TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

CENTRAL CAMPUS PULCHOWK

CASE STUDY REPORT

ON

IOE INTRANET DESIGN

By:

PRANESH SHAKYA / 068BCT528

RAJESH BHUJU / 068BCT531

RUPESH KARN / 068BCT534

SUVRAT RAM JOSHI / 068BCT546

Submitted To:

Mr. Baburam Dawadi

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

LALITPUR, NEPAL

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IOE PULCHOWK CAMPUS INTRANET DESIGN

Question:

Pulchowk Campus has six Departments (COMP&elx,elect,civil,mech, arch, S&H), CIT, CES, administrative building (library), boys hostel, Ladies hostel, msc hostel. Boys hostel blocks(A,B,C) having in total 45X3=105 rooms, ladies hostel block having in total 30 rooms, 24 faculty quarters. Msc hostel having 36 rooms. DOECE has 4 computer labs (at cit and library) each having 24 computers, 20 faculty/administrative rooms. Other departments have in an average 2-computer labs each of 24 computers and 12 faculty/administrative rooms, CES has 20 rooms. CIT server room has web, proxy, primary DNS, cache dns, Mail, AAA servers of www.pcampus.edu.np, 2 network printers, 2 CISCO voip phones. campus administrative building located at library has 20 administrative cabin and 6 library computers. Internet is supplied to all rooms /quarters computer with a wired CAT6 port and every department has two wireless points, boys hostel has 3 AP for each block, ladies hostel has 1 AP and quarter is covered by 2APs, CIT/Library has 2 APs. CIT has purchased the public ip block 103.5.150.0/24 from APNIC and 20Mbps internet from NTC. All servers, routers and switches at server control room have public IPs. Similarly DOECE administrative rooms are connected with public IPs, a network lab of DOECE is also connected with public IPs. List the complete physical equipments/virtual equipments required for the complete networking design/intranet design. Prepare the Summary specification sheet of all the equipments. Draw/design the network/intranet showing all the connection in switch/AP level. (use visio or PT). Design the logical ip address distribution. You shall have your own choice of private and public IPv4/v6 addressing. design appropriate VLAN, Security/Firewall etc…at your work.

PHYSICAL EQUIPMENTS

1. Router
2. Access-Point
3. Switch
4. CAT-6 UTP Cable
5. PC/Workstations
6. Server
7. Mail Server
8. Proxy Server
9. Web Server
10. Primary DNS Server
11. Cache DNS Server

12. Fiber Optics Gigabit Ethernet Switch
13. DMG Router

SPECIFICATION SHEET

SN	Item-Description	Quantity	Unit	Summary Specification
1	CAT-6 UTP Cable	380	Meter	4-pair pure copper conductor PVC jacketed Foiled/UTP cable with TIA standard color coded 23 AWG and having tested frequency range of 250-550 MHz, Support upto1000Base-T at 100 Meter
2	PCs	260	unit	Dell 745 (or higher; dual Core-series processor); 2GB of RAM; Windows XP or Windows 7
3	Router	1	unit	Cisco® 2900 Series Integrated Services Routers
4	Access Point	26	unit	150Mbps Wireless N Router; 2.4-2.4835GHz
5	Mail Server	1	unit	Intel Quad-core processor; 8GB RAM; 100Mbps NIC
6	Server	1	unit	Xeon E3-1220L V2; Dual Core; 4 threads; 2.3 GHz processor
7	DNS Server	1	unit	30MB RAM for PDNS + an extra 30MB for MySQL

8	Proxy Server	1	unit	Linux such as Red Hat or Ubuntu. Ubuntu; 300MHz processor, 128MB of memory and 1GB of hard drive space
9	Fiber Optics Switch	1	unit	7 UTP ports; 10/100 auto-sensing and auto-negotiating; 1 fiber port 100BaseFX; ST or SC connectors; multimode/singlemode; Distances to 70 km
10	Switch	21	unit	Cisco Catalyst 2950SX-24: 8.8 Gbps maximum forwarding bandwidth
11	DMG Router	1	unit	2.4/5.0 GHz; 802.11n; WPS button; DLNA; Ethernet

LOGICAL IP ADDRESS

We are provided with a public IP address from APNIC 103.5.150.0/24. Since there are two switches for different LAN requirement we initially have to create 2 subnets. Also as question stated the administration and network lab of DoECE also has public IPs so altogether we need 4 subnets.

1 st subnet (A) – 9 machines (Servers)

2 nd subnet (B) – 20 machines (PCs)

3 rd subnet (C) – 24 machines (PCs)

4 th subnet (D) – 26 machines (Access Points)

Applying VLSM technique,

Starting from the highest machines which is C,

26 machines = $(2^5 – 2)$ hosts = 30 hosts

3 bits from host is added to network bits,

2^3 subnets = 8 subnets

Network bits = 27 bits

Multiplier = 2^5 = 32

Subnet Mask = 255.255.255.11100000

The subnets created are :-

Subnet 1 = 103.5.150.0/27 [0 – 31]

Subnet 2 = 103.5.150.32/27 [32 – 63]

Subnet 3 = 103.5.150.64/27 [64 – 95]

Subnet 4 = 103.5.150.96/27 [96 – 127]

Subnet 5 = 103.5.150.128/27 [128 –159]

Subnet 6 = 103.5.150.160/27 [160 – 191]

Subnet 7 = 103.5.150.192/27 [192 – 233]

Subnet 8 = 103.5.150.234/27 [234 – 255]

Subnet 1 is assigned to D i.e. Access Points in Boys Hostel, Girls Hostel, Quarter, Departments and CIT/Library.

