📘 Lecture 5- Class C Subnetting

🌐 1. What is Subnetting?

Subnetting means dividing **one large network into multiple smaller networks** 🧩.

✅ Why Subnetting is Used?

- Better **network management**
- Improved **security** 🔐
- Reduced **network traffic** 🚦
- Efficient use of IP addresses

🧠 Daily Life Example:

- One big office building 🏢 is divided into different departments (HR, IT, Admin)
- Same way, one network is divided into multiple sub-networks

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🔢 2. Class C Network Basics

- Class C network has **256 total IP addresses**
- Usable IPs = **254**

🔹 Reserved IPs

- **First IP** → Network ID (e.g. .0)
- **Last IP** → Broadcast ID (e.g. .255)

📌 Purpose

- **Network ID**: Identifies the network 🆔
- **Broadcast ID**: Used to send data to all devices in the subnet 📢

📜 3. What is CIDR?

CIDR (Classless Inter-Domain Routing) is a method to represent:

- Network bits
- Subnet mask

📌 Format

IP / Number of Network Bits

Example:

- /24 → 24 bits for network
- /25 → 25 bits for network

👉 CIDR helps in **flexible subnetting** without strict class rules

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🧮 4. Subnetting Example: 192.168.10.0/25

🔹 Step 1: Identify Base Network Class

- 192.168.x.x → **Class C**
- Default mask = **/24**

Class C structure:

- First 3 octets → Network
- Last 1 octet → Host

🔹 Step 2: Borrow Bits

- Default mask = /24
- Given mask = /25

👉 Borrowed **1 bit** from host part

- Network bits = 25
- Host bits = 7

🔹 Step 3: Calculate Total Subnets

Formula:

Number of Subnets = 2^n

- n = borrowed bits = 1

👉 Subnets = $\mathbf{2^1 = 2}$

🔹 Step 4: Calculate Hosts per Subnet

Formula:

Hosts per Subnet = $2^n - 2$

- Remaining host bits = 7

👉 Total IPs = $2^7 = 128$
👉 Usable Hosts = **126**

🔹 Step 5: Subnet Ranges

🟩 Subnet 1

- Network ID: 192.168.10.0
- First Usable: 192.168.10.1
- Last Usable: 192.168.10.126
- Broadcast: 192.168.10.127

🟦 Subnet 2

- Network ID: 192.168.10.128
- First Usable: 192.168.10.129
- Last Usable: 192.168.10.254
- Broadcast: 192.168.10.255

🧮 5. Subnetting: 192.168.10.0/26

- 🔹 **Borrowed Bits**
  - /24 → /26
  - Borrowed = 2 bits
- 🔹 **Total Subnets**
  - 2^2 = **4 subnets**
- 🔹 **Hosts per Subnet**
  - Remaining bits = 6
  - Total IPs = 2^6 = 64
  - Usable = **62**
- 🔹 **Subnet Ranges**

Subnet	Network ID	First IP	Last IP	Broadcast
1	.0	.1	.62	.63
2	.64	.65	.126	.127
3	.128	.129	.190	.191
4	.192	.193	.254	.255

🧮 6. Subnetting: 192.168.10.0/27

- 🔹 **Borrowed Bits**
  - /24 → /27
  - Borrowed = 3 bits
- 🔹 **Total Subnets**
  - 2^3 = **8 subnets**
- 🔹 **Hosts per Subnet**
  - Remaining bits = 5

- Total IPs = $2^5 = 32$
- Usable = **30**

🔹 **Subnet Ranges (Jump = 32)**

Subnet	Network ID	First IP	Last IP	Broadcast
1	.0	.1	.30	.31
2	.32	.33	.62	.63
3	.64	.65	.94	.95
4	.96	.97	.126	.127
5	.128	.129	.158	.159
6	.160	.161	.190	.191
7	.192	.193	.222	.223
8	.224	.225	.254	.255

📐 7. FLSM (Fixed Length Subnet Mask)

- All subnets have **same subnet mask**
- All subnets have **equal number of hosts**

👉 Used in **simple and structured networks**

📊 8. Subnetting Cheat Sheet

Group Size	Subnet Mask	CIDR
128	255.255.255.128	/25
64	255.255.255.192	/26
32	255.255.255.224	/27
16	255.255.255.240	/28
8	255.255.255.248	/29
4	255.255.255.252	/30
2	255.255.255.254	/31
1	255.255.255.255	/32

📌 CIDR Reference (Octet Wise)

CIDR	Octet Used
/25–/32	4th Octet
/17–/24	3rd Octet
/9–/16	2nd Octet
/1–/8	1st Octet

🎯 Key Points to Remember

- Subnetting divides networks
- Network & Broadcast IPs are reserved
- CIDR defines network bits
- FLSM uses equal subnet size
- Practice makes subnetting easy 💪

🔹 1️⃣ Chapter Summary

Subnetting is the process of dividing **one large network into multiple smaller networks** to improve performance, security, and IP utilization 🧩.

In **Class C networks**, we start with **256 IP addresses**, out of which:

- **254 are usable**
- **1 Network ID** (first IP)
- **1 Broadcast ID** (last IP)

Using **CIDR (Classless Inter-Domain Routing)** like /25, /26, /27, we:

- Borrow bits from the **host portion**
- Create **multiple subnets**
- Control **number of subnets & hosts per subnet**

Key calculations involve:

- **Number of subnets = 2^n**
- **Hosts per subnet = $2^n - 2$**

Subnetting types like **FLSM** ensure **equal subnet sizes**, making networks easy to manage 🧠.

