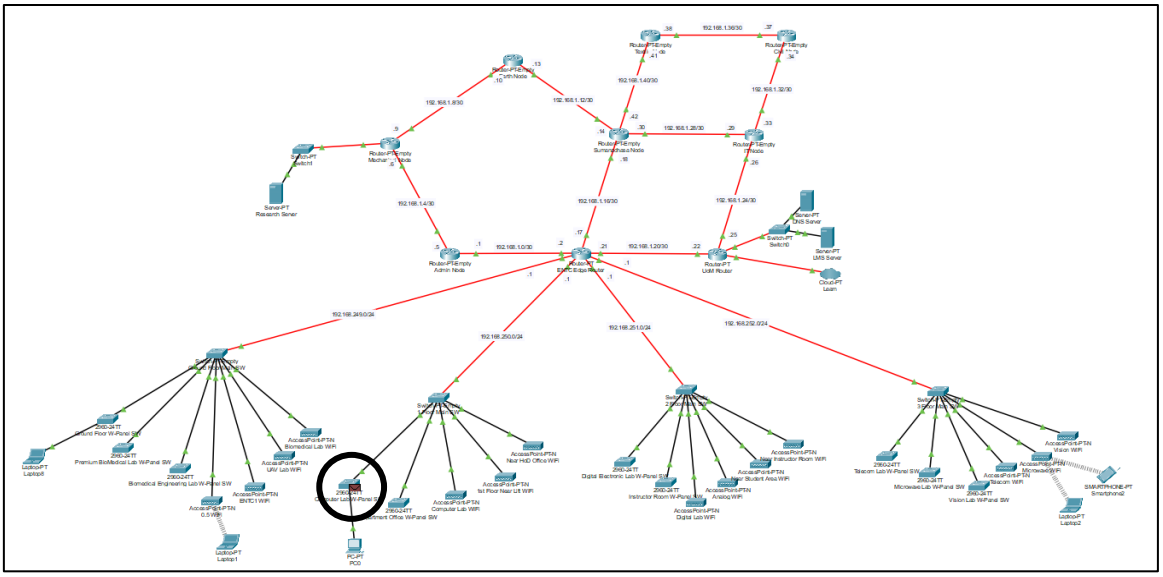


Figure 2: Packet at the next switch

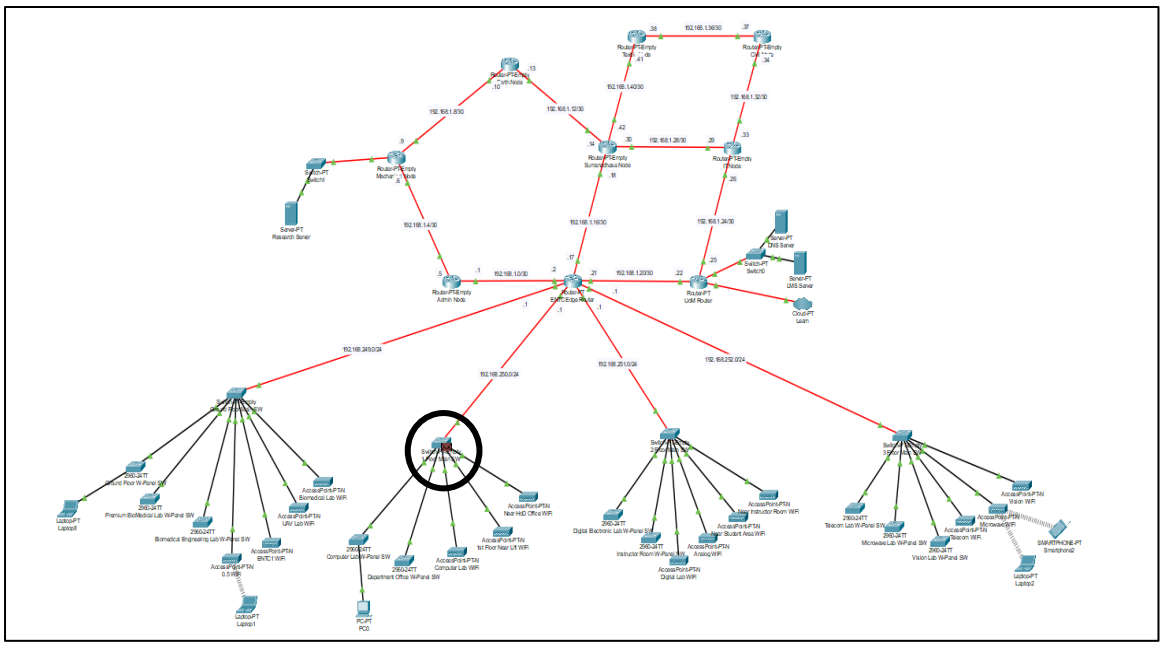


Figure 3 Packet at the main switch

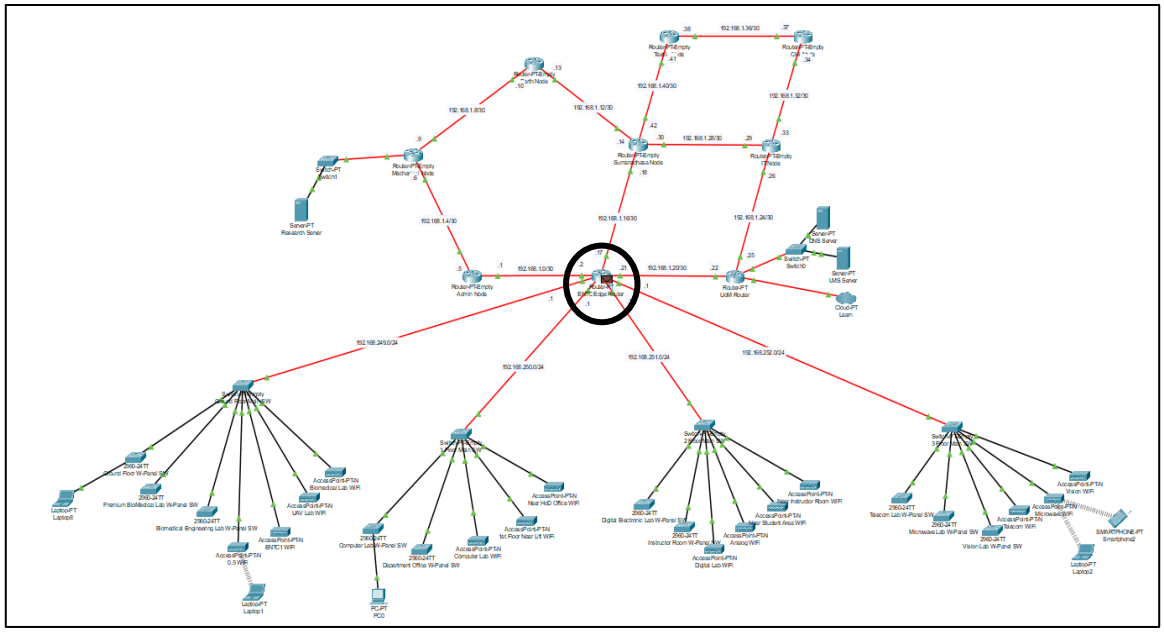


Figure 4 Packet at ENTC router

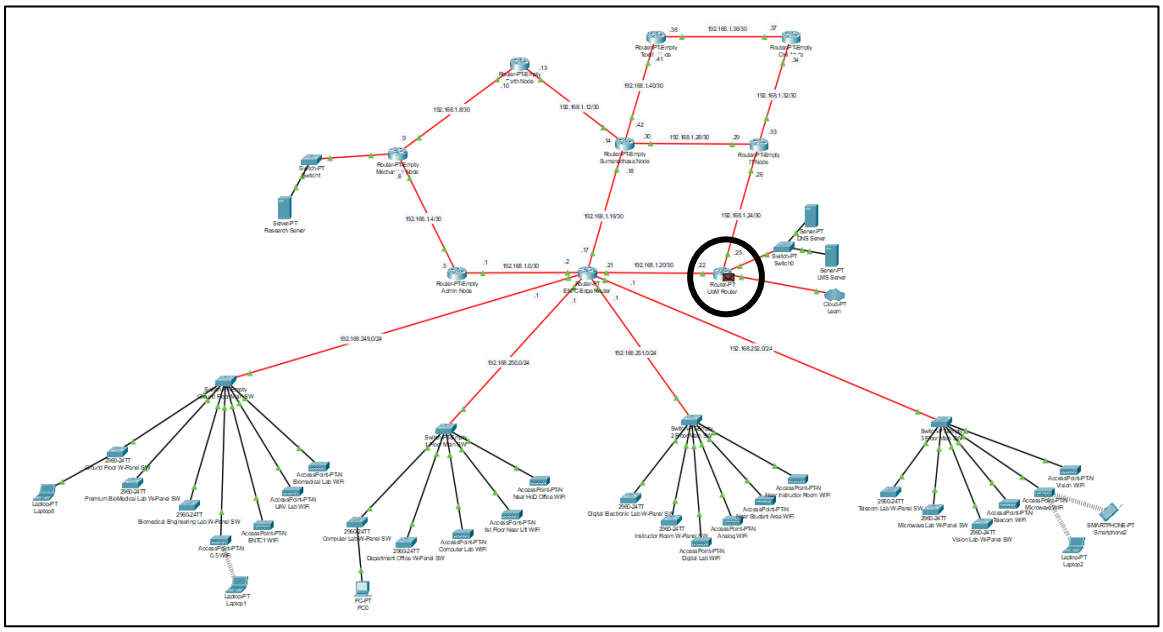


Figure 5 Packet at UOM router

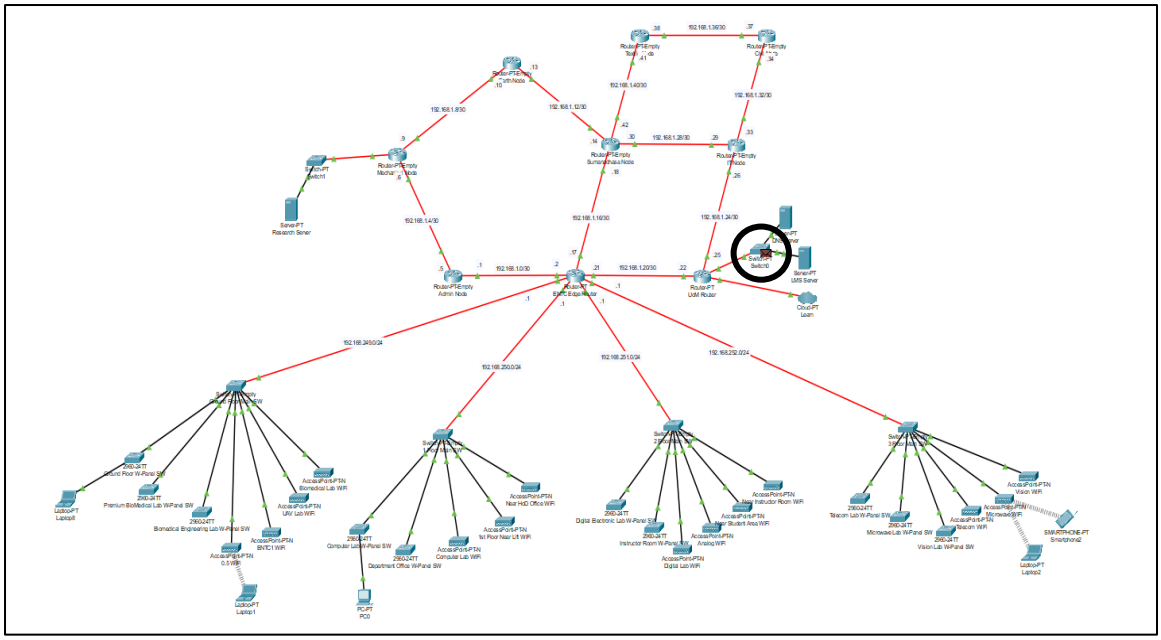


Figure 6 Packet at the switch next to the UOM router

