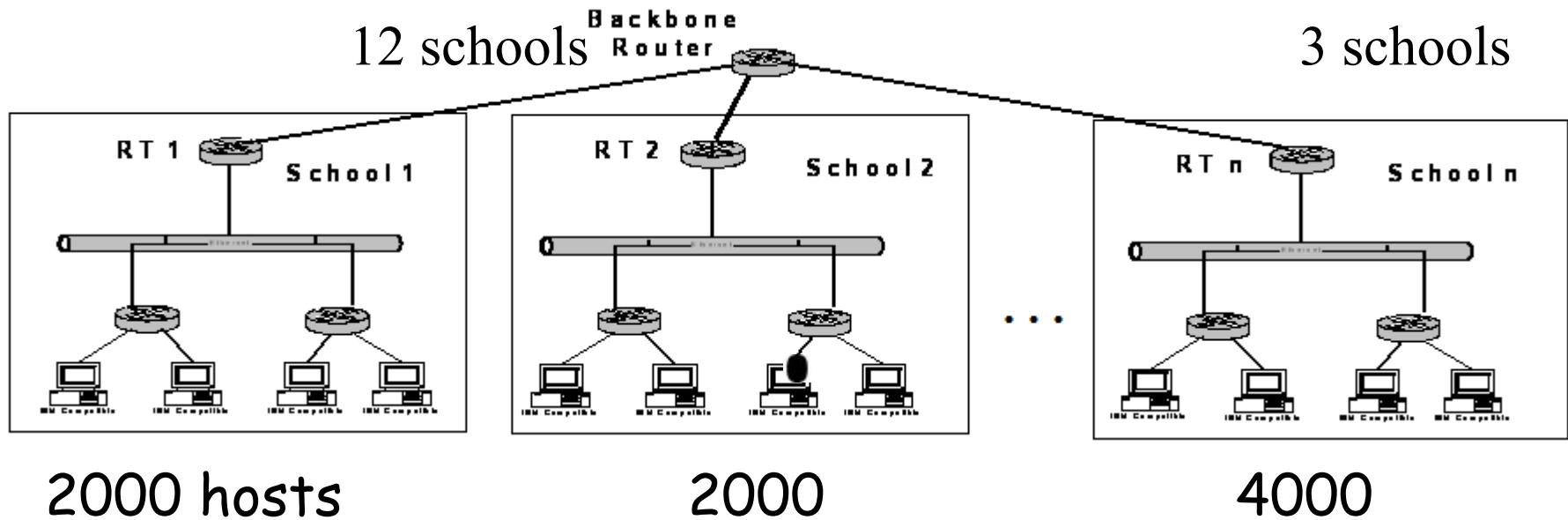


CE3005/SC2008/CZ3006:
Computer Networks

Tutorial 2-1

Q1: Assign suitable subnet address/subnet mask



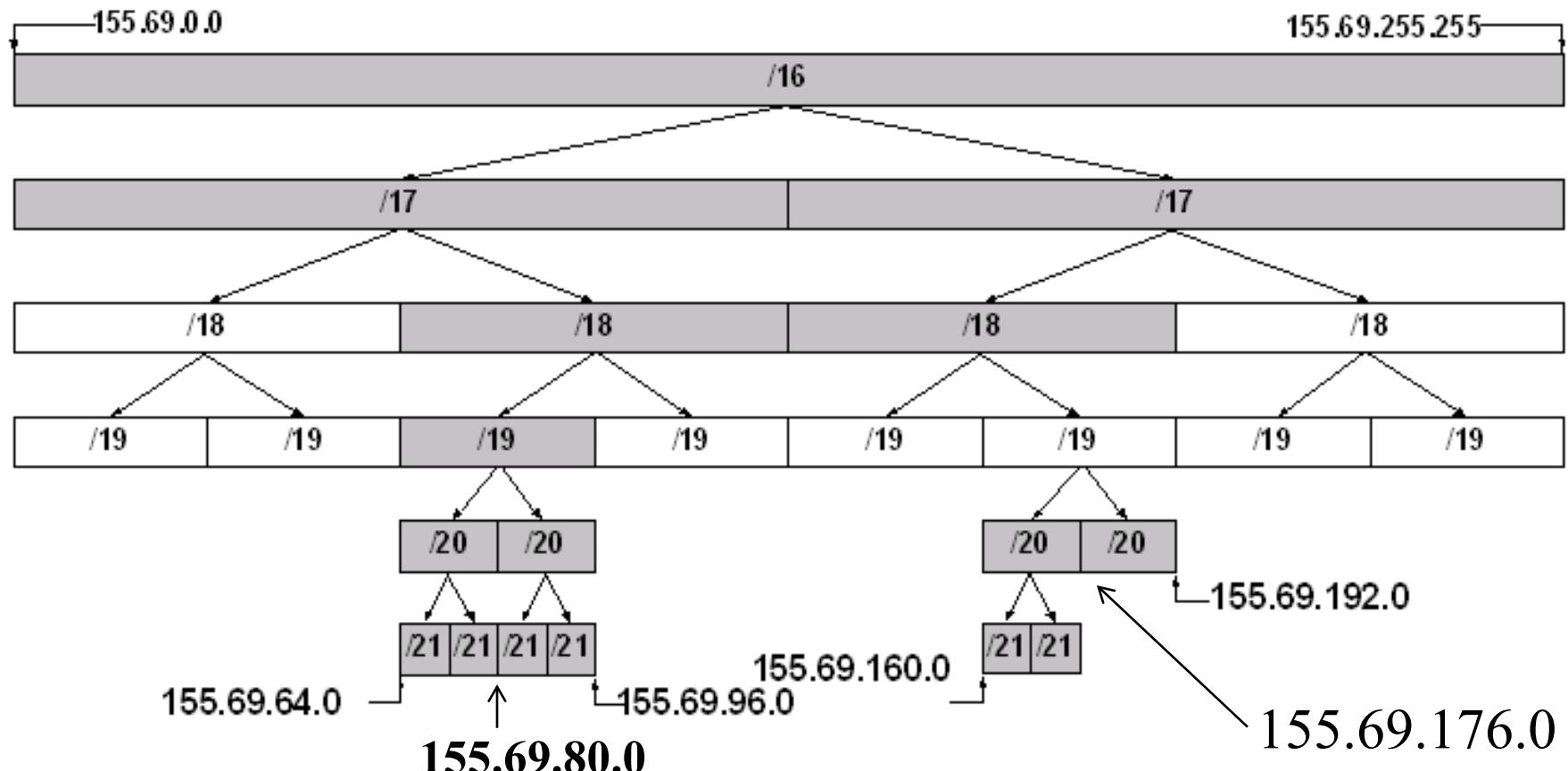
Note:

IP block: 155.69.0.0/16

If using /20 mask, # of hosts = $2^{12} - 2 = 4094$

If using /21 mask, # of hosts = $2^{11} - 2 = 2046$

Q1: Assign suitable subnet address/subnet mask



In this /16 network, there can be 16 subnets with /20 masks, or 32 subnets with /21 masks.

Subnet mask :/20 255.255.11110000.0

Q1: Assign suitable subnet address/subnet mask

- You can choose
 - any 3 address blocks with /20, e.g.
 - 155.69.0.0/20 : 155.69.0.0 till 155.69.15.255
 - 155.69.16.0/20 : 155.69.16.0 till 155.69.31.255
 - 155.69.32.0/20 : 155.69.32.0 till 155.69.47.255
 - any 12 address blocks with /21, e.g.
 - 155.69.64.0/21 : 155.69.64.0 till 155.69.71.255
 - 155.69.72.0/21 : 155.69.72.0 till 155.69.79.255
 - ...
 - Remember not to overlap the address block