👉 This chapter builds the **foundation of real-world networking**, routing, VLANs, and IP planning 💪🌐

🔹 2️⃣ Chapter Conclusion 🎯

Subnetting is one of the **most important skills** for any network engineer 👨‍💻👩‍💻.

By mastering **Class C subnetting**, you can:

- Design efficient networks 🏗️
- Reduce unnecessary broadcast traffic 🚦
- Improve security by isolating departments 🔐

- Save IP addresses (very important in IPv4 shortage 🌍)

Understanding **CIDR, subnet masks, network IDs, broadcast IDs, and host calculation** clearly shows the interviewer that:

✅ You don’t just memorize formulas
✅ You actually **understand how networks work**

👉 **Practice + logic = subnetting becomes automatic** 💡💪

🔹 3️⃣ Detailed Mind Map

Class C Subnetting

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├── What is Subnetting?

| ├── Dividing one network into many

| ├── Better management

| ├── Improved security

| └── Reduced traffic

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├── Class C Basics

| ├── Total IPs: 256

| ├── Usable IPs: 254

| ├── Network ID (.0)

| └── Broadcast ID (.255)

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├── CIDR

| ├── /24 (Default Class C)

| ├── /25, /26, /27...

| └── Flexible subnetting

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├── Subnetting Process

| ├── Identify class

| ├── Borrow host bits

| ├── Calculate subnets

| ├── Calculate hosts

| └── Find subnet ranges

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├── Examples

| ├── /25 → 2 subnets, 126 hosts

| ├── /26 → 4 subnets, 62 hosts

| └── /27 → 8 subnets, 30 hosts

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├── FLSM

| ├── Equal subnet size

| ├── Same subnet mask

| └── Simple network design

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└── Key Formulas

  ├── Subnets = 2^n

  └── Hosts = $2^n - 2$

🔹 4️⃣ Q & A

❓ Q1. What is Subnetting?

Answer:
Subnetting is the process of dividing a large network into multiple smaller networks to improve performance, security, and IP utilization 🧩.

❓ Q2. Why do we use subnetting?

Answer:
Subnetting is used to:

- Reduce network congestion 🚦
- Improve security 🔒
- Manage large networks easily 🏢
- Use IP addresses efficiently 💡

❓ Q3. How many IP addresses are there in a Class C network?

Answer:
A Class C network has **256 IP addresses**, out of which **254 are usable**.
The first IP is **Network ID**, and the last IP is **Broadcast ID**.

❓ Q4. What is Network ID?

Answer:
Network ID identifies the network itself 🆔.
It is the **first IP address** in a subnet and cannot be assigned to any device.

❓ Q5. What is Broadcast ID?

Answer:
Broadcast ID is used to send data to **all devices in a subnet at once** 📢.
It is the **last IP address** of the subnet.

❓ Q6. What is CIDR?

Answer:
CIDR (Classless Inter-Domain Routing) is a method to represent:

- Network bits
- Subnet mask
  Example: /24, /26, /27
  It allows **flexible subnetting without class limitations** 🎯.

❓ Q7. What does /25 mean in CIDR?

Answer:
/25 means:

- 25 bits are used for the network
- 7 bits are left for hosts
- Total IPs = 128
- Usable hosts = 126

❓ Q8. How do you calculate number of subnets?

Answer:
Formula:
👉 **Number of subnets = 2^n**
Where n = number of borrowed bits

❓ Q9. How do you calculate hosts per subnet?

Answer:
Formula:
👉 **Hosts per subnet = $2^n - 2$**
(−2 for Network ID & Broadcast ID)

❓ Q10. Explain subnetting of 192.168.10.0/25

Answer:

- Borrowed bits: 1
- Subnets: 2
- Hosts per subnet: 126

Subnet 1:

- Network: .0
- Broadcast: .127

Subnet 2:

- Network: .128
- Broadcast: .255

❓ Q11. What is the subnet mask for /26?

Answer:
Subnet mask for /26 is:
👉 **255.255.255.192**

❓ Q12. How many subnets and hosts in /27?

Answer:

- Borrowed bits: 3
- Subnets = $2^3 = 8$

- Hosts per subnet = 30

❓ Q13. What is FLSM?

Answer:
FLSM (Fixed Length Subnet Mask) means:

- All subnets have the **same subnet mask**
- All subnets have **equal number of hosts**
  Used in simple and structured networks 🧱.

❓ Q14. What is the jump size in subnetting?

Answer:
Jump size = **Group size**
Example:

- /26 → Jump = 64
- /27 → Jump = 32
  It helps find subnet ranges quickly ⚡.

❓ Q15. Why are Network & Broadcast IPs not usable?

Answer:
Because:

- Network ID identifies the subnet
- Broadcast ID sends data to all hosts
  They have **special purposes** and cannot be assigned ❌.

❓ Q16. Which octet changes in Class C subnetting?

Answer:
In Class C subnetting:
👉 **4th octet** is used (/25–/32)

❓ Q17. Is subnetting important for real networks?

Answer:

Yes 💯

Subnetting is used in:

- Offices
- Data centers
- ISPs
- Cloud networks

  Without subnetting, networks become slow and unmanageable 🚨 .