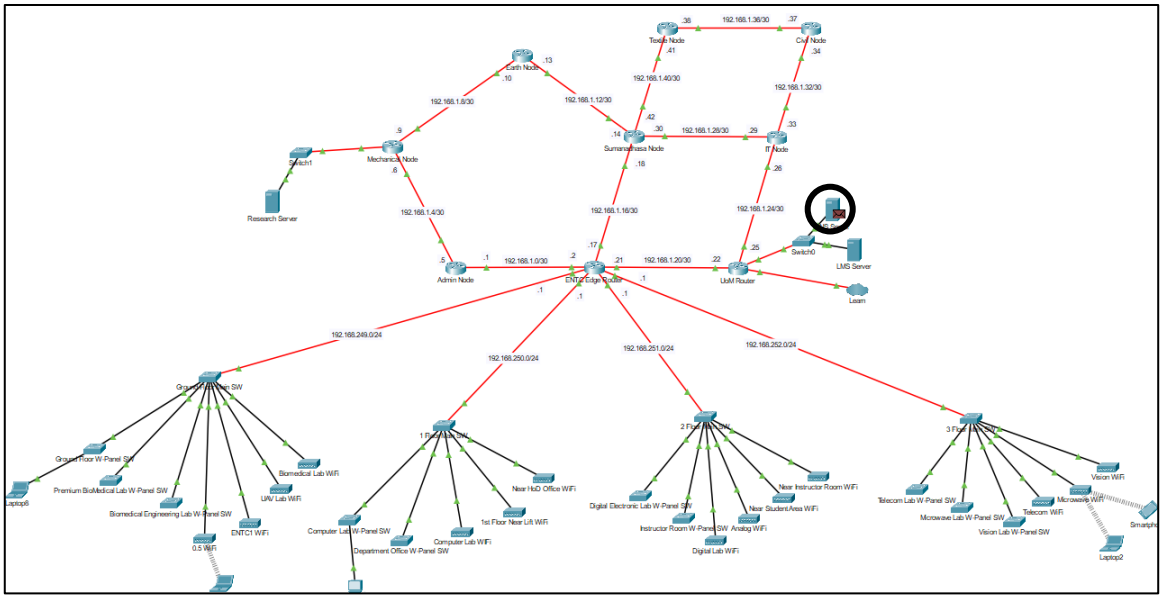


Figure 7 Packet at the DNS Server

After resolved the hostname DNS server send the packet through the same path. Then, the end PC send the TCP packet through the same path until the switch next to the UOM router. After that Packet will traverse like below to the LMS data server and server sends back TCP packets through the same path.

