

Homework 1 : InternetWorking

1. IPv4 Addressing (30/100)

a) -> The best fit netmask for a network with 255 hosts is : **255.255.254.0**

Because you gonna need 1 address for the network, one broadcast address and then 255 hosts address, so 257 addresses, therefore 255.255.254.0 is the best fit netmask for this network.

b) -> The maximum number of host we can have in a /14 network is : $(2^{(32-14)}) - 2 = 262142$ hosts.

c) -> We have the network 93.113.245.224/27 in four equally sized /29 networks :

- 1) 93.113.245.224/29
- 2) 93.113.245.232/29
- 3) 93.113.245.240/29
- 4) 93.113.245.248/29

d) -> The directed broadcast address of the network 84.129.75.113/24 is : **84.129.75.255**

e) -> The directed broadcast address of the network 84.129.75.113/24 is : **255.255.255.255**

f) -> According to IANA services IP network 195.74.160.0/19 belongs to ESA (European Space Agency) and their AS number is : 128519

2. Address allocation (30/100)

➔ **Network A** : We gonna need 500 hosts, so network A is going to be a /23 network.

@NetworkA = 72.33.144.0/23 -- @BroadcastA = 72.33.145.255/23

We definitely have enough addresses for 500 hosts, and 10 free addresses.

➔ **Network B** : Just like for NetworkA we gonna need 500 hosts :

@NetworkB = 72.33.146.0/23 -- @BroadcastB = 72.33.147.255/23

➔ **Network F** : This time we need to be able to reach 3 places (NetworkA, NetworkB, Switch R2), therefore we gonna need 3 hosts minimum then the network F is going to be a /29 network.

@NetworkF = 72.33.148.0/29 -- @BroadcastF = 72.33.148.8/29

➔ **Network C** : Here we gonna need 300 hosts, so network B is going to be a /23 network.

@NetworkC = 72.33.150.0/23 -- @BroadcastC = 72.33.151.255/23

➔ **Network D** : Same than for networkC

@NetworkD = 72.33.152.0/23 -- @BroadcastD = 72.33.153.255/23

➔ **Network E** : Same again.

@NetworkE = 72.33.154.0/23 -- @BroadcastE = 72.33.155.255/23

➔ **Network G** : This network needs to be able to talk to 4 different networks, therefore it needs at least 4 hosts address. Then it's gonna be a /29 network.

@NetworkG = 72.33.156.0/29 -- @BroadcastG = 72.33.156.8/29

➔ **Network H** : This network needs to be able to talk to 3 different networks (F through R2, G through R3 and ext. Network through R1) therefore it needs at least 3 hosts address. Then it's gonna be a /29 network.

@NetworkH = 72.33.158.0/29 -- @BroadcastH = 72.33.158.8/29

In that network we have we define :

- @R2 = 72.33.158.1/29

- @R3 = 72.33.158.2/29

- @R1 = 72.33.158.3/29

➔ **Conclusion :**

What we did is that we split the network in 2 big blocks :

- block 1 = 72.33.144.0/21 reachable through R2

- block 2 = 72.33.150.0/21 reachable through R3

➔ **Then the routing table of R1 is :**

Destination	Next hop	Flags	Interface
72.33.144.0/21	72.33.158.1 (@R2)	UG	M1
72.33.150.0/21	72.33.158.2 (@R3)	UG	M2
ext	-	U	M3

3. [IPv4 forwarding \(20/100\)](#)

a) -> Next hop : 249.21.118.102 – interface : m2

b) -> Next hop : 7.255.85.122 – interface : m0

c) -> Next hop : None – interface : m2

d) -> Next hop : 7.255.85.112 – interface : m0

e) -> Next hop : None – interface : m0

4. IPv4 options (20/100)

- a) -> They are simple options. The No-options option can be used to align the next option on a 16-bit or 32-bit boundary ; on the other hand End-of-options option is used for padding at the end of the option field, but it only can be the last option ! Which means that if more than 1 byte is needed to align the option field, some No-options options **must** be used, followed by an End-of-options option.
- b) -> It can "only" list up 9 route IP addresses because the maximum size of the header is 60 bytes, which must include 20 bytes for the base header. This implies that only 40 bytes are left over the option part.
- c) -> Strict Source Route and Loose Source Route options are options that are copied in every fragment. Simply because for the example of the Strict Source Route, this option is used to route the IP packet based on information supplied by the source, so every fragment needs to keep this option.
- d) -> The identification, flags and offset fields are eliminated from the base header, they are included in the extension header. That's also true for the option fields. The real advantage is that we don't "pollute" the base header with options and we can put them in an extension header and therefore we can put more options. We can have 6 extension header.