

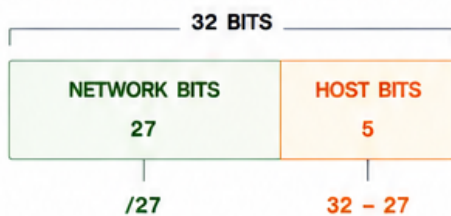
SUBNETTING QUICK FACTS

Concept	Rule
IP IPv4 Address	32 Bits
Prefix /n	Network Bits
Host Bits	32 - Prefix
Total Addresses	2^H
Traditional Usable Hosts	$2^H - 2$
Network Address	First Address
Broadcast Address	Last Address

★ PREFIX → HOST BITS → BLOCK SIZE →
→ NETWORK → BROADCAST

NETWORK & HOST BITS

Example: 192.168.10.70/27



Host Bits = 5
Total Addresses = $2^5 = 32$
Usable Hosts = 30

★ /27 → 5 HOST BITS → 32 ADDRESSES
→ 30 TRADITIONAL HOSTS

CIDR & SUBNET MASK

/27
11111111.11111111.11111111.11100000
NETWORK HOST

255.255.255.224

CIDR	Subnet Mask	Addresses	Host*
/24	255.255.255.0	256	254
/25	225.255.255.128	128	126
/26	225.255.255.192	64	62
/27	255.255.255.224	32	30
/28	225.255.255.240	16	14
/29	225.255.255.248	8	6
/30	255.255.255.252	4	2
/31	255.255.255.254	2	P2P Special Case
/32	255.255.255.255	1	Single Host Route

★ LONGER PREFIX → FEWER ADDRESSES

BLOCK SIZE

BLOCK SIZE = 256 - MASK VALUE

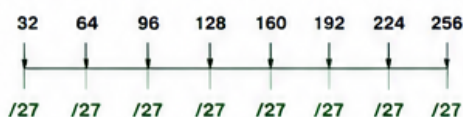
For /27:

Mask = 255.255.255.224

256 - 224 = 32

BLOCK SIZE = 32

Subnet boundaries:

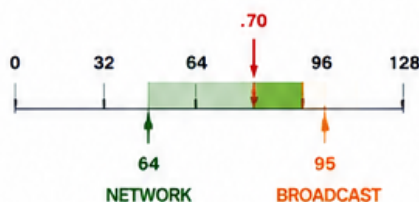


★ /27 NETWORKS INCREASE BY 32

NETWORK, HOST & BROADCAST

For: 192.168.10.70/27

Block size = 32



Network = 192.168.10.64
First Host = 192.168.10.65
Last Host = 192.168.10.94
Broadcast = 192.168.10.95

★ 64 < 70 < 96 → NETWORK = 64

THE 4-STEP SUBNETTING METHOD

1 FIND SUBNET MASK

2 FIND BLOCK SIZE

3 FIND NETWORK

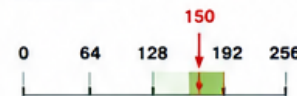
4 FIND BROADCAST

1 HOST RANGE

Example: 10.10.10.150/26

/26 = 255.255.255.192
256 - 192 = 64

Boundaries:



Result:

Network	10.10.10.128
First Host	10.10.10.129
Last Host	10.10.10.190
Broadcast	10.10.10.191

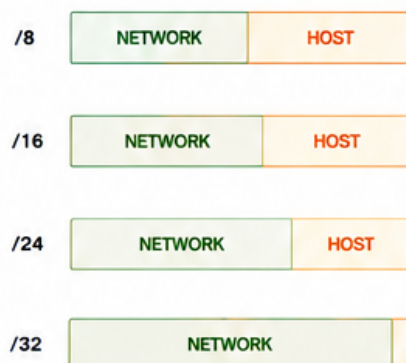
QUICK PREFIX REFERENCE

Prefix	Block Size	Addresses	Hosts*
/25	128	128	126
/26	64	64	62
/27	32	32	30
/28	16	16	14
/29	8	8	6
/30	4	4	2

* Traditional subnet host calculation.

★ 128 → 64 → 32 → 16 → 8 → 4 EZBERLE!

CIDR VISUAL



★ /8 → LARGE NETWORK
/32 → SINGLE IPv4 ADDRESS

SAME OR DIFFERENT NETWORK?

192.168.1.10/24 192.168.1.200/24



192.168.1.10/24 192.168.2.10/24



DIFFERENT NETWORKS
ROUTING REQUIRED

★ SAME SUBNET → LOCAL COMMUNICATION
DIFFERENT SUBNET → ROUTING REQUIRED

SUBNETTING FORMULAS

Need	Formula
Addresses	2^H
Traditional Hosts	$2^H - 2$
Host Bits	$32 - \text{Prefix}$
Equal Subnets	2^B
New Prefix	Original Prefix + Borrowed Bits
Wildcard	$255.255.255.255 - \text{Subnet Mask}$

★ HOSTS → HOST BITS
SUBNETS → BORROW BITS

FIND PREFIX FROM REQUIRED HOSTS

Need: 50 hosts

Host Bits (H)	Total (2^H)	Usable ($2^H - 2$)	Enough?
5	32	30	✗
6	64	62	✓
7	128	126	✓