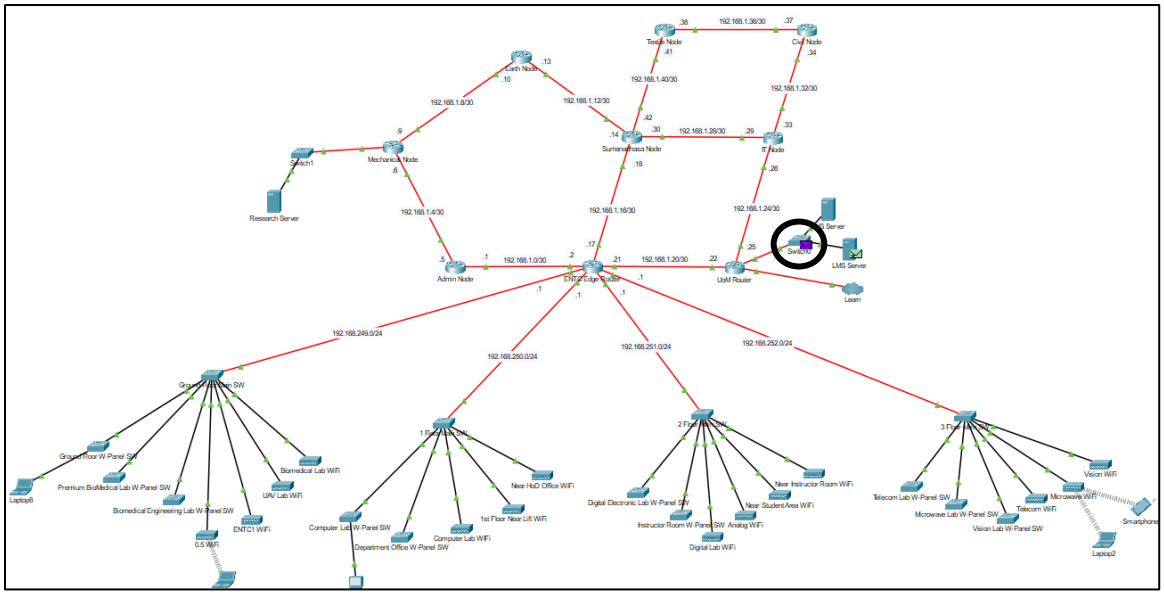


Figure 8 Packet at the switch next to the UOM router

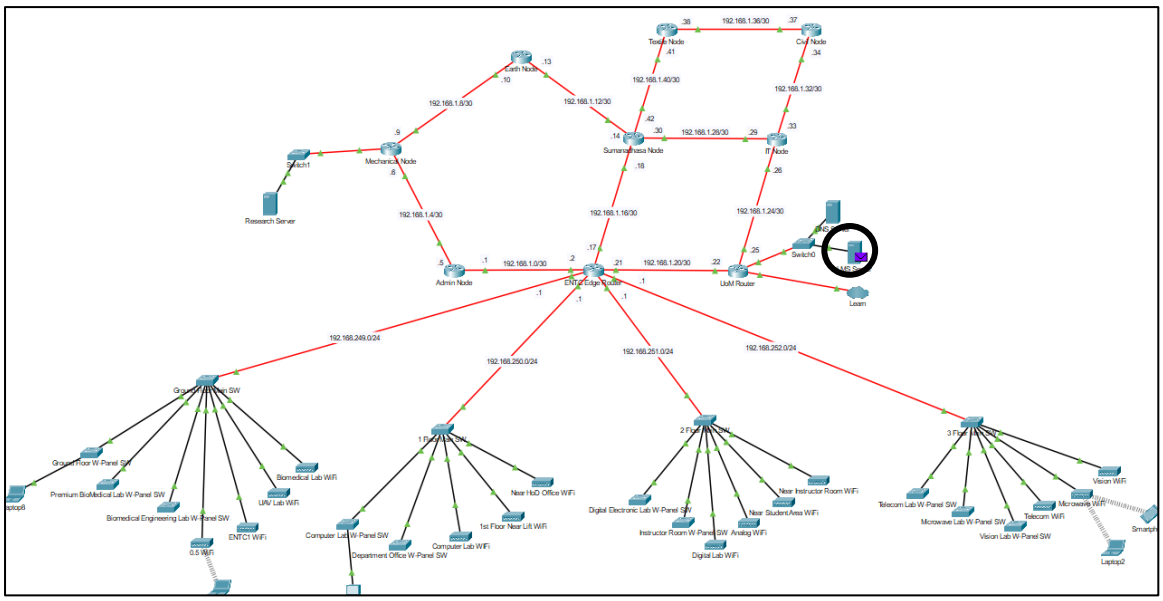


Figure 9 Packet at LMS server

After the link connecting backbone network nodes between ENTC and data center is broken. Routing path taken by a network session of student at ENTC who is accessing LMS servers

Packets will take the same path until ENTC router after that the path will be like below.