How much address is left ? 7 blocks of /20

Q2: Broadcast Address of a Subnet

Given subnet address/subnet mask:

Dotted decimal: 145.32.128.0 / 255.255.224.0

In binary: 145.32.10000000.0 / 255.255.11100000.0

Remember broadcast address = all '1's in host-id

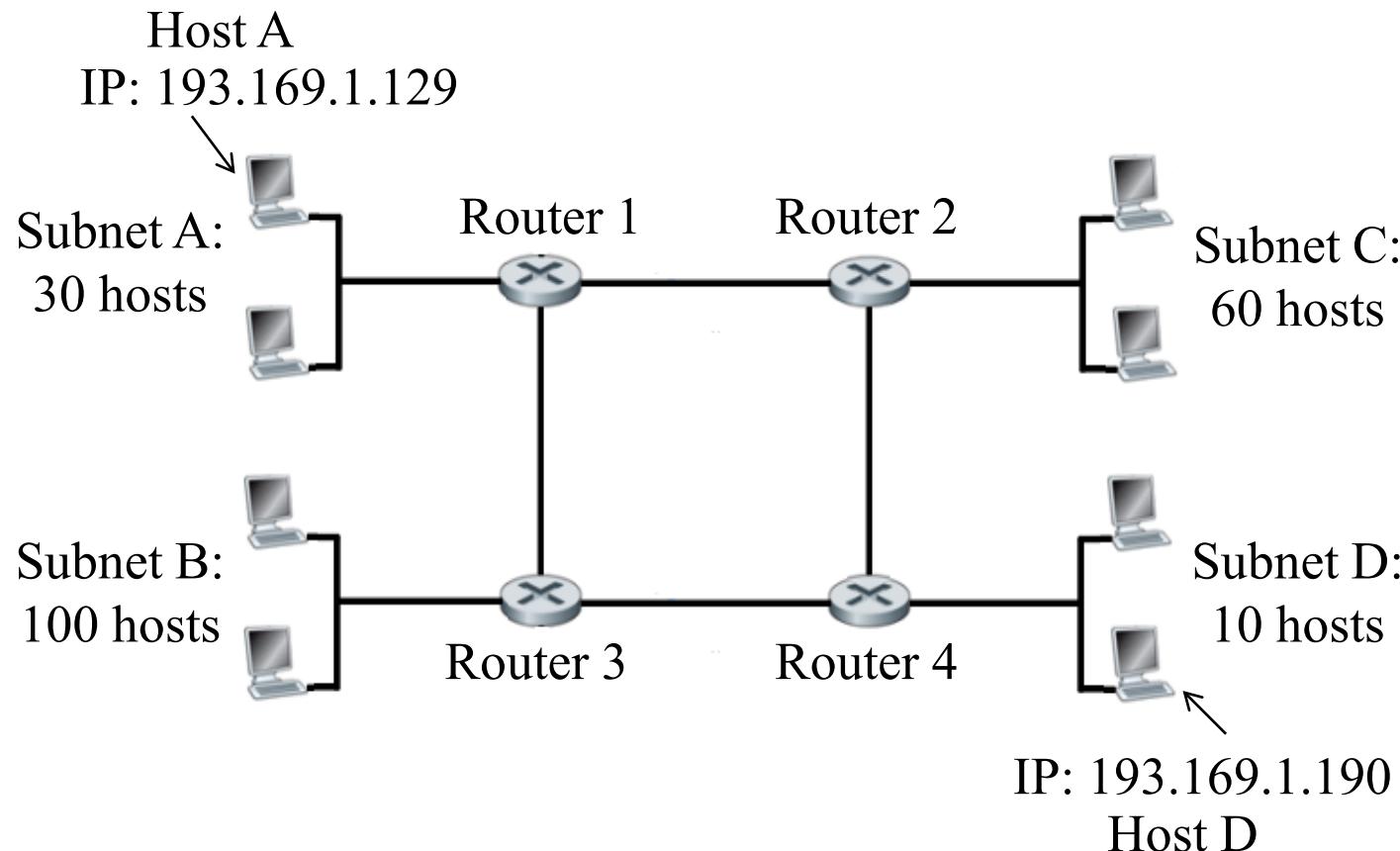
So, broadcast address of subnet 145.32.128.0/19:

