CN Lab 14 – Subnetting (Minimize IP Wastage)

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1 Requirements

Team	Hosts required	+2 overhead	Minimum addresses	Smallest power of 2	Prefix	Usable hosts
Front-end	20	2	22	32	**/27**	30
Back-end	12	2	14	16	**/28**	14
Management	4	2	6	8	**/29**	6

2 Subnet Allocation (VLSM)

Working largest → smallest inside the parent **192.168.10.0 /24**:

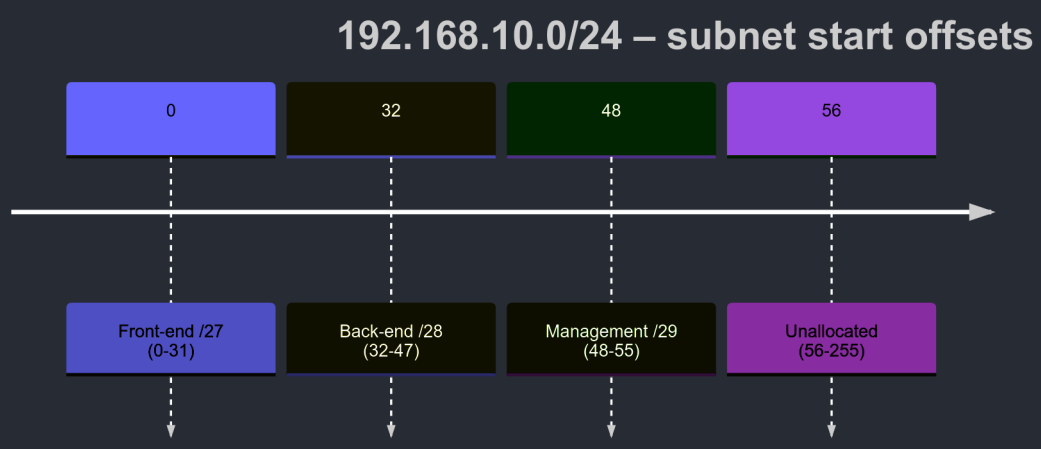
Team	Network ID	Prefix	Netmask	Usable range	Gateway	Broadcast
Front-end	**192.168.10.0**	/27	255.255.255.224	.1 – .30	192.168.10.1	.31
Back-end	**192.168.10.32**	/28	255.255.255.240	.33 – .46	192.168.10.33	.47
Management	**192.168.10.48**	/29	255.255.255.248	.49 – .54	192.168.10.49	.55

Addresses .56 – .255 remain unassigned if we need to increase it in the future.

3 Efficiency Check

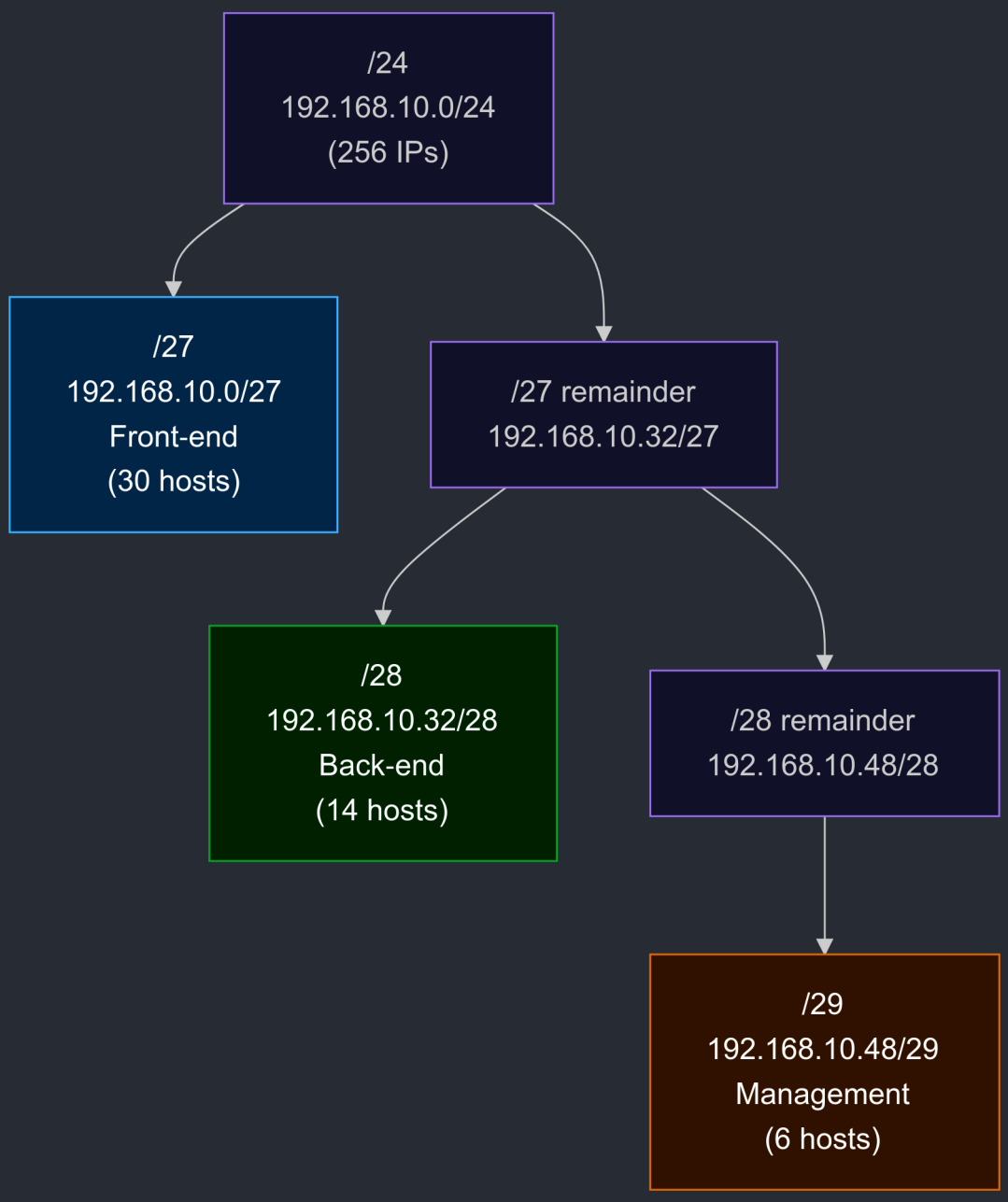
- Total usable host IPs = 30 + 14 + 6 = **50**
- Addresses consumed = 32 + 16 + 8 = **56**
- Waste = 6 (≈ **94 % utilisation**)

4.1 Address-Block “Ruler”



What it shows is that a visual ruler of the /24 where each coloured band is one subnet so the numbers are starting byte offsets (0-255).

4.2 Prefix-Tree View



What it shows is that the VLSM carving process as a binary tree so the /24 splits, then the remaining chunk splits again until all requested subnets are allocated so in the end each leaf node is colour-highlighted with team and capacity.

5 Method we used for the solution

1. **Add two** addresses to each host requirement.
2. Round each total **up to the next power of two**.
3. Convert size → prefix: $/ = 32 - \log_2(\text{size})$.
4. **Sort by size descending**.
5. Carve subnets sequentially from low end of the parent block, aligning on multiples of their size.
6. Document network ID, mask, gateway, broadcast, usable range.
7. Leave the remainder free for growth.