**Basic Campus Network Design**

Let’s assume, we Have 3 buildings on our campus.

1. student Hall, where around 200 students live.

2. Teachers dormitory, where approximately 20 family resides.

3. Academic building, where nearly 50 staffs work.

Our objective is to connect all of their devices through a network and provide internet access to everyone. Therefore we would like to create 3 individual networks for three buildings.

**Addressing Table 1:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device/Endpoints** | **IP Address** | **Subnet Mask** | **Default Gateway** | **Network** |
| ISP Public Network |  |  | 103.133.254.1 | 103.133.254.0/24 |
| Public DNS/HTTP Server | 103.133.254.2 | 255.255.255.0 | 103.133.254.1 | 103.133.254.0/24 |
| Remote PC | 103.133.254.4 | 255.255.255.0 | 103.133.254.1 | 103.133.254.0/24 |
| **Core Router:** |  |  |  |  |
| Interface 1 | 103.133.254.3 | 255.255.255.0 |  | 103.133.254.0/24 |
| Interface 2 | 10.28.0.1 | 255.255.255.248 |  | 10.28.0.0/29 |
| **Dist Router:** |  |  |  |  |
| Interface 1 | 10.28.0.2 | 255.255.255.248 |  | 10.28.0.0/29 |
| Interface 2: |  |  |  |  |
| Sub-interface 10 | 10.28.32.1 | 255.255.224.0 |  | 10.28.32.0/19 |
| Sub-interface 20 | 10.28.64.1 | 255.255.224.0 |  | 10.28.64.0/19 |
| Sub-interface 30 | 10.28.96.1 | 255.255.224.0 |  | 10.28.96.0/19 |

**Addressing Table 2 (VLANs):**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **VLAN-ID & Name** | **DHCP Pool** | | **Default Gateway** | **Network** |
| **DHCP From** | **DHCP To** |
| VLAN-10 Student | 10.28.32.2 | 10.28.63.254 | 10.28.32.1 | 10.28.32.0/19 |
| VLAN-10 Student | 10.28.64.2 | 10.28.95.254 | 10.28.64.1 | 10.28.64.0/19 |
| VLAN-10 Student | 10.28.96.2 | 10.28.127.254 | 10.28.96.1 | 10.28.96.0/19 |

Components we will use for this network:

* 1 Core router
* 1 Distribution Router
* 1 managed switch
* 3 unmanaged switch
* 3 Home Router/Access Point

First of all, to provide internet access and services we have to get an internet connection from the local ISP (Internet Service Provider) via either

* Ethernet Twisted Pair cable or via
* Optical Fiber Cable, through Media converter or SFP module

This ISP line will enter into The Core Router, Core Router runs on the same Public Network of the Backbone of the Internet and can also connect distributed routers from multiple large enterprises or community locations.

Here we have used the MikroTik Network Router (RB3011) as the core router

It has

* 10 ethernet ports
* 1 SFP Port
* 1 USB port

The first port is a PoE (Power over Ethernet) port, we have connected the ISP-provided line to this port.

Now, our task is to provide this line to our distribution router.

For that purpose, we have created a small network between the core router and distribution router with the IP pool (10.28.0.0/29)

We have taken another MikroTik (RB3011) router as a distribution router.

At this point, some of you may be thinking about why we are using 2 routers here.

We are using two routers:

* To Apply VLAN (Virtual Local Area Network) apart from the core network
* Distribution routers have complex connectivity and critical monitoring and management endpoints whereas Core routers have only concerned with the transmission of the data at a high rate.
* To use multiple ISP networks ( one will work in active mode and another will remain as a failover backup -that means if for some reason, one ISP fail to provide internet, we will use the second ISP’s Line, and our distribution layer will not be affected by this)
* For load balancing

In the Distribution router, we got a connection from the core router via the first PoE port (The core router’s 2nd port is connected to the distribution router’s first port).and used BGP (Border Gateway Protocol) to make communication between two routers. BGP 65001 is assigned to the Distribution router and BGP 65002 is used in the Core router.

Then, we created 3 VLANs for 3 individual buildings and named them

* VLAN-10 for Students
* VLAN-20 for Teachers
* VLAN-30 for Academic

And implemented DHCP (Dynamic Host Configuration Protocol) Service for each network. Now, these VLANs are distributed via the 2nd Ethernet port of the distribution router.

Then we connected this Interface to a Distribution switch.

Here, We Have used ‘Cisco SG350 28P’ as the distribution switch. It is a managed switch with 28 ports.

We have configured the ports of this switch for the VLANs.

The first port of the switch is connected to the distribution router as trunk mode (we will know about trunk mode later)

From 2nd to 6th these 5 ports are configured for VLAN-10 (Student)

From 7th to 11th these 5 ports are configured for VLAN-20 (Teacher)

From 12th to 16th these 5 ports are configured for VLAN-30 (Academic)

We have also created 3 different DHCP IP pools for 3 individual networks.

We have assigned an IP range

* 10.28.32.0/19 for Students
* 10.28.64.0/19 for Teachers
* 10.28.96.0/19 for Academic

Then we have taken connections from the 2nd, 7th and 12th ports and connected them with 3 individual unmanaged switches for our three different networks.

In unmanaged switch

* All ports work in the same VLAN
* Any ports can be connected without configuration
* Connection can be distributed to AP ( Access Point) / Home router
* Can be connected directly to PC via ethernet cable.

Finally, we have connected 3 individual wireless Home routers to 3 unmanaged switches.

The First Home Router provides Connectivity to the Student’s hall. We named its SSID:

Asi@Connect\_Student

The second Home Router provides Connectivity to the Teacher’s Dormitory. We named its SSID:

Asi@Connect\_Teacher

The Third Home Router provides Connectivity to the Academic Building. We named its SSID:

Asi@Connect\_Academic

So now we can conclude that the whole design has 3 layers such as:

1. Core Layer: ISP Network and Core Router functionality
2. Distribution Layer: Distribution Router and Distribution (Managed) Switch
3. User Access Layer: Access (Unmanaged) Switch and Home Routers/ Access Points

This completes our full campus network design.

If, you have any queries, feel free to ask them in our WhatsApp Group or shoot a mail at [techgirl@cse.pstu.ac.bd](mailto:techgirl@cse.pstu.ac.bd)

1. Step 1 :