@ lgandarillas

GENERAL COMPUTER NETWORKS NOTES

IP Address (Internet Protocol Address)

- Is a unique ID assigned to each device (host) connected to a computer network.

- IPv4 : xxx.xxx.xxx.xxx
  → 4 octects separated by '.' ; each octet has a num 0-255
- IPv6 : xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx
  → 8 groups of 4 hex. digits separated by :

- IP CATEGORIES
  → **Public IP address**, to identify device on the internet
  → **Private IP address**, used within private networks
  - 192.168.0.0 - 192.168.255.255 → Home/Office networks
  - 172.16.0.0 - 172.31.255.255 → Medium Enterprise
  - 10.0.0.0 - 10.255.255.255 → Very Large Private
  - we cannot use them in netpractice because the ROUTER discards private IP's, they need to be Translated into Public IP's by NAT.

  RFC 1918 allowed private networks to use internal IP's freely
  - Devices can talk to each other locally
  - But not directly to the internet unless we use NAT

  NAT (Network Address Translation) is a technique used by routers or firewalls that translates your private IP addr. (192.168.X.X) into a public IP addr.
  - Allows devices inside a private network to communicate with internet
  - Allows many devices to share a public IP
  - Google : "what's my IP" to see the public one

  ISP (Internet Service Provider) gives us 1 public IP address

  → **Static IP**, manually assigned, doesn't change
  → **Dynamic IP**, automatically assigned by DHCP (Dynamic Host Configuration Protocol), a program running on the router that assigns IP addresses to devices.

- SEE IP LINUX : `ip addr show` or `ifconfig`

- Network Interface : Connexion point between host and network, has an IP associated

- PARTS OF AN IP
  192.168.1.204 → entrarían 256 - 2 = 254 dir. IP
  (network portion / host portion)
  ↳ network & broadcast

- LOCALHOST Network of a computer, `ping 127.0.0.1` (all between class A and B)

- RESERVATED IP addr (we cannot use them)
  → **Network Address**
    - It identifies an entire network.
    - Is the 1st IP addr of a subnet,
      Eg. With subnet mask of 255.255.255.0 (or /24), is 192.168.1.0
  → **Broadcast Address**
    - Address used to talk to all devices on a network at once.
    - Is the last IP addr of a subnet,
      Eg. With subnet mask of 255.255.255.0 (or /24), is 192.168.1.255
  → **Default Gateway**
    - Is the exit door of a network (usually a router), it sends traffic to other networks.
    - Usually the 2nd IP address of a network, but could be anyone.
      Eg. With subnet mask of 255.255.255.0 (or /24), is 192.168.1.1

DECIMAL TO BINARY

An IP ha 32 bits = 4 bytes (octets = 8 bits)

$$\begin{cases} 2^0 = 1, & 2^4 = 16, \\ 2^1 = 2, & 2^5 = 32, \\ 2^2 = 4, & 2^6 = 64, \\ 2^3 = 8, & 2^7 = 128, \end{cases}$$

SUBNET MASK

- Is a 32 bit number used to divide an IP address into :
  - NETWORK PORTION (first 1's in the mask) → first $(255)_{10}$ for sure + ...
  - HOST PORTION (last 0's in the mask)

- **HOW MANY HOSTS** fit in a network based on subnet mask.

  $$N°Hosts = 2^{(n° host\ bits)} - 2$$

  EXAMPLE

  1) Convert subnet mask to bin
     255.255.255.0 ⇒ 1111 1111.1111 1111.1111 1111.0000 0000 (32 bits)
     ↳ $(255)_{10} = (1111\ 1111)_2$ (24 network bits | 8 host bits)
  2) Apply the formula.
     n° hosts = $2^8 - 2 = 256 - 2 = 254$

CIDR (Class Inter-Domain Routing)

1) From CIDR to Subnet Mask
   /N { means N bits set to 1 in binary (left to right)
   the rest set to 0
   Group into 8-bit chunks (octets) and convert to decimal.
   EXAMPLE
   - /26 → First 26 = 1's and last 32 − 26 = 6 are 0's
     1111 1111 . 1111 1111 . 1111 1111 . 1100 0000
     255 . 255 . 255 . 192

2) From Subnet Mask to CIDR
   Convert each octet to binary, count how many 1's
   EXAMPLE
   - 255.255.255.224 (8=1's | 8=1's | 8=1's | ↳ 1110 0001) } 8·3 + 3 = /27

INCREMENT

- It is the number you add to the base network address to get the next subnet.

  EXAMPLE

  - 192.168.1.0 / 26

    /26 → 255.255.255.192 : SUBNET MASK

    24 bits (3 oct) ↪ 2 bits → $(1100\ 0000)_2 = 2^7 + 2^6 = 192$

  - Increment = 256 − 192 = 64
    - 192.168.1.0 → Subnet 1
    - 192.168.1.64 → Subnet 2
    - 192.168.1.128 → Subnet 3
    - 192.168.1.192 → Subnet 4

  - ¿ How many hosts ?

    → In each subnet, nºhost = $2^{(32-26)} - 2 = 2^6 - 2 = 62$ hosts

LAN = Local Area Network

WAN = Wide Area Network

SWITCH = Connects Devices Within same Network

ROUTER = Networking device that forwards data packets between "different" computer networks.

- **GATEWAY** = The IP address of the router

- CORE FUNCTIONALITIES OF A ROUTER
  - **NAT** = Network Address Translation

    Allows multiple devices on a private network to share a single public IP address to access the internet.

  - **FIREWALL**

    Protects your network by blocking unwanted or dangerous traffic.

  - **DMZ** = Demilitarized Zone

    Exposes one device to the internet with fewer restrictions.

  - **PORT FORWARDING**

    Makes a specific service inside your network accessible from the internet.

TCP / IP MODEL (Transmission Control Protocol)

- Communications Standard that enables application programs and devices to exchange messages over a network.
- 4 layers (Application, Transport, Internet, Link

@lgandarillas

SUBNETTING EXERCISES

SUBNETING BASED ON N°SUBNETS

EXAMPLE Given 192.168.1.0 /24
↳ 3 oct. · 8 = 24 bits, Mask = 255.255.255.0

- ¿Cuantos bits necesitamos para 5 subredes? **N°Subredes = 2^n** → n = 3
- **Calcular nueva mascara** sumando esos bits → /24 + 3 = /27
  Con /27, 3 oct. · 8 = 24 bits + 3 bits $(1110\ 0000)_2 = (224)_{10}$
  Mask = 255.255.255.224
- **Calcular incremento**, Increment = 256 − 224 = 32
- **Calcular subnets**

```
# 1 : 192.168.1.0   /27 - 192.168.1.31  /27      # ...
# 2 : 192.168.1.32  /27 - 192.168.1.63  /27
# 3 : 192.168.1.64  /27 - 192.168.1.95  /27
# 4 : 192.168.1.96  /27 - 192.168.1.127 /27
# 5 : 192.168.1.128 /27 - 192.168.1.159 /27
```

SUBNETING BASED ON N°HOSTS

EXAMPLE 1

Given the network → 10.1.1.0 /24, break it in 3 subnets based on how many hosts we have in each network.
Each coffee shop has 40 hosts.