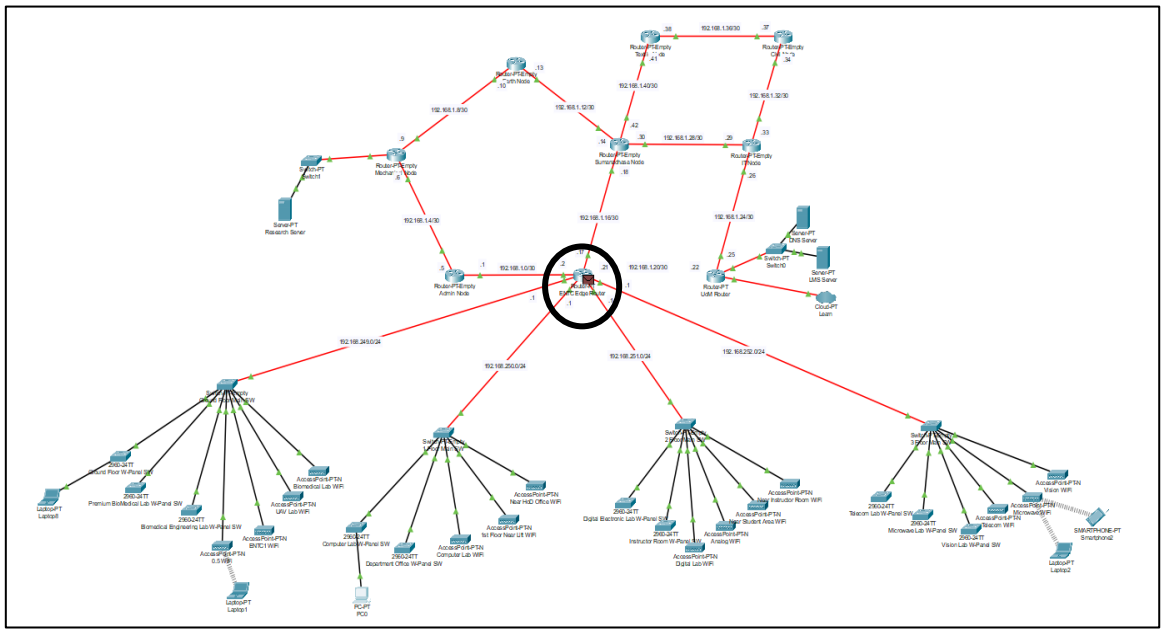


Figure 10 Packet at ENTC router

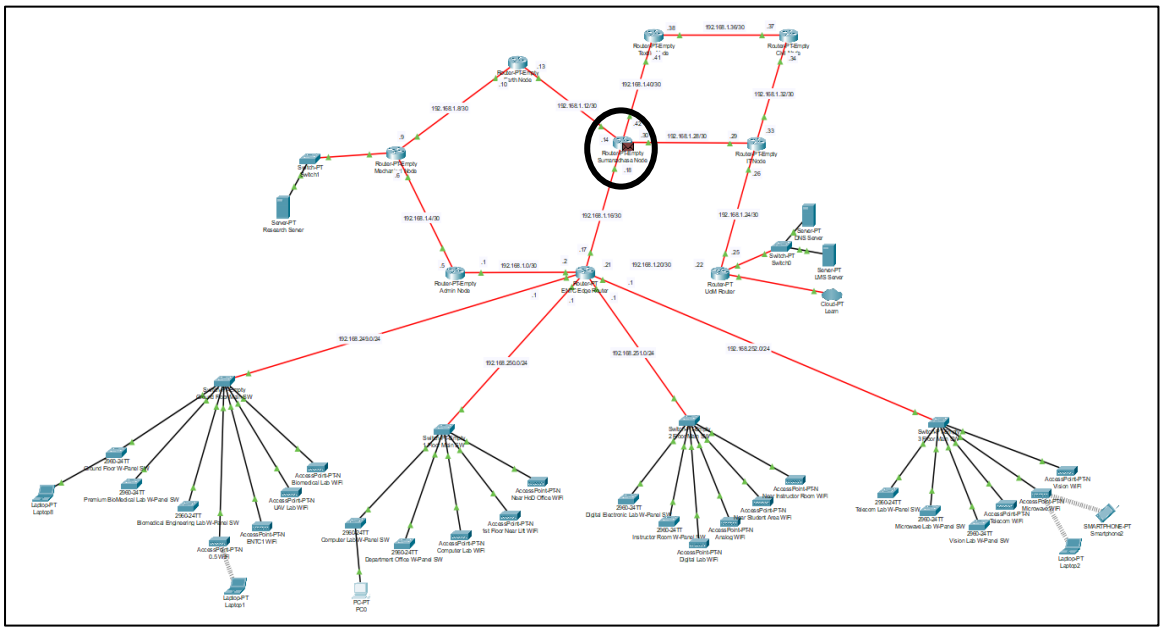


Figure 11 Packet at Sumanathasa router

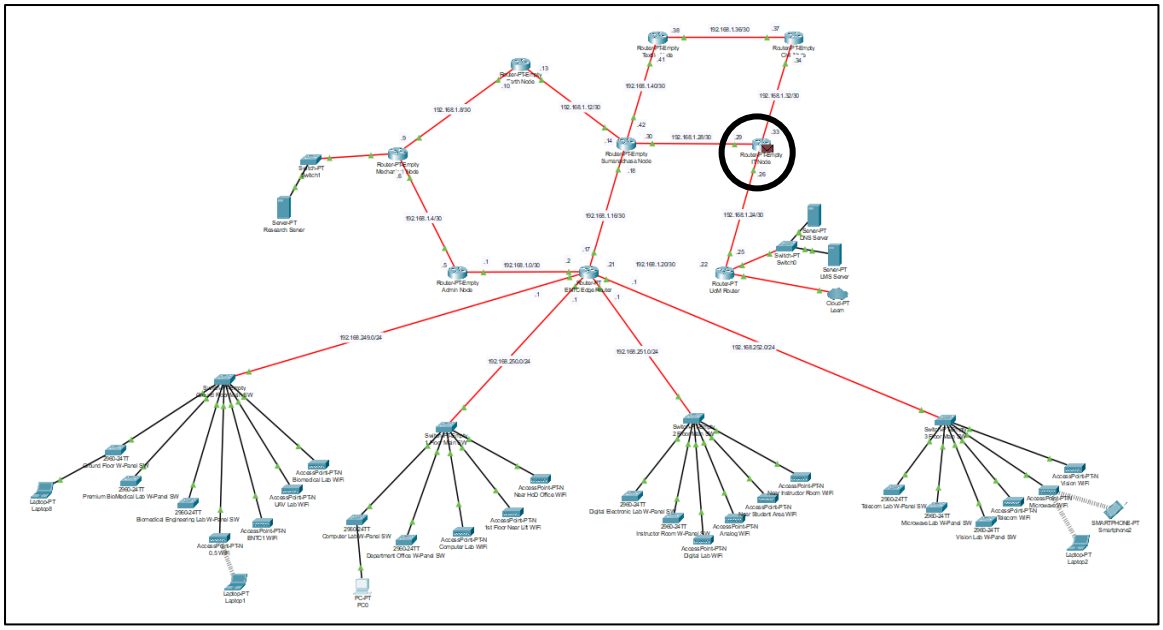


Figure 12 Packet at IT router

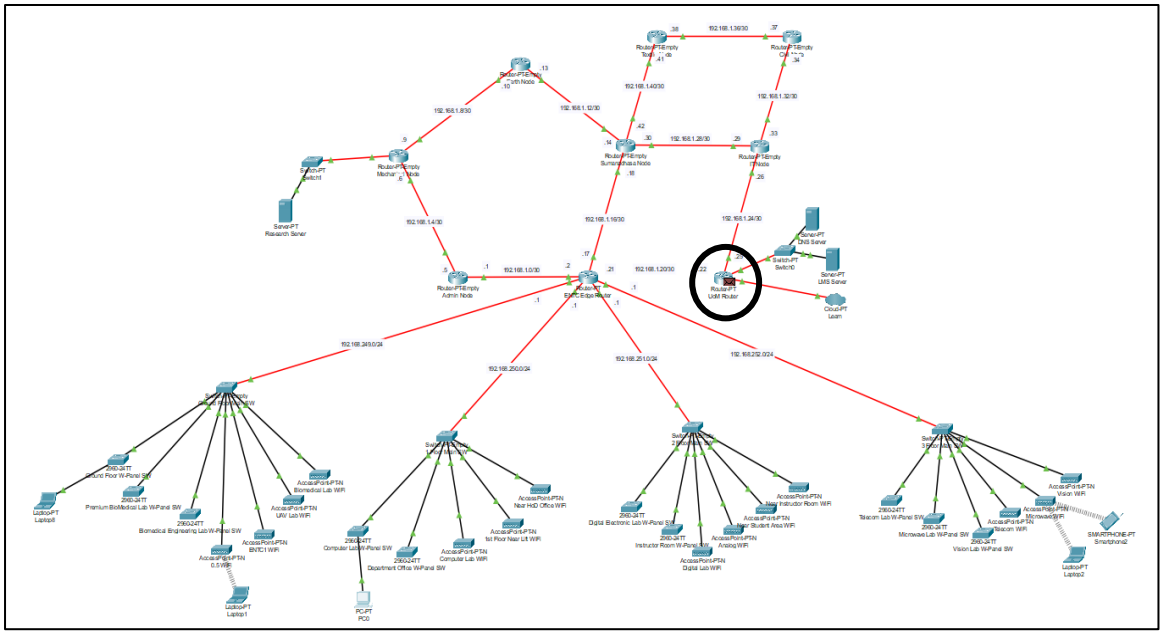


Figure 13 Packet at UOM router

After this packet will take the same path as before to the DNS server and TCP packet traversal happen through the same path to the LMS data server.

