

IP's address-ranges reserved for Private Networks:

10.0.0.0 – 10.255.255.255

172.16.0.0 – 172.31.255.255

192.168.0.0 – 192.168.255.255

IP's range is reserved for so called loopback addresses:

127.0.0.0 – 127.255.255.255

Subnets are typically defined by their subnet masks, which determine the range of IP addresses in each subnet. The subnet mask specifies how many bits from the IP address represent the network identifier and how many represent the host identifier.

Subnet mask is a 32-bit value used in combination with an IP address. Used to distinguish between a network address and a host address in the IP address. It defines the range of IP addresses that can be used within a network or a subnet.

Special to the mask is, after one bit was 0 there can't be any 1 bit's anymore.

So the only available numbers are:

255 (binary: 11111111)
254 (binary: 11111110)
252 (binary: 11111100)
248 (binary: 11111000)
240 (binary: 11110000)
224 (binary: 11100000)
192 (binary: 11000000)
128 (binary: 10000000)
0 (binary: 00000000)

Through which 255.255.255.0 is a valid mask

and 255.255.128.128 is **not** a valid mask.

SUBNETTING CHEATSHEET

subtract upper row from 256,

from /32, list CIDR notation (32 is amount of bits in a mask: 00000000.00000000.00000000.00000000)

128	64	32	16	8	4	2	1
128	192	224	240	248	252	254	255
/25	/26	/27	/28	/29	/30	/31	/32

1 - group size

2 - subnet mask

3 - CIDR

table is to guide the router on where to send incoming data packets based on their destination IP addresses

level 1

copy-paste IP, calculate possible range based on cheat sheet.

level 2

A-B:

make sure mask is same in one network. 224 mask means there are groups of 32 IP's, 1st and last reserved. 222 is in use, so we count:

0→32→64→96→128→160→192→224→... so our group is 192-223, 192 and 223 are reserved ⇒ everything except them and 222 can be used.

C-D:

copy ip from A-B pair hence it's a private network. 252 mask⇒ groups of 4 IP's. so 1-2 or 253-254 (for example) will be valid.

level 3:

make sure mask is everywhere the same.

calculate IP's using cheatsheet

level 4:

mask can be .240 for example.

copy IP's from A1 to B1 and R1, modify A1 & B1 accordingly (like .130 & .131)

level 5

2 networks here:

R2-B1 share same Mask.

R1-B2 share same Mask.

Then calculate corresponding IP's (i'd recommend to copy-paste first)

Then set routes: default ⇒ IP of corresponding interface (client B to R2, client A to R1)

level 6

interface connected to internet directly cannot have those ip's:

192.168.0.0 – 192.168.255.255 (65,536 IP addresses)

172.16.0.0 – 172.31.255.255 (1,048,576 IP addresses)

10.0.0.0 – 10.255.255.255 (16,777,216 IP addresses)

A1 and R1 share same mask. Use cheatsheet to fix R1 IP.

client A route is: destination default, next hop R1 IP

router R:destination default

internet route: IP of final destination(Interface A1) => last number likely .128/matching CIDR(25 in my case)

level 7

we have 3 subnets - so mask is /26 or higher (192, allows us groups of 64).

set IP's like 1-2, 253-254, 100-101. first 3 numbers will be same.

read assignment: *dev.non-real.net* need to communicate with *accounting.non-real.net*. so set ip's in client's destinations accordingly:

client A \Rightarrow R11 IP

client C \Rightarrow R22 IP

router R1 \Rightarrow R21 IP

router R2 \Rightarrow R12 IP (next router that you need to send packages to in order to reach destination-network)

level 8

R1 sends internet through R13-R21 to R23-D1, R22-C1, and all goes back. so they need to share 3 1st numbers - OPEN IP's

middle:

router R2: copy next hop to IP of R13, destination default.

R21-R13 contain only 2 IP's so we can use smallest possible mask 255.255.255.252. copy R13 IP to R21 and modify (like .62 \rightarrow .61)

upper right: R12 has fixed IP \Rightarrow put it to routing table of internet

bottom left: D1-R23 - copy paste mask (you can use same one for C1-R22, or at least 255.255.255.252)

bottom: D1-R23 & C1-R22 - set IP's according to cheatsheet (open IP! same 3 numbers as for R13-R21) and modify last number like .1-.2. put .17-.18 to C1-R22 if mask is .252 - choose both lowest! groups!!)

clients: set up next hope for client D & C (IP's of R23 and R22 respectively)

upper left: R1 destination will be 3 first numbers of IP of R23/R22/D1/C1 + .0 and mask /27 (will allow to cover both networks of R23-D1 and R22-C1) or SIMPLY DEFAULT, next hop will be IP R21

level 9

upper left: goal 1: fix mask, IP's not private to be able to connect to internet (192.169!.... is fine), fix clients

internet: goal 3: set route to meson, mask /25

bottom right: set up R22-C1: open IP is for example 11. or 9., for example 11.0.0.2, can leave mask .0, set up client C

internet: for example 11.0.0.0/24

bottom: set up R23-D1, use private IP from client D, modify in D1 and client D

middle: set up R13-R21: same mask, IP like 253-254 (check all numbers!), R2 next hop is R13, R1 next hop is R21 (one field can be removed)

level 10

At this level, there are 4 different subnets:

1. Router R1 to Switch S1
2. Router R1 to Router R2
3. Router R2 to Client H4
4. Router R2 to Client H3

they all share 1st 3 numbers!

right upper corner : setup masks (H21-H11), IP H21 make simple to .3

low left corner: setup masks for H41-R23, IP R23 should be copied from client H4.

middle: R21-R13 masks should be the same.

internet: connect to router, 1st 3 numbers from IP's everywhere, CIDR can be /24 so we can cover 0-256 - modify internet destination (use IP from interface R13, last number set to 0)

right low corner: take smallest mask .252 + ip range which is still free (check r11-h21-h11: 0-127, r23-h41: 128-191, r13-r21:252-254), for example 192-195 or 249-250, setup client H3

Router R1 - setup dest for R22-H31 (probably .192/30 on the end) or leave it default