- Mask = /24 = 255.255.255.0
- We need 40 hosts → $2^6 = 64$ → 6 host bits → 32−6 = 16 is enough
- We want 3 subnets, N°Subnets = $2^n = 4$ → n = 2
- New mask, /24 + 2 = /26 → 255.255.255.192
  ↳ $(1100\ 0000)_2 = (192)_{10}$
- Increment = 256 − 192 = 64

```
# 1 : 10.1.1.0   /26 - 10.1.1.63  /26
# 2 : 10.1.1.64  /26 - 10.1.1.127 /26
# 3 : 10.1.1.128 /26 - 10.1.1.191 /26
# 4 : 10.1.1.192 /26 - 10.1.1.255 /26
```

EXAMPLE 2

You are an ISP (Internet Service Provider), you have 4 customers who need at least 20 static IP's. Your network is 142.2.0.0 /16.
Be conservative giving them the least possible.

- For 20 hosts, at least $2^5 - 2 = 32 - 2 = 30 > 20$ → 5 host bits
- The Mask is 32 − 5 = /27 = 255.255.255.224
  ↳ $(1110\ 0000)_2 = (224)_{10}$
- Increment = 256 − 224 = 32
- Subnets :

```
# 1 : 142.2.0.0  /27 - 142.2.0.31  /27
# 2 : 142.2.0.32 /27 - 142.2.0.63  /27
# 3 : 142.2.0.64 /27 - 142.2.0.95  /27
# 4 : 142.2.0.96 /27 - 142.2.0.127 /27
```

SUBNETTING IN REVERSE

EXAMPLE 1

Given Beatrice's host info., { IP Address = 172.17.16.255 ; Subnet Mask = 255.255.240.0 ; Default Gateway = 172.17.0.1 }

Calculate network address, broadcast address, network range to check what's wrong with Beatrice's IP address.

- Subnet Mask = 255.255.240.0 (all 1's) → $(240)_{10} = (1111\ 0000)_2$ ⇒ 16 + 4 = /20
- Increment = 256 − 240 = 16 en el 3rd octet
- # 1: 172.17.0.0 /20 – 172.17.15.255 /20
  # 2: 172.17.16.0 /20 – 172.17.31.255 /20 → Bea's range (wrong)
  # 3: 172.17.32.0 /20 – 172.17.41.255 /20
  # 4: 172.17.42.0 /20 – 172.17.55.255 /20
  # ...
  network addr. of each subnet — broadcast addr. of each subnet
- Her Default Gateway is in #1 and her IP addr. in # 2, WRONG !!!

SUBNETTING DIFFERENT SIZES

EXAMPLE 1

We are given a network 172.21.42.0 /24.
We need 3 networks with X networks each: { robots (57), servers (26), workers (117) }

VLSM → Variable length subnet Mask, calculate subnets from bigger to smaller.

- Mask = /24 = 255.255.255.0
- The biggest requirement, 117 hosts → $2^7 - 2 = 128 - 2 = 126 > 117$
  We need 7 host bits, 32 − 7 = 25 network bits
  New mask = /25 = 255.255.255.128 → $(1000\ 0000)_2 = (2^7)_{10} = (128)_{10}$
- Increment = 256 − 128 = 128
  Subnet #1, 172.21.42.0 - 172.21.42.127 (WORKERS)
- For robots (57 hosts), $2^6 - 2 = 62$ → we need 6 host bits (/26 network)
  /26 = 255.255.255.192 → $(1100\ 0000)_2 = (192)_{10}$
  Increment = 256 − 192 = 64
  Subnet #2, 172.21.42.128 – 172.21.42.191 → 128 + 64 − 1 = 191
- For servers (26 hosts), $2^5 - 2 = 30$ → we need 5 host bits (/27 network)
  /27 = 255.255.255.224 → $(1110\ 0000)_2 = (224)_{10}$
  Increment = 256 − 224 = 32
  Subnet #3, 172.21.42.192 – 172.21.42.223 → 192 + 32 − 1 = 223

NETPRACTICE NOTES

- **Modo examen** → nombre en blanco
  Aparecerán niveles aleatorios entre 6 y 10.

- **Modo practica** → nombre con el login
  [Check Again] : to verify configuration
  [Get my config] : to download my configuration → subir a root del repo
  [Next level]

- **CALCULADORA** → Tenemos permitido usar BC en Terminal
  - BINARY TO DECIMAL
    `echo "ibase=2; 1010" | bc`
  - DECIMAL TO BINARY
    `echo "obase=2 ; 10" | bc`
  - CÁLCULOS → > bc , poner operaciones, cerrar con Ctrl + D

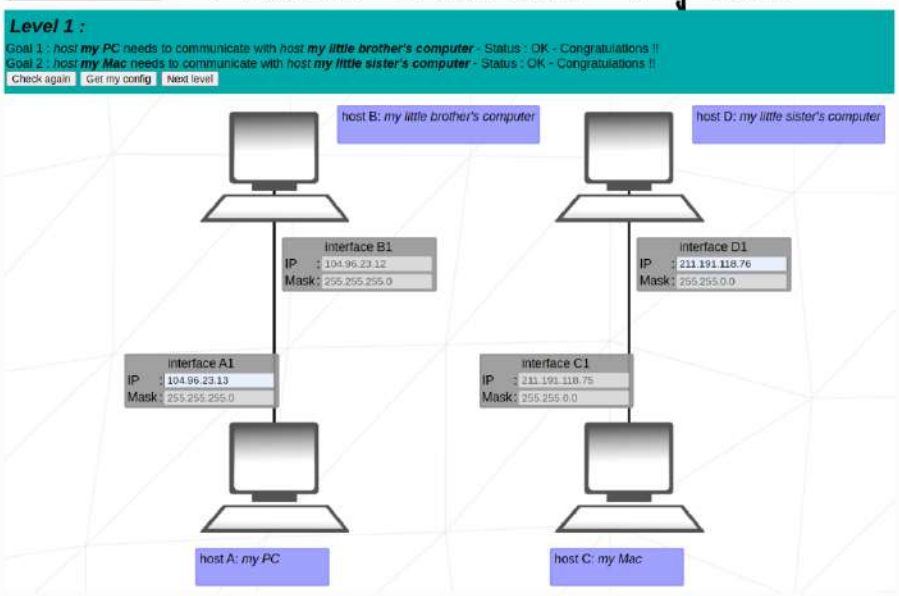
- **SUBNET CHART**

/17	/18	/19	/20	/21	/22	/23	/24		
/25	/26	/27	/28	/29	/30	/31	/32		
128	64	32	16	8	4	2	1	→	Increment
.128	.192	.224	.240	.248	.252	.254	.0	→	Subnet Mask

@ lgandarillas

NETPRACTICE EXERCISES

LEVEL 1 : Conectar 2 host dado IP y Mask



(1) Mask = 255.255.255.0 → 8 · 3 n°1's = /24 } 24 network bits, 8 host bits (32-24)

IP_1 = 104.96.23.12

IP_2 = 104.96.23.___ } Increment = 256 - 0 = 256

104.96.23.0 (Network Addr.) - ... - 104.96.23.255 (Broadcast Addr.)