Routing path taken for a session to the collaborative research project server being done by ENTC and Mechanical students

The project server is connected to the Mechanical Node Router.

Packet will take the same path as before to resolve the host name from the DNS server. After that TCP packets will take same path until the ENTC router as before for the DNS resolution. After that, TCP packets will take the path as below to the project server at Mechanical Department.

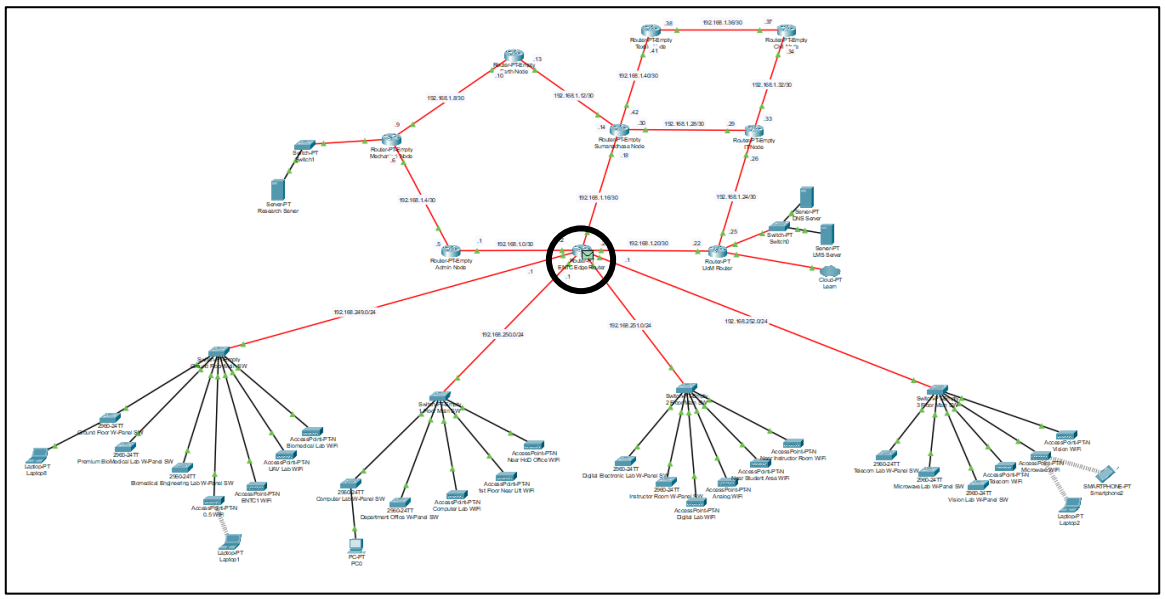


Figure 14 Packet at ENTC router

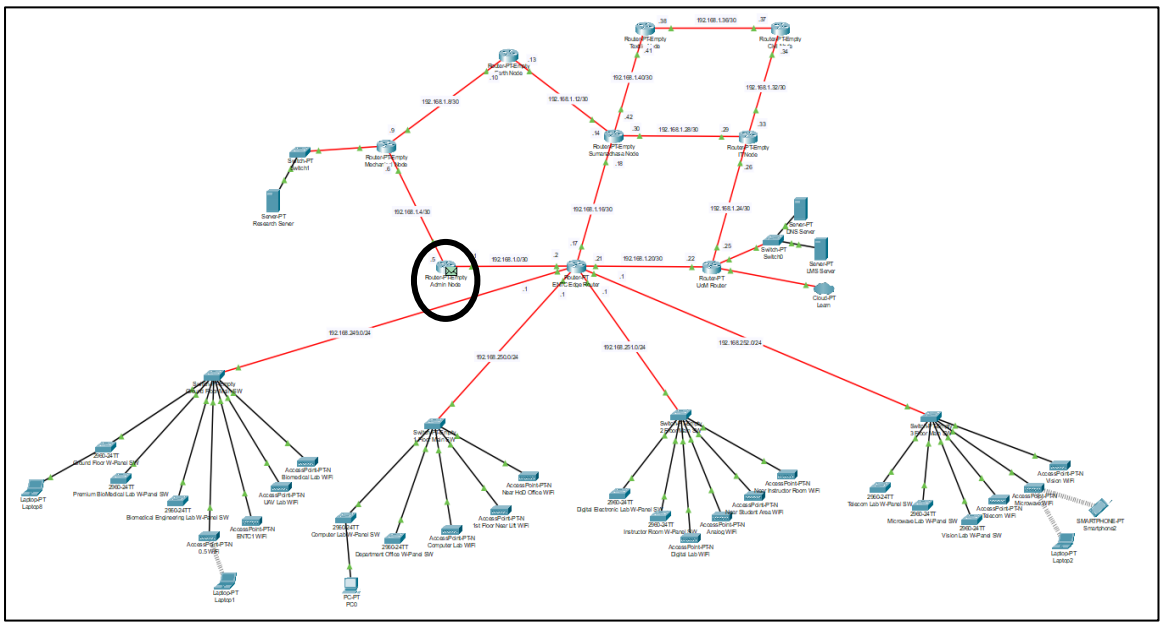