Similarly,

Taking C with 24 machines

24 machines = (2^5 – 2) hosts = 30 hosts

Since this is similar to D, hence we assign Subnet 2 to C i.e. DoECE Network Lab.

Again,

Taking B with 20 machines

20 machines = (2^5 – 2) hosts = 30 hosts

Since this is similar to B, hence we assign Subnet 3 to B i.e. DoECE Administrative Unit.

Lastly, Taking Block A with 9 machines

9 machines = (2 4 – 2) hosts = 14 hosts

(5-4) bits from host is added to network bits,

2 1 subnets = 2 subnets

Network bits = (27 + 1) bits = 28 bits

Multiplier = 2 4 = 16

Subnet Mask = 255.255.255.11110000

Take Subnet 4 = 103.5.150.96/27 [96 – 127]

The subnets created are :-

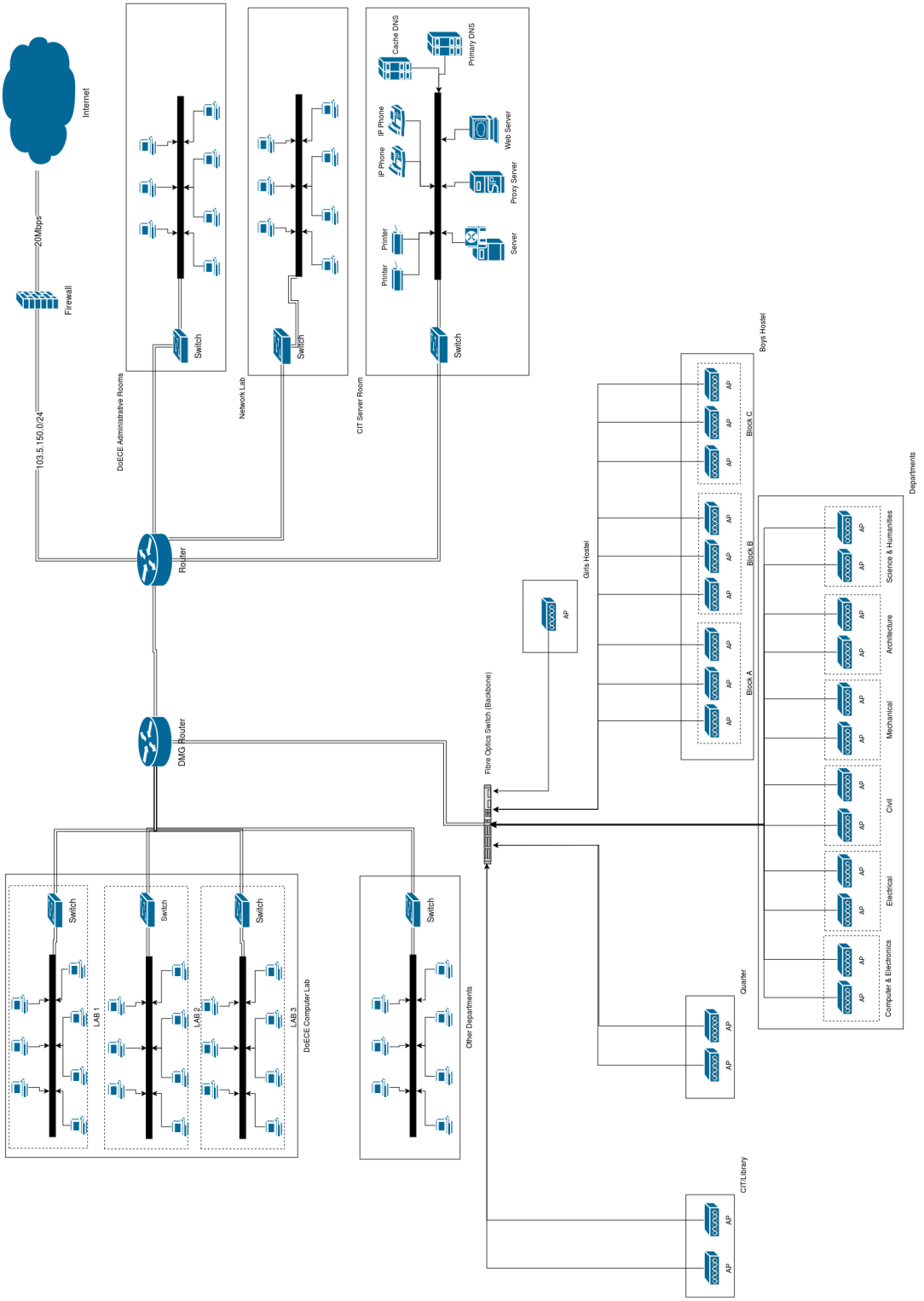
Subnet 4.0 = 103.5.150.96/28 [96 – 111]

Subnet 4.1 = 103.5.150.104/28 [112 – 127]

Subnet 4.0 is assigned to A i.e. CIT Server Room

INTRANET DESIGN

Physical Network Design



Logical Network Design (IP Addressing)