↳ select in the range

(2) Mask = 255.255.0.0 → 8 · 2 n°1's = /16 } 16 network bits, 16 host bits (32-16)

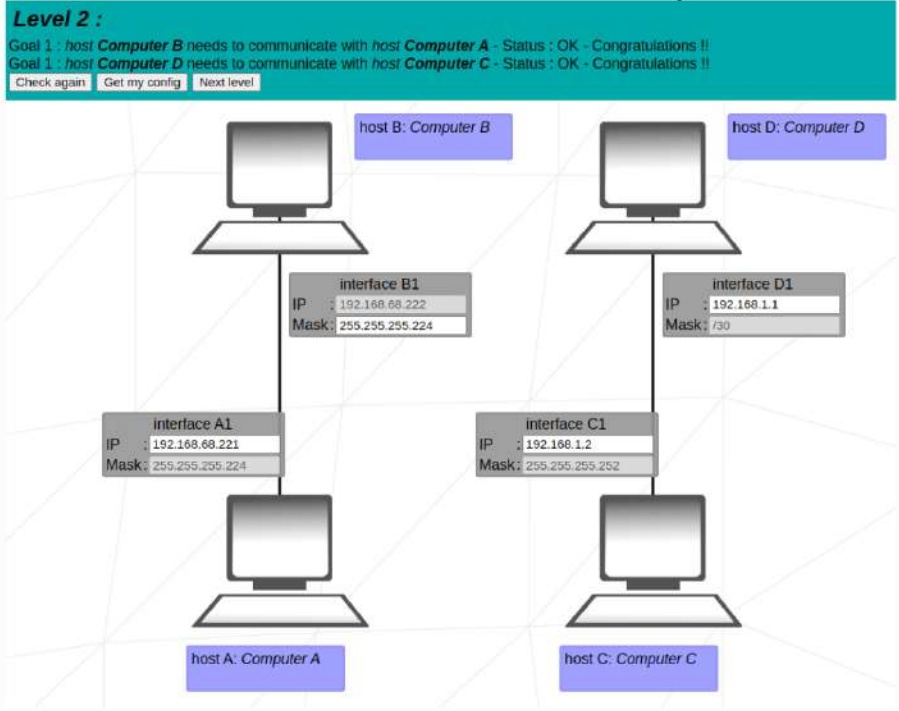
IP_1 = 211.191.118.75

IP_2 = 211.191.___.___ } Increment = 256 - 0 = 256

211.191.0.0 (Network Addr.) - ... - 211.191.255.255 (Broadcast Addr.)

↳ select in the range

LEVEL 2 : Conectar 2 host dado IP y Mask



(1) Mask = 255.255.255.224 → $(224)_{10} = (1110\ 0000)_2$ → 5 host bits, 32 − 5 = /27

Increment = 256 − 224 = 32 → 32, 64, 96, 128, 160, 192, 224

IP_1 = 192.168.68.222
IP_2 = 192.168.68.____

Rango : 192.168.68.192 (Network IP) — 192.168.68.223 (Broadcast IP) → select in between

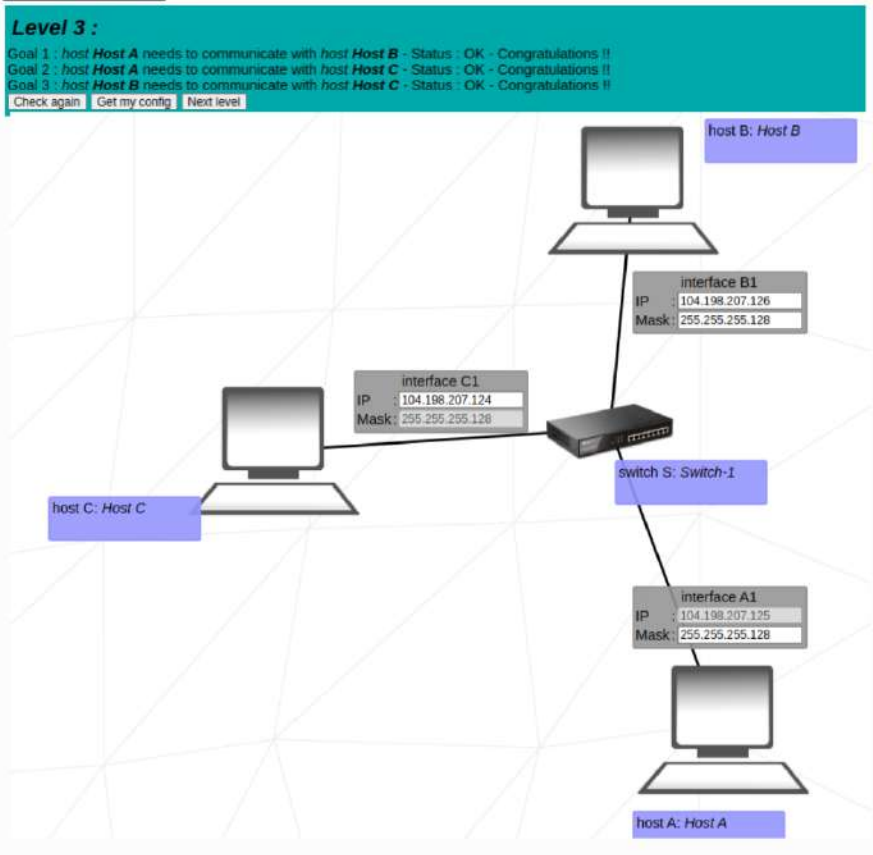
(2) Mask = 255.255.255.252 → Increment = 256 − 252 = 4