In binary: 145.32.10011111.11111111

Dotted decimal: 145.32.159.255

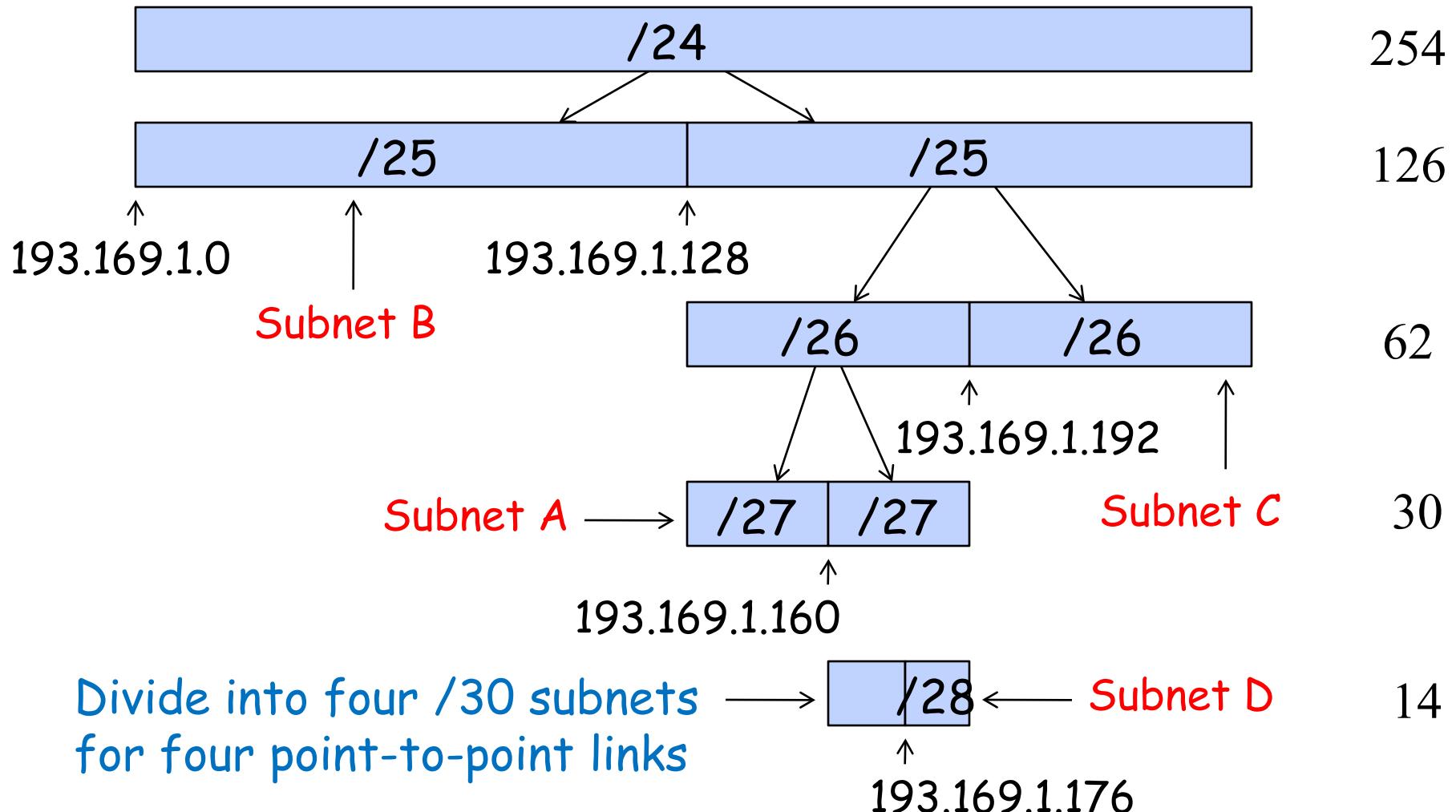
Q3: Assign suitable IP addresses/subnet masks

Remember that all hosts/routers in a subnet must have the same subnet id.