Figure 15 Packet at Admin block router

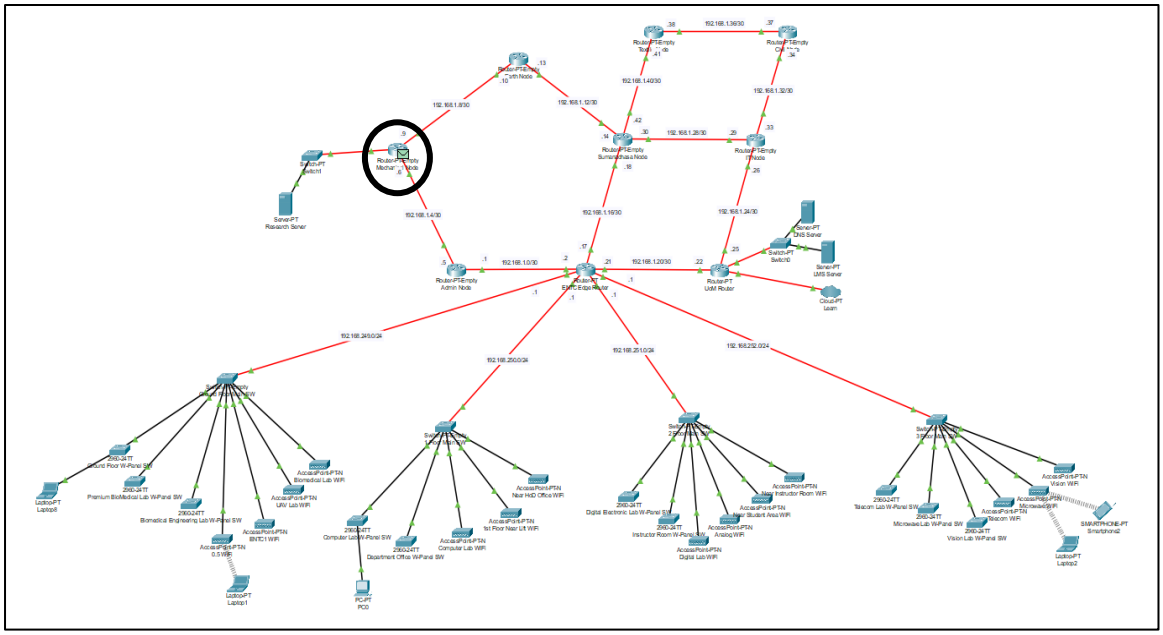


Figure 16 Packet at Mechanical router

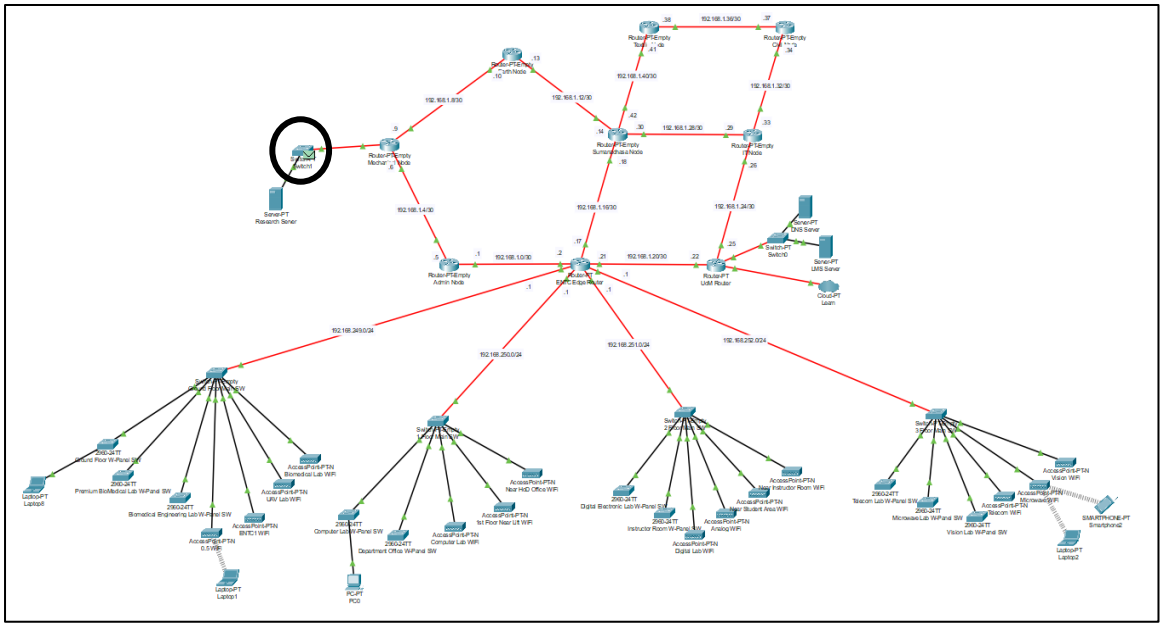


Figure 17 Packet at switch next to Mechanical router

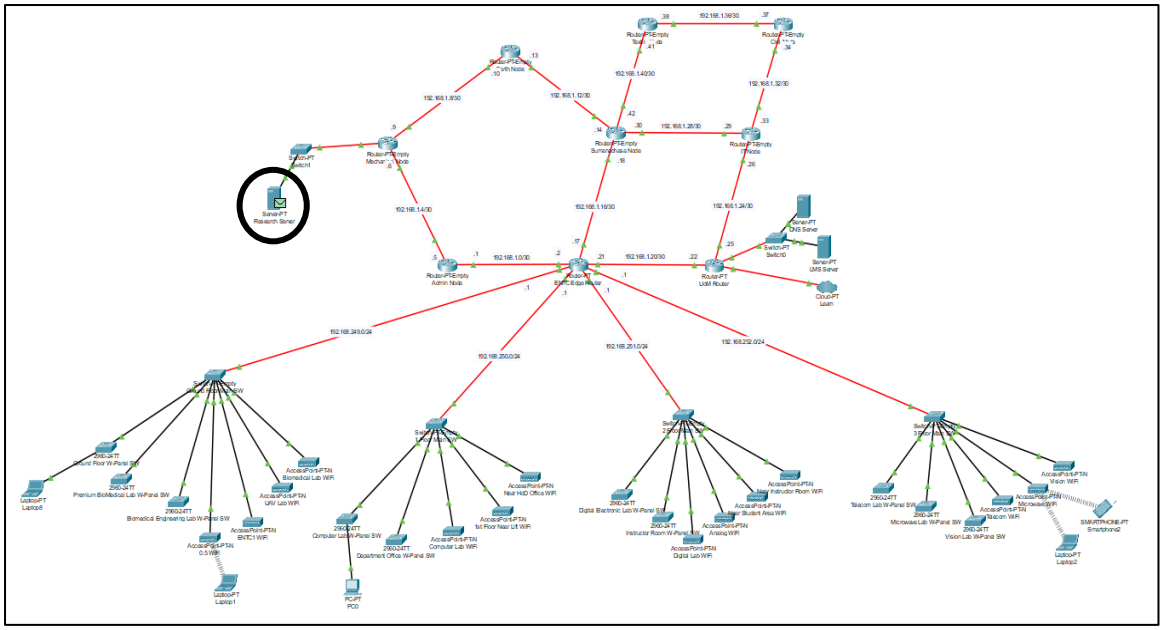


Figure 18 Packet at the Server in the Mechanical department

New routing path taken by the network session after disconnecting any one of the backbone links used by the path above.

TCP packets will take same path until ENTC router as before. After that the packet will take path as below.