IP_1 = 127.0.0.____
IP_2 = 127.0.0.____

en rangos de 4 sin ser inferior (network) ni superior (broadcast) → eg. 2 y 3

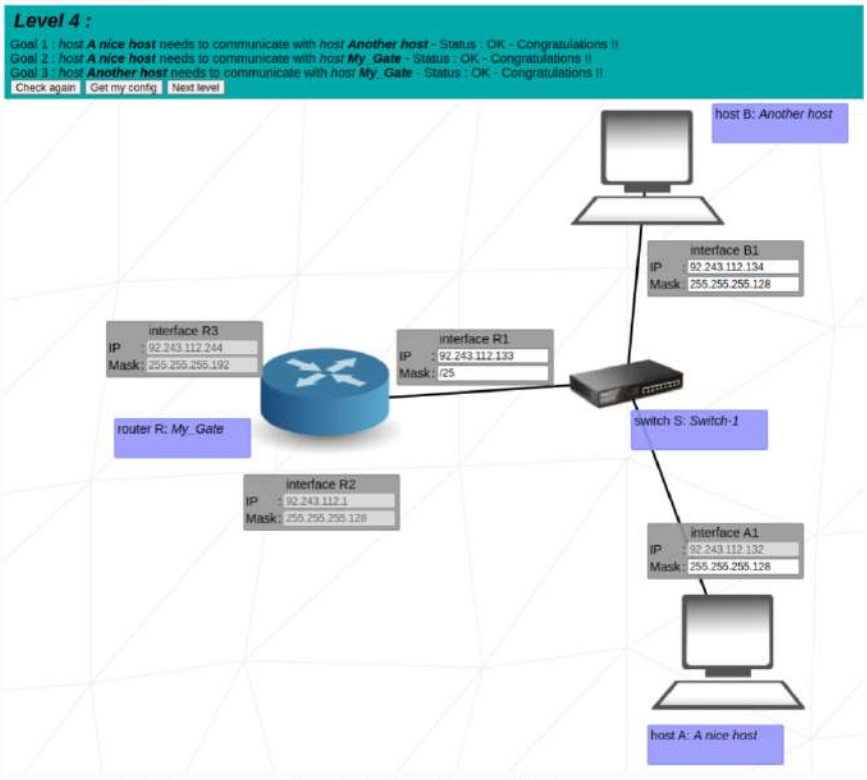
OJO! 127.x.x.x está reservado para IANA, no las puedo usar

LEVEL 3



- Poner misma máscara en Toda la subred
- Mask = 255.255.255.128 → $(128)_{10} = (1000\ 0000)_2$ ⇒ /25
- IP_A1 = 104.198.207.125
- Increment = 256 − 128 = 128
- Rango → 104.198.207.0 (Network) — 104.198.207.127 (Broadcast) → Select in this range

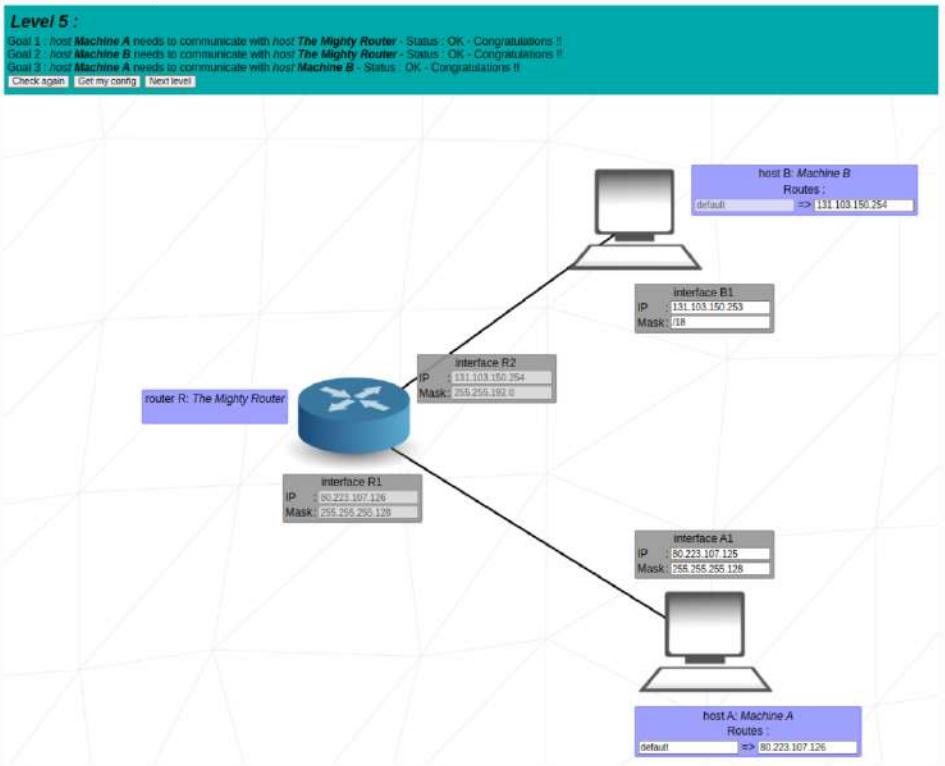
LEVEL 4



- Mask = 255.255.255.128 ⇒ /25
  ↳ $(128)_{10} = (1000\ 0000)_2$
- IP_A1 = 92.243.112.132
- Increment = 256 − 128 = 128

- Rango = 92.243.112.128 (Network) − 92.243.112.255 (Broadcast)
  ↳ Select in this range

LEVEL 5



(1) PRIMERA SUBRED

- Mask = 255.255.192.0 ⇒ /18
  ↳ $(192)_{10} = (1100\ 0000)_2$
- IP_R2 = 131.103.150.254
- Incremento = 256 − 192 = 64
- Rango → 131.103.192.0 (Network) − 131.103.255.255 (Broadcast)
  ↳ Select in this range

(2) SEGUNDA SUBRED

- Mask = 255.255.255.128 ⇒ /25
  ↳ $(128)_{10} = (1000\ 0000)_2$
- Increment = 256 − 128 = 128
- IP_R1 = 80.223.107.126
- Rango = 80.223.107.0 (Network) − 80.223.107.127 (Broadcast)
  ↳ Select in this range