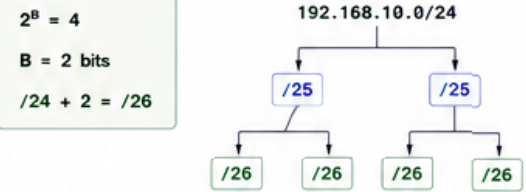
✓ Host Bits = 6
 $32 - 6 = /26$

50 HOSTS → /26 → 62 TRADITIONAL
USABLE HOSTS

FIND PREFIX FROM REQUIRED SUBNETS

Start: 192.168.10.0/24

Need: 4 equal subnets



Resulting /26 Subnets (Block size = 64)

Subnet	Network Address	Host Range	Broadcast
1	192.168.10.0	.1 - .62	.63
2	192.168.10.64	.65 - .126	.127
3	192.168.10.128	.129 - .190	.191
4	192.168.10.192	.193 - .254	.255

★ BORROW 2 BITS → 4 SUBNETS

BINARY SUBNETTING (ONE OCTET)

Decimal	Binary
128	10000000
192	11000000
224	11100000
240	11110000
248	11111000
252	11111100
254	11111110
255	11111111

★ 128 → 192 → 224 → 240 → 248 → 252 → 254 → 255

BINARY AND (FIND NETWORK)

Example: 192.168.10.70/27

IP Address 192.168.10.70
Subnet Mask (/27) 255.255.255.224

Last Octet (binary AND)

01000110 (70) ← IP
11100000 (224) ← MASK

01000000 (64) ← NETWORK

Network Address = 192.168.10.64

★ IP ADDRESS AND SUBNET MASK → NETWORK

WILDCARD MASK

Wildcard = 255.255.255.255 - Subnet Mask

Prefix	Subnet Mask	Wildcard Mask
/24	255.255.255.0	0.0.0.255
/25	255.255.255.128	0.0.0.127
/26	255.255.255.192	0.0.0.63
/27	255.255.255.224	0.0.0.31
/28	255.255.255.240	0.0.0.15
/29	255.255.255.248	0.0.0.7
/30	255.255.255.252	0.0.0.3

★ INVERSE OF SUBNET MASK

VLSM (VARIABLE LENGTH SUBNET MASK)

Given: 192.168.10.0/24

Requirements:

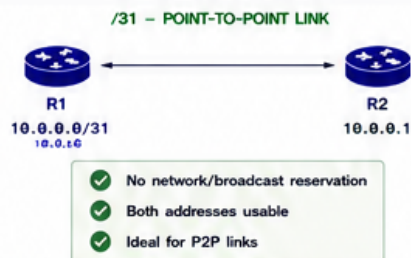
LAN A → 100 hosts
LAN B → 50 hosts
LAN C → 20 hosts
WAN → 2 hosts

Allocate Largest
First

Segment	Needed Hosts	Prefix	Usable Hosts	Network Address	Host Range	Broadcast
LAN A	100	/25	126	192.168.10.0	.1 - .126	.127
LAN B	50	/26	62	192.168.10.128	.129 - .190	.191
LAN C	20	/27	30	192.168.10.192	.193 - .222	.223
WAN	2	/30	2	192.168.10.224	.225 - .226	.227

★ VLSM → ALLOCATE LARGEST NETWORK FIRST

/31 AND /32



/32 – SINGLE HOST / ROUTE



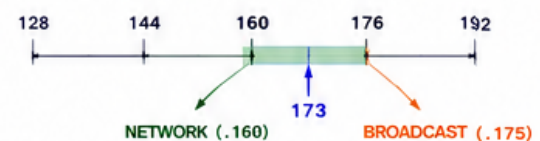
★ /31 = POINT-TO-POINT • /32 = SINGLE ADDRESS

FAST SUBNETTING EXAMPLE

Find subnet for: 172.16.5.173/28

/28 → 255.255.255.240

Block Size = 256 - 240 = 16



Network Address = 172.16.5.160
First Host = 172.16.5.161
Last Host = 172.16.5.174
Broadcast Address = 172.16.5.175

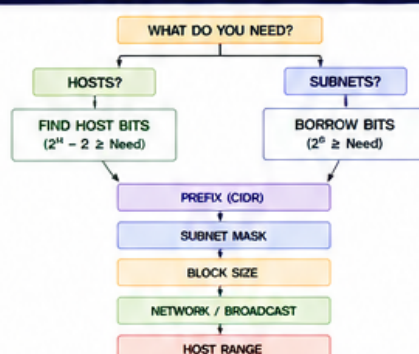
★ /28 → BLOCK 16 → 160-175

QUICK PREFIX REFERENCE

Prefix	Block Size	Addresses (2^H)	Hosts ($2^H - 2$)
/25	128	128	126
/26	64	64	62
/27	32	32	30
/28	16	16	14
/29	8	8	6
/30	4	4	2

★ 128 → 64 → 32 → 16 → 8 → 4 **MEMORIZE!**

SUBNETTING DECISION FLOW



★ REQUIREMENT → PREFIX → BLOCK → RANGE

EXAMPLE SUMMARY

- A Hosts Needed: 50 hosts
→ /26 → 62 usable hosts
- B Subnets Needed: 4 subnets from /24
→ Borrow 2 bits → /26 → 4 subnets
- C Binary AND: 192.168.10.70 & 255.255.255.224
→ Network = 192.168.10.64
- D Wildcard: /27
→ 255.255.255.224 → 0.0.0.31

★ PRACTICE → SPEED → ACCURACY