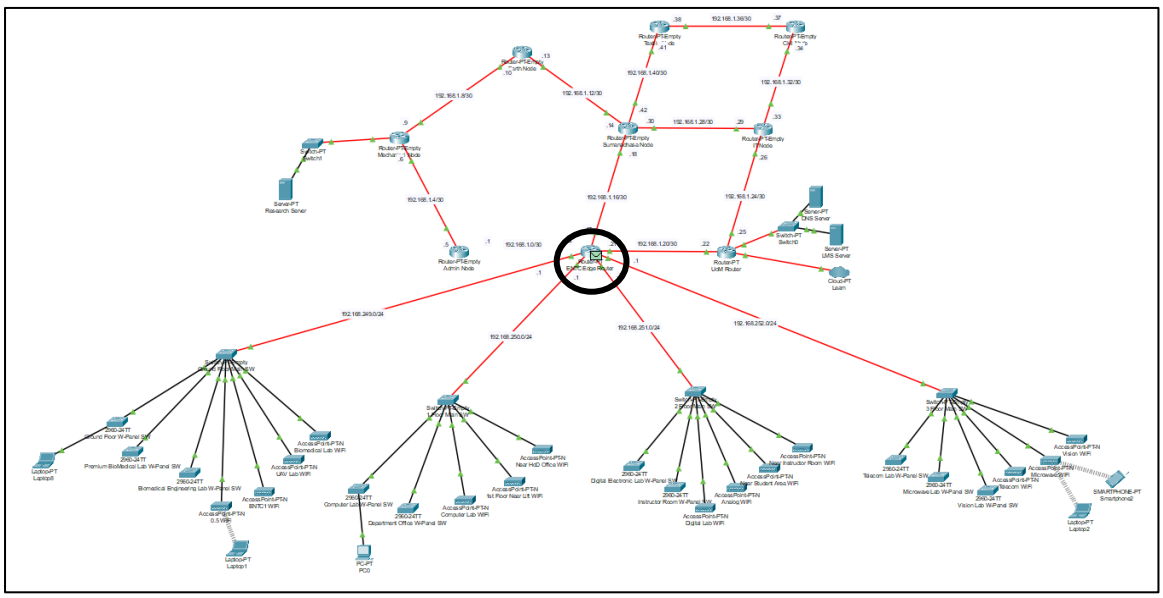


Figure 19 Packet at ENTC router

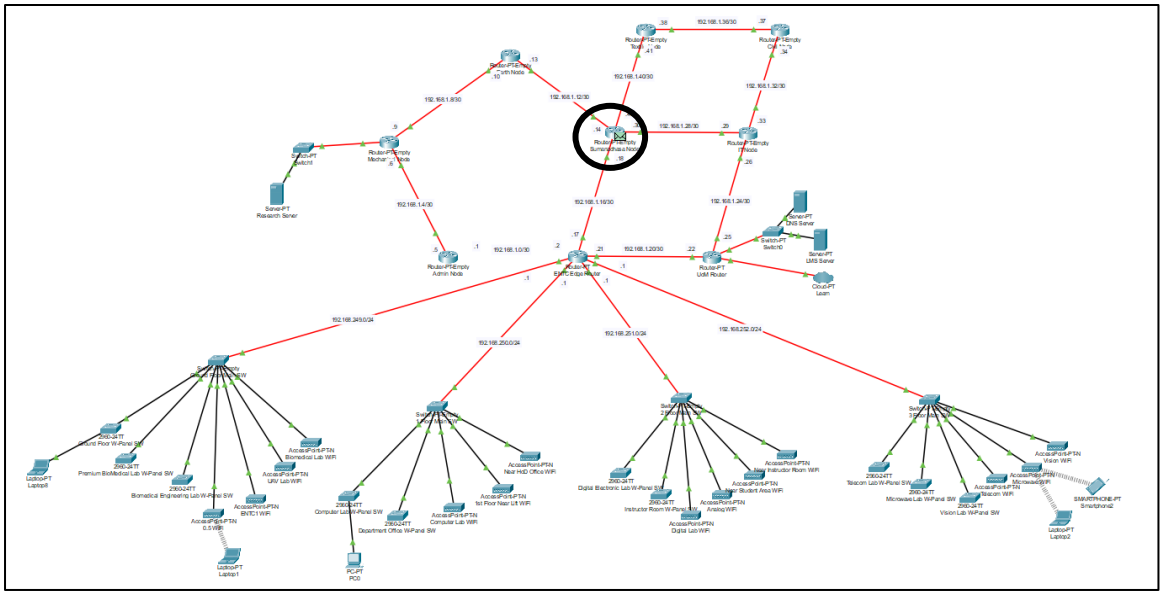


Figure 20 Packet at Sumanadhasa router

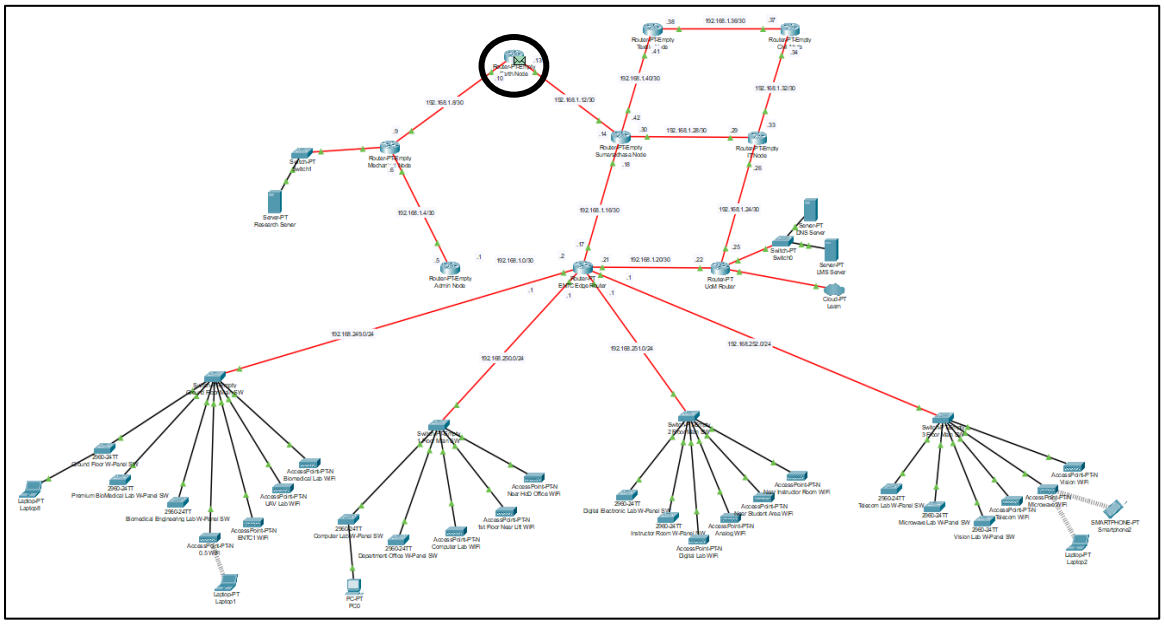


Figure 21 Packet at Earth router

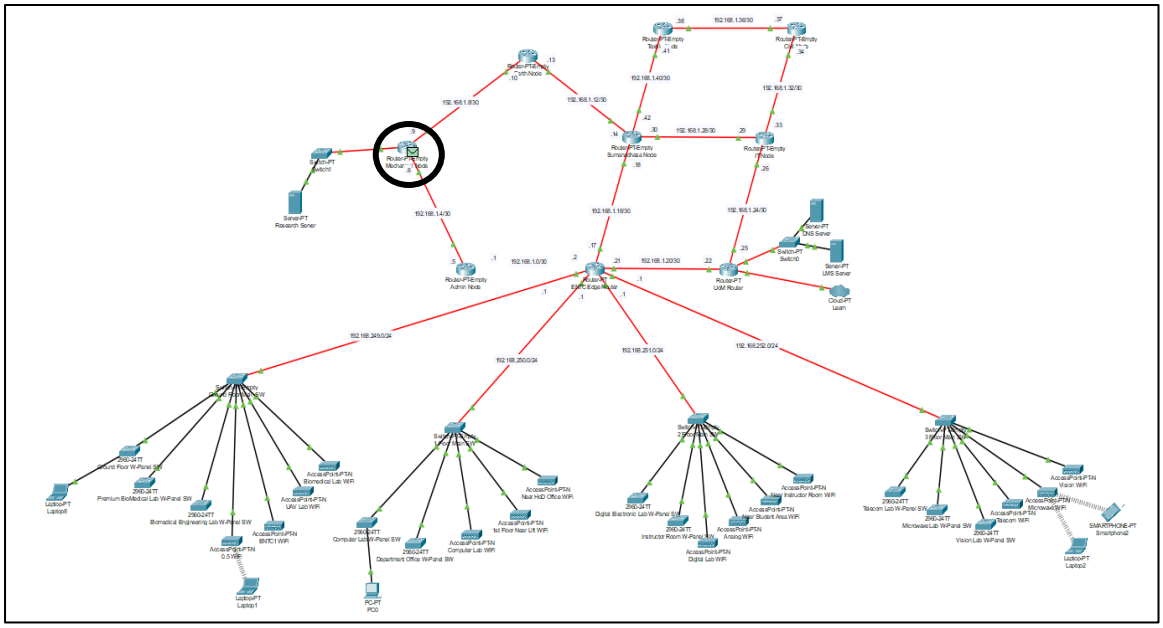


Figure 22 Packet at Mechanical router

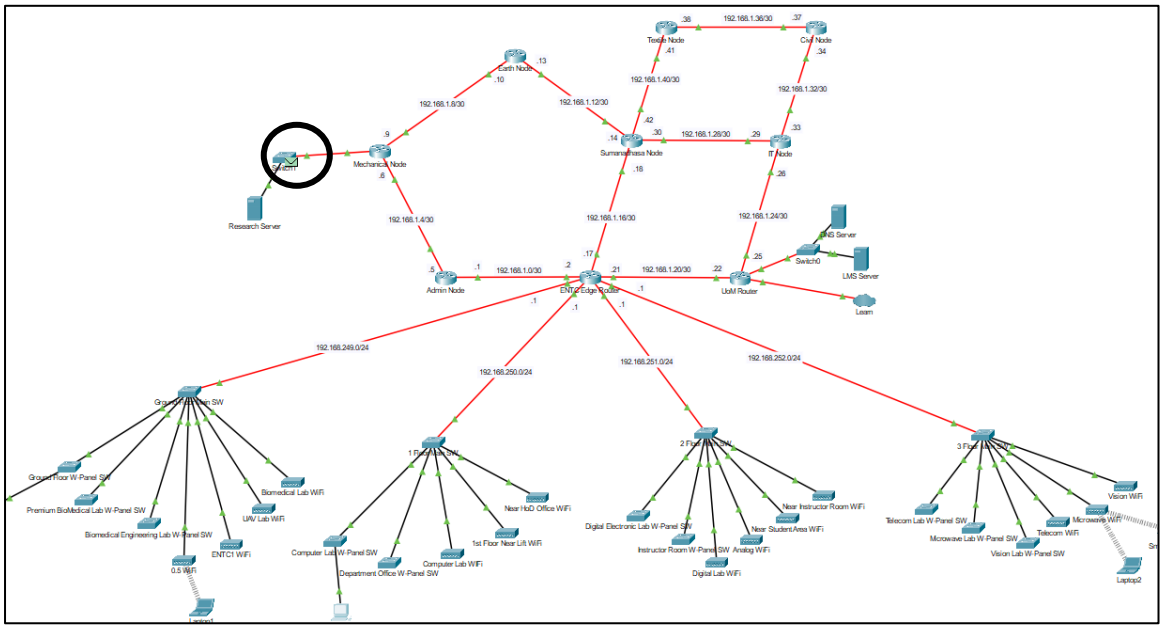


Figure 23

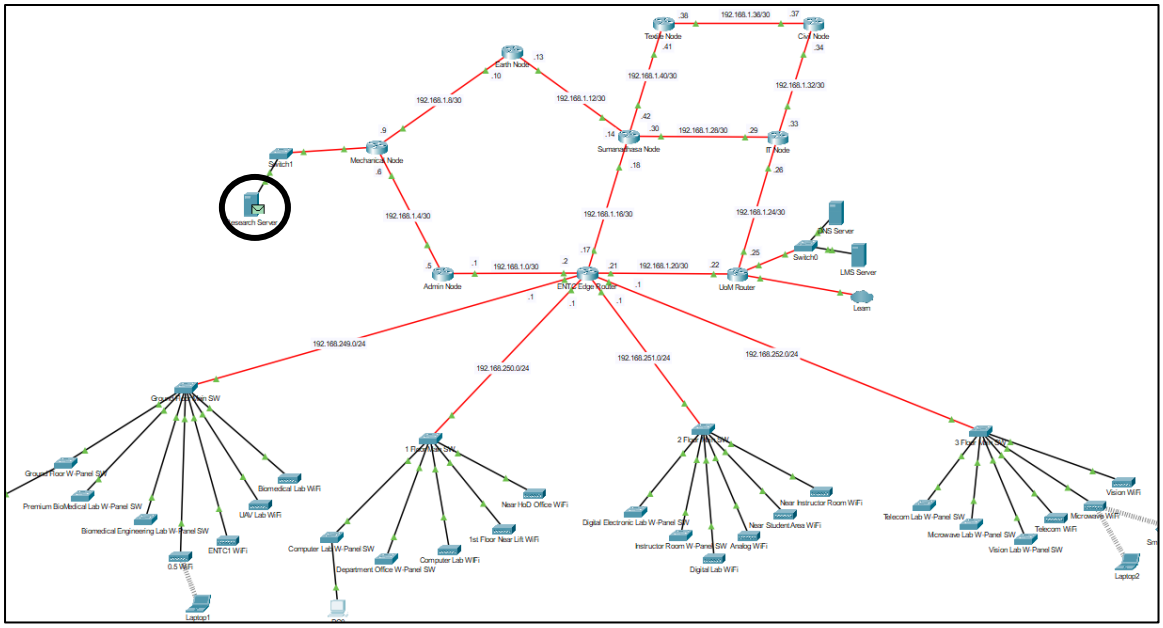

192.168.1.36/30
192.168.1.40/30
192.168.1.32/30
192.168.1.8/30
192.168.1.12/30
192.168.1.28/30
192.168.1.4/30
192.168.1.16/30
192.168.1.24/30
192.168.1.0/30
192.168.1.20/30
192.168.249.0/24
192.168.250.0/24
192.168.251.0/24
192.168.252.0/24
Earth Node
Texas Node
Civil Node
Mechanical Node
Switch1
Research Server
Sumanadasa Node
IT Node
Admin Node
ENTC Edge Router
UoM Router
DNS Server
Switch0
LMS Server
Learn
Ground Floor W-Panel SW
Premium BioMedical Lab W-Panel SW
Biomedical Engineering Lab W-Panel SW
0.5 WiFi
ENTC1 WiFi
UAV Lab WiFi
Biomedical Lab WiFi
Laptop1
1 Floor W-Panel SW
Computer Lab W-Panel SW
Department Office W-Panel SW
Computer Lab WiFi
1st Floor Near Lift WiFi
Near HoD Office WiFi
2 Floor W-Panel SW
Digital Electronic Lab W-Panel SW
Instructor Room W-Panel SW
Digital Lab WiFi
Analog WiFi
Near Student Area WiFi
Near Instructor Room WiFi
3 Floor W-Panel SW
Telecom Lab W-Panel SW
Microwave Lab W-Panel SW
Vision Lab W-Panel SW
Telecom WiFi
Microwave WiFi
Vision WiFi
Laptop2

Figure 24