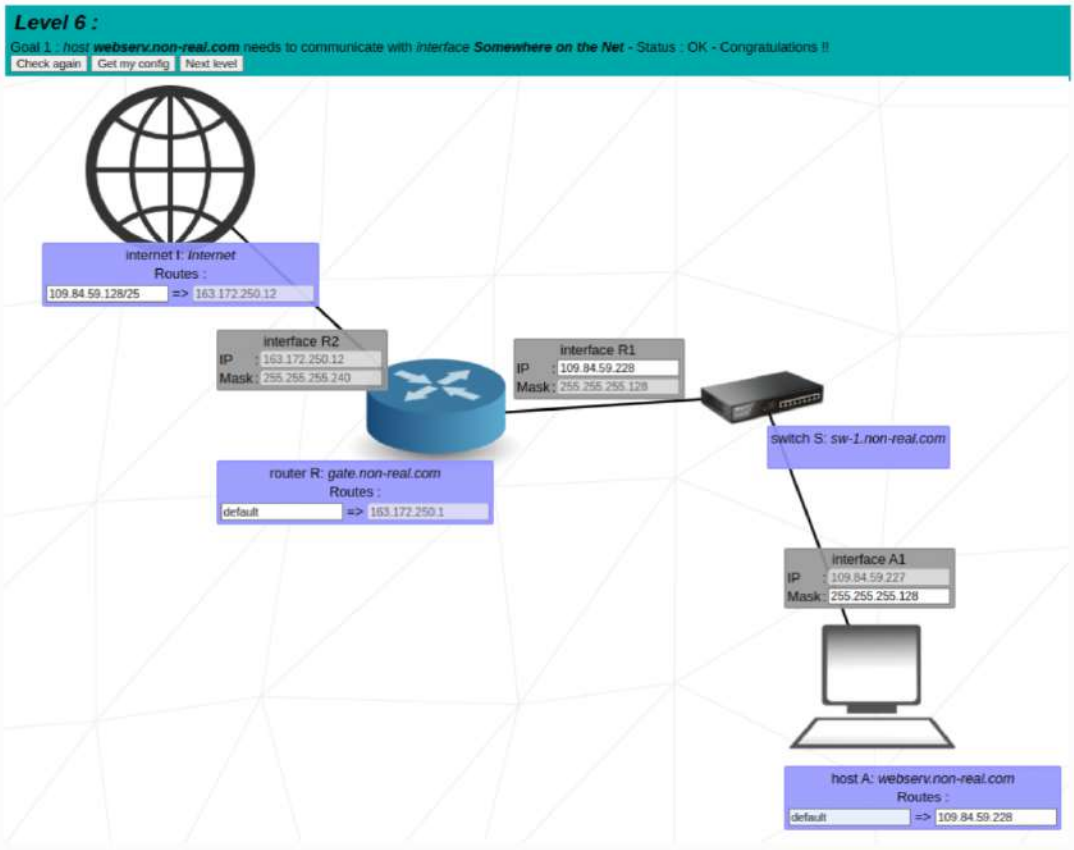
(3) TABLAS DE RUTA

Destination → Next Hop

Si estamos en un HOST,

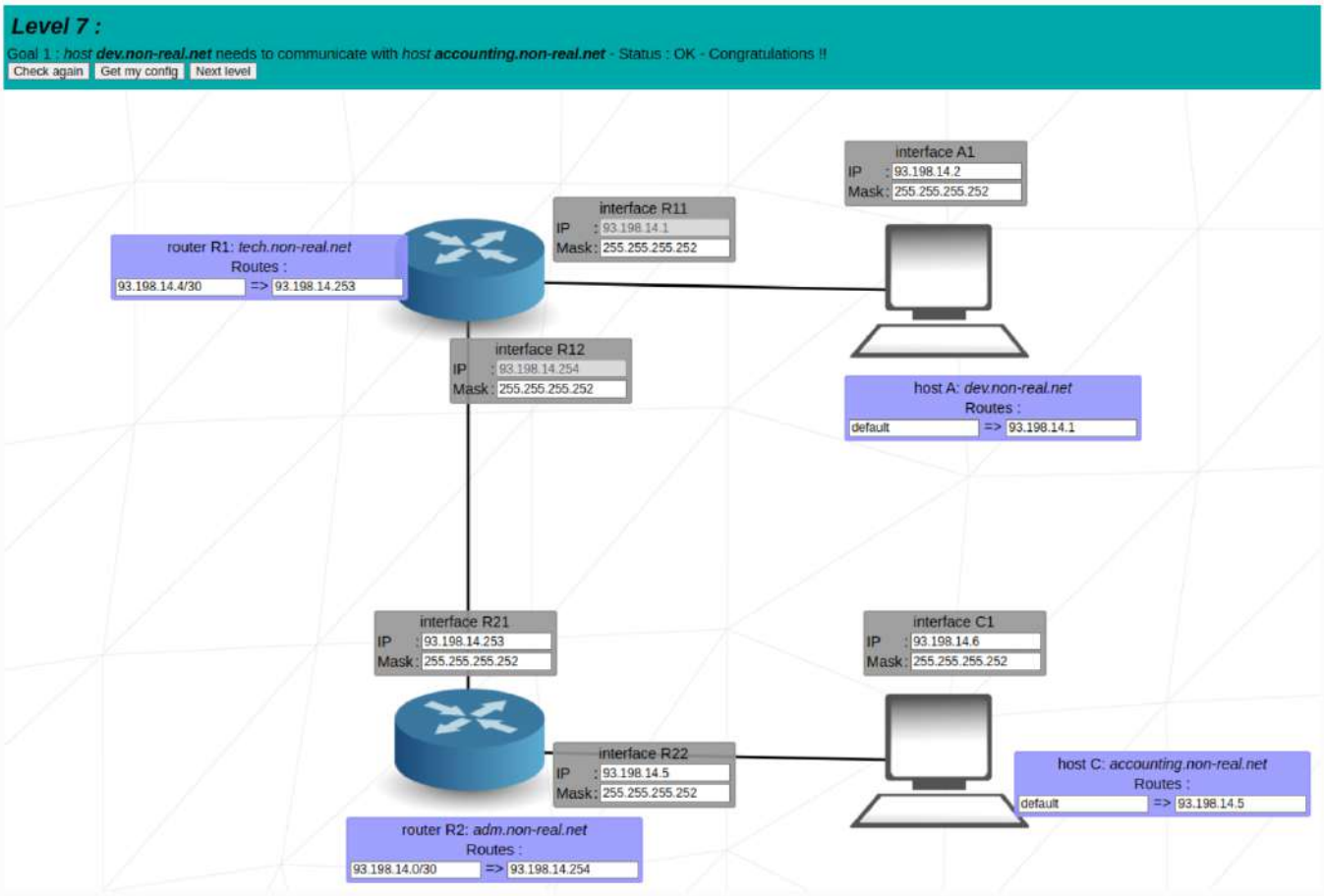
- DESTINATION : Red a la que queremos llegar.
  Pongo "default" = 0.0.0.0 /0
  → Si la IP a la que quiero conectar NO está en mi red local, la mando al router.
- NEXT HOP : IP del router más cercano.

