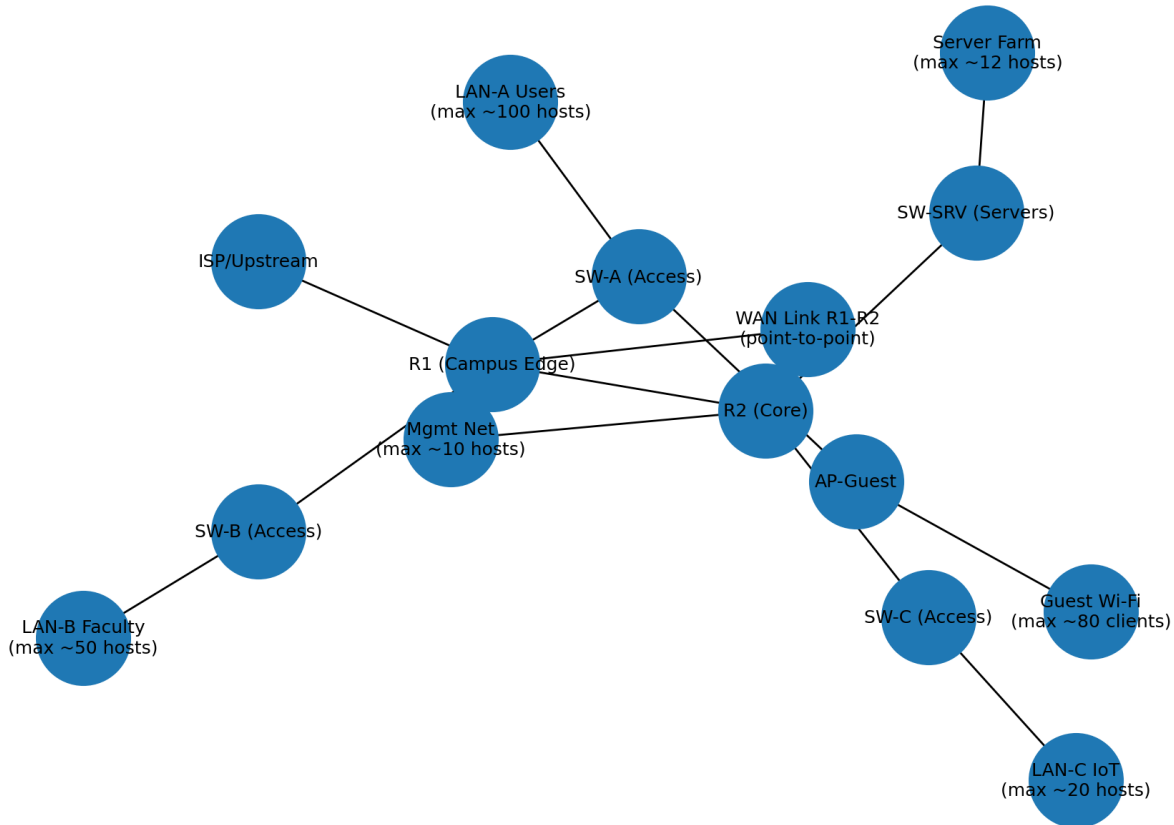


IPv4 Subnetting Exercise - Multi-Subnet Campus Topology



IPv4 Subnetting Exercise – Multi-Subnet Campus

Scenario

Your campus network has the following topology and requirements:

- **Routers:** R1 (Campus Edge), R2 (Core) with a **point-to-point WAN** between them
- **Access switches:** SW-A, SW-B, SW-C
- **Server switch:** SW-SRV
- **Wireless AP:** AP-Guest (on SW-A)

Subnet requirements (Variable Length Subnet Masking (VLSM) expected)

1. **LAN-A Users (behind SW-A): up to 100 hosts**

2. **LAN-B Faculty** (behind SW-B): **up to 50 hosts**
3. **LAN-C IoT** (behind SW-C): **up to 20 hosts**
4. **Server Farm** (behind SW-SRV): **up to 12 hosts**
5. **Guest Wi-Fi** (behind AP-Guest on SW-A): **up to 80 clients**
6. **Management network** (for network devices reachable from R2): **up to 10 hosts**
7. **WAN link R1–R2: point-to-point** (2 usable IPs)
8. **Edge/ISP link** (R1 to ISP): **point-to-point** (2 usable IPs)

You are given the address block:

10.20.0.0/20

(Provides 4096 addresses; you must **subnet with VLSM** to meet needs efficiently and leave room for growth.)

Questions

Q1. Planning & Count

How many distinct subnets do you need to create to satisfy the requirements (include both point-to-point links and the management network)?

Q2. Mask Selection (VLSM)

For each requirement below, choose the **smallest** subnet mask that satisfies the host count (include network, gateway and broadcast addresses in your calculation):

- a) LAN-A Users (100)
- b) LAN-B Faculty (50)
- c) LAN-C IoT (20)
- d) Server Farm (12)
- e) Guest Wi-Fi (80)
- f) Management (10)
- g) R1–R2 WAN (2 usable)
- h) R1–ISP WAN (2 usable)

Q3. Address Allocation Strategy

Describe a rationale for the **order** you'll allocate subnets from 10.20.0.0/20 (e.g., largest-to-smallest, grouping by site/role). Why is this approach beneficial?

Q4. Subnetting – Concrete Assignment

Allocate **non-overlapping** subnets for **each** requirement from 10.20.0.0/20. List them clearly with **CIDR**, **network address**, and **broadcast address**.

Q5. Usable Ranges

For **each** allocated subnet, provide the **usable host range**.

Q6. Interface IP Assignment

Assign IPs to router interfaces and key SVIs:

- R1: interfaces to SW-A, SW-B, ISP, and R2 (WAN)
- R2: interfaces to SW-C, SW-SRV, Management, and R1 (WAN)
- SVI/Default gateways for LAN-A, LAN-B, LAN-C, Server Farm, Guest Wi-Fi, and Management

Q7. Default Gateways

Specify the **default gateway** address for **each LAN/VLAN**.

Q8. Summaries (Optional Advanced)

Create a **summary route** (or aggregate route) for all **R2-local** LANs that R1 could install to reduce routing table size. Provide the summarized prefix (if feasible) and explain any constraints.

Q9. Growth Planning

Reserve and document at least **two additional subnets** within 10.20.0.0/20 for future growth (state their sizes and potential use).

Q10. Validation

Explain two methods to verify there are **no overlaps** and that all subnets and links have **sufficient host capacity**.

Q11. WAN Efficiency

For the 2-host point-to-point links, choose appropriate masks (e.g., /30 or /31). Discuss pros/cons of each and justify your choice here.