LEVEL 6



- Copio máscara en A1 porque está en la misma subred que R1.
  Mask = 255.255.255.128
  → Increment = 256 − 128 = 128
  → $(128)_{10} = (1000\ 0000)_2 \Rightarrow /25$
  necesitaré el CIDR para las tablas de ruta
- IP_A1 = 109.84.59.227 (Fixed)
  Range : 109.84.59.128 (Network IP) – 109.84.59.255 (Broadcast IP)
- IP_R1 = 109.84.59.228
  → Para que sea consecutiva, realmente podría coger cualquiera del rango
- **TABLA RUTA HOST A**
  - Destination = default por ser host
  - Next Hop = 109.84.59.228
    Es la IP del router más cercano (R1).
- **TABLA RUTA INTERNET** (Funciona como router)
  - Destinatio = 109.84.59.128/25
    Es la IP de red (network, 1º del rango) de la subred a la que busco llegar
  - Next Hop = 163.172.250.12 (router más cercano)
- **TABLA RUTA R**
  - Destination = default
    → Todo lo que no sepa dónde va lo mando a internet.
  - Next Hop = 163.172.250.1
    → IP interfaz internet

LEVEL 7



- Tengo 3 subredes **Point-To-Point (P2P)**, este tipo de redes sirven para conectar directamente 2 dispositivos entre sí sin pasar por switches, hubs ni routers intermedios.
  Por ejemplo, conectar directamente dos routers o dos PC's.

  La **máscara** = 255.255.255.252 = /30
  8·3 = 24 nº1's ↳ (252)10 = (1111 1100)2
  Por lo tanto hay 30 bits de red y 2 de hosts.
  Con esos 2 bits, $2^2 - 2 = 2$ → 2 IPs, una para cada host.
  ↳ 1ª IP para red, última IP para broadcast
  ⇒ Aplico esa máscara a todas las interfaces.

- Para **asignar IP's** a todas las interfaces calculo los rangos con las IP que me den.

(1) R11 - A1

IP Red :	93.198.14.0
IP Nº1 :	93.198.14.1
IP Nº2 :	93.198.14.2
IP Broadcast :	93.198.14.3

(2) R12 - R21

IP Red :	93.198.14.252
IP Nº1 :	93.198.14.253
IP Nº2 :	93.198.14.254
IP Broadcast :	93.198.14.255

(3) R22 - C1

IP Red :	93.198.14.4
IP Nº1 :	93.198.14.5
IP Nº2 :	93.198.14.6
IP Broadcast :	93.198.14.7

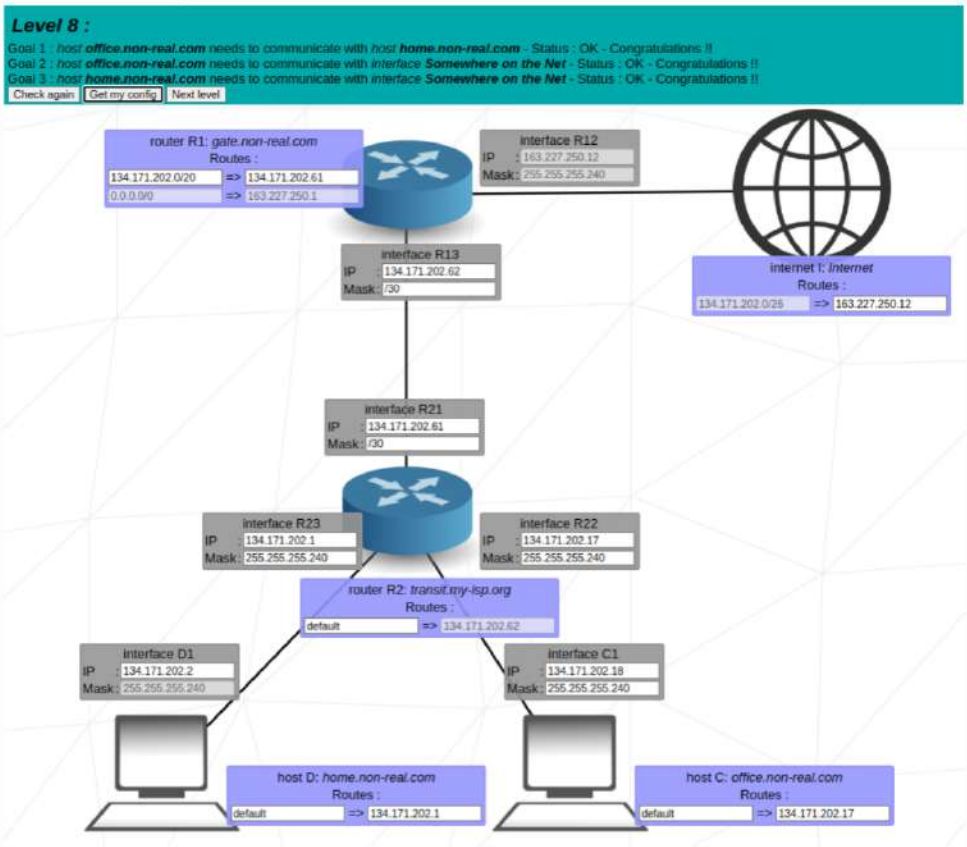
- **TABLAS DE RUTA**, indican a un host o router a dónde enviar los paquetes IP dependiendo de su destino.

Destination → Next Hop

Si estamos en un HOST,
- DESTINATION : Red a la que queremos llegar.
  Pongo "default" = 0.0.0.0 /0
  → Si la IP a la que quiero conectar NO está en mi red local, la manda al router.
- NEXT HOP : IP del router más cercano.

Si estamos en un ROUTER,
- DESTINATION : Red a la que queremos llegar y NO estoy conectado directamente, pongo esa IP.
  → Apunto la IP de RED (la 1ª del rango) con la máscara. En este caso /30.
- NEXT HOP : IP del router más cercano con máscara.
  → En este caso la máscara es (/30)

LEVEL 8



- Entre los routers R2 y R3, como es **Point-To-Point (P2P)**, la **máscara** es
  $255.255.255.\underbrace{252}_{8\cdot 3 = 24\ no's} = /30$
  $\hookrightarrow (252)_{10} = (1111\ 1100)_2$

- En la Tabla de ruta de R2, { • Destination = default ; • Next Hop = 134.171.202.62 ← IP R13 }
  Como next hop viene dado (la del siguiente router), la copio en R1.
  Dado esa máscara y esa IP, $\underbrace{134.171.202.60}_{\text{Network IP}} - \underbrace{134.171.202.63}_{\text{Broadcast IP}}$
  → Asigno la otra IP libre a R21, 134.171.202.61

- Para las subredes de los host (D1, C1, R23, R22) uso la máscara dada.
  Mask = $255.255.255.\underbrace{240}_{\hookrightarrow (240)_{10} = (1111\ \underbrace{0000}_{\text{Con 4 host bits, nohost} = 2^4-2=14})_2} \Rightarrow /28$
  Increment = 256 − 240 = 16

- En la Tabla de rutas de Internet, Destination = 134.171.202.0 /26 (dado).
  Calculo las IP's de las subredes en esos rangos,

Network IP		Broadcast IP	
134.171.202.0	-	134.171.202.15	→ selecciono .1 y .2 para D1, R23
134.171.202.16	-	134.171.202.31	→ selecciono .17 y .18 para C1, R22

- En las Tablas de ruta de los hosts, { Destination = default ; Next Hop = IP router cercano }

- En la Tabla de ruta del router,
  - Destination = 134.171.202.0/20
    → Es la network IP de la subred que conecta con el sig. router
  - Next Hop = IP router cercano

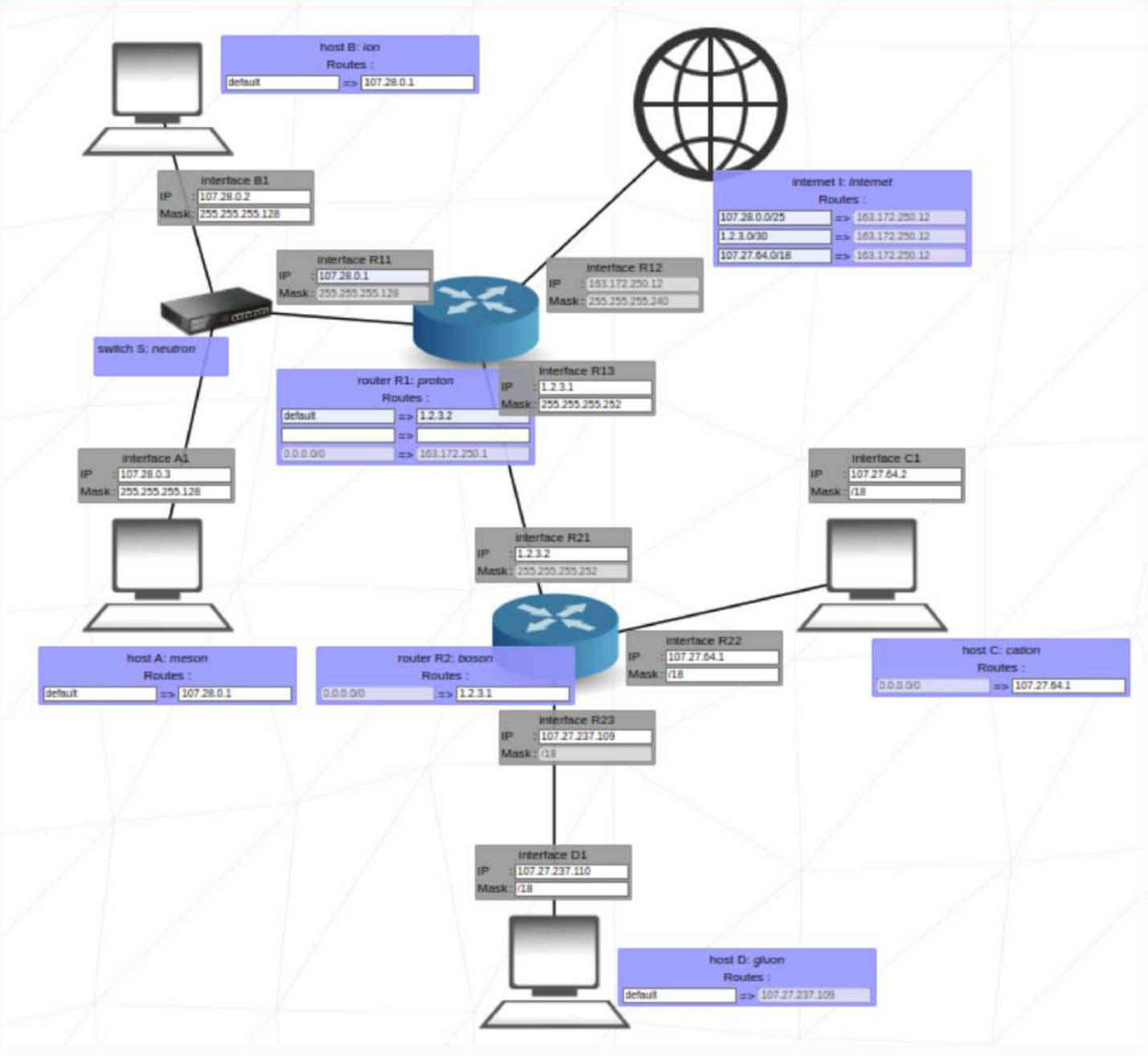
- En la Table de ruta de internet, Next Hop = IP router cercano

LEVEL 9

Level 9 :

Goal 1 : *host* ***meson*** needs to communicate with *host* ***ion*** - Status : OK - Congratulations !!
Goal 2 : *host* ***cation*** needs to communicate with *host* ***gluon*** - Status : OK - Congratulations !!
Goal 3 : *host* ***meson*** needs to communicate with *host* ***internet*** - Status : OK - Congratulations !!
Goal 4 : *host* ***meson*** needs to communicate with *host* ***gluon*** - Status : OK - Congratulations !!
Goal 5 : *host* ***ion*** needs to communicate with *host* ***cation*** - Status : OK - Congratulations !!
Goal 6 : *host* ***cation*** needs to communicate with *host* ***internet*** - Status : OK - Congratulations !!

Check again | Get my config | Next level



- En la subred (R11, A1, B1) copio la máscara dada.
  Mask = 255.255.255.128 → $(128)_{10} = (1000\ 0000)_2$ ⇒ /25
  ↳ Increment = 256 - 128 = 128
- En la subred (R13, R21) copio la máscara dada.
  Mask = 255.255.255.252 → $(252)_{10} = (1111\ 1100)_2$ ⇒ /30
  ↳ Increment = 256 - 252 = 4
- En la subred (R23, D1) copio la máscara dada, /18.

- En las Tablas de red de los hosts (A1, B1, C1, D1) en el primer campo (Destination) pongo "default".

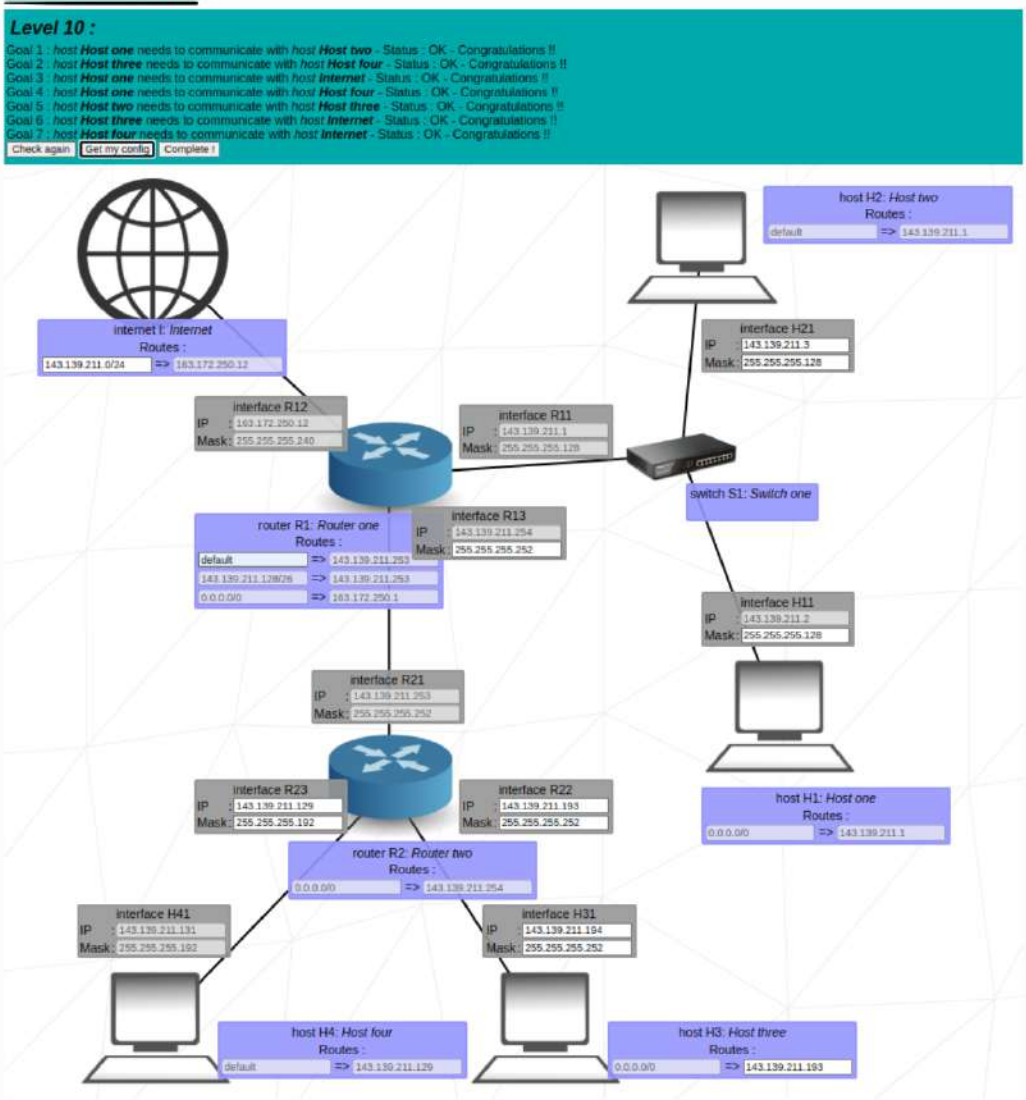
- La Tabla de red de D1 en "next hop" me da IP_R23 = 107.27.237.109
  Con ella, sabiendo que con /18 Tenemos (18 network bits, 14 host bits),
  Rangos son .0, .64, .128, .192, .256
  Mask = 255.255.192.0
  16 bits 2 bits → $(1100\ 0000)_2 = (192)_{10}$
  Increment = 256 - 192 = 64
  Rango = 107.27.192.0 - ... - 107.27.255.255
  Network IP Broadcast IP

- Para el host C1 asumo /18 a la máscara de la subred R22, C1.
  Para no solapar cojo el rango anterior.
  Rango = 107.27.64.0 - ... - 107.27.91.255
  Network IP Broadcast IP
  ↳ selecciono 2 IP's del rango { 107.27.64.1, 107.27.64.2
  En "next hop" de la Tabla de rutas de C1 pongo la IP del router.

- Para la conexión **Point-To-Point** entre R13 y R12 asigno cualquier IP, por ejemplo, 1.2.3.1 y 1.2.3.2 ⇒ /30
  Con eso ya puedo poner el "next hop" en la Tabla de rutas de R2, y a la inversa para la Tabla de R1 { Destination = default, Next Hop = 1.2.3.2

- Asigno IP's a la subred de A y B.
  Mask = 255.255.255.128 → Increment = 256 - 128 = 128 → $(128)_{10} = (1000\ 000)_2$
  Cojo un rango que no solape otras subredes, como: ⇒ /25
  Rango 107.28.0.0 - 107.28.0.127
  ↳ selecciono del rango { R11 : 107.28.0.1 → next hop de B, A : 107.28.0.2, B : 107.28.0.3

LEVEL 10



1) Entre H41 y R23

Mask = 255.255.255.<u>192</u> → $(192)_{10} = (1100\ 0000)_2 \Rightarrow /26$

Increment = 256 − 192 = 64

La IP para R23 la cojo de la Tabla de rutas,

- IP_H41 (dada) = 143.139.211.131
- IP_R23 = 143.139.211.129

Con /26 el increment es 64, los posibles rangos serían .0, .64, .128, .192

Esta subred ocupa el rango .128 con <u>143.139.211.128</u> (Network IP) a <u>143.139.211.191</u> (Broadcast IP)

2) Entre R1, H1 y H2.

Mask = 255.255.255.<u>128</u> → $(128)_{10} = (1000\ 0000)_2 \Rightarrow /25$

Increment = 256 − 128 = 128

Nos dan IP_R11 = 143.139.211.1

El rango ocupado será <u>143.139.211.0</u> (Network IP) a <u>143.139.211.127</u> (Broadcast IP)

Asigno IP_H21 = 143.139.211.3 (consecutiva y en el rango)

3) Entre R2 y R1 es Point-To-Point,

Mask = 255.255.255.<u>252</u> → $(252)_{10} = (1111\ 1100)_2 \Rightarrow /30$

Increment = 256 − 252 = 4

4) Asigno IP's para H31 y R22.
Como Tengo ocupado de 143.139.211.0 a 143.139.211.191,
cojo el siguiente rango. Como son 2 hosts (P2P),
Mask = 255.255.255.252
El rango será : 143.139.211.192 (Network IP) a 143.139.211.195 (Broadcast IP)
Selecciono para el router 143.139.211.193 y apunto en la Tabla de rutas,
y para el host 143.139.211.194

5) Como R1 Tiene dos caminos pongo default.

6) Como Internet debe llegar a las 3 subredes, pongo :
143.139.211.0 / 24
↳ Network IP de la 1ª
↳ /24 Tiene increment = 256, llega a Todas