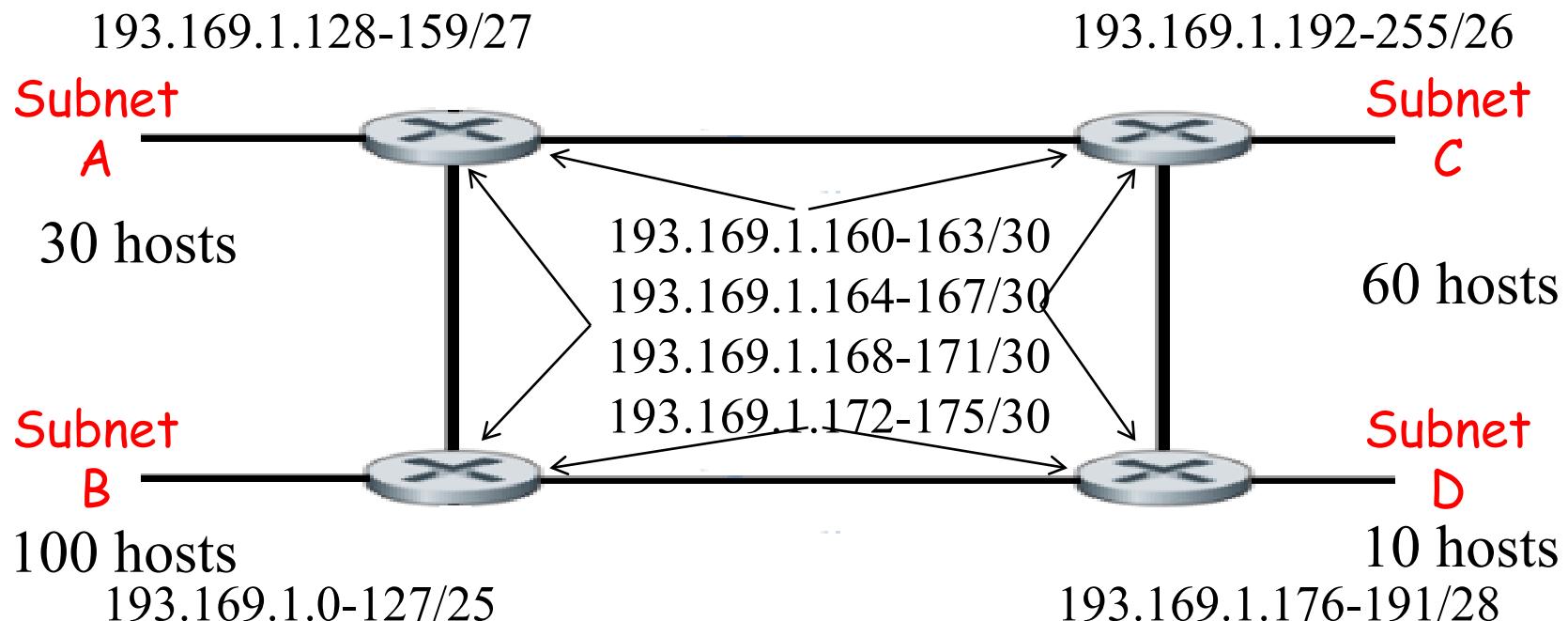


Q3: Assign suitable IP addresses/subnet masks

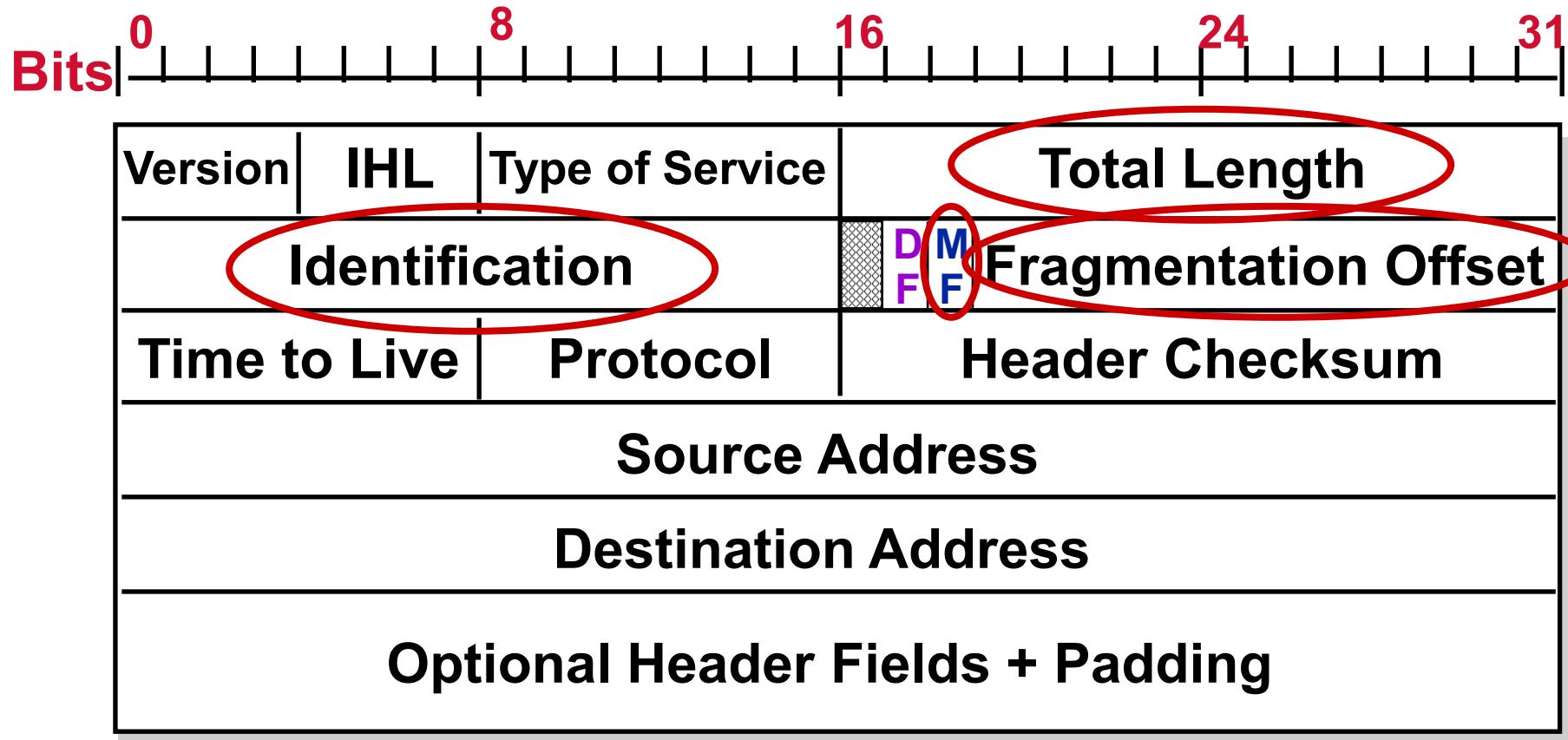
of host



Q3: Assign suitable IP addresses/subnet masks



Q4: IP Header



DF: Don't Fragment

MF: More Fragments



Bit not used

Q4: IP Fragmentation

Size of the datagram = 3000 bytes

Total data in the datagram = 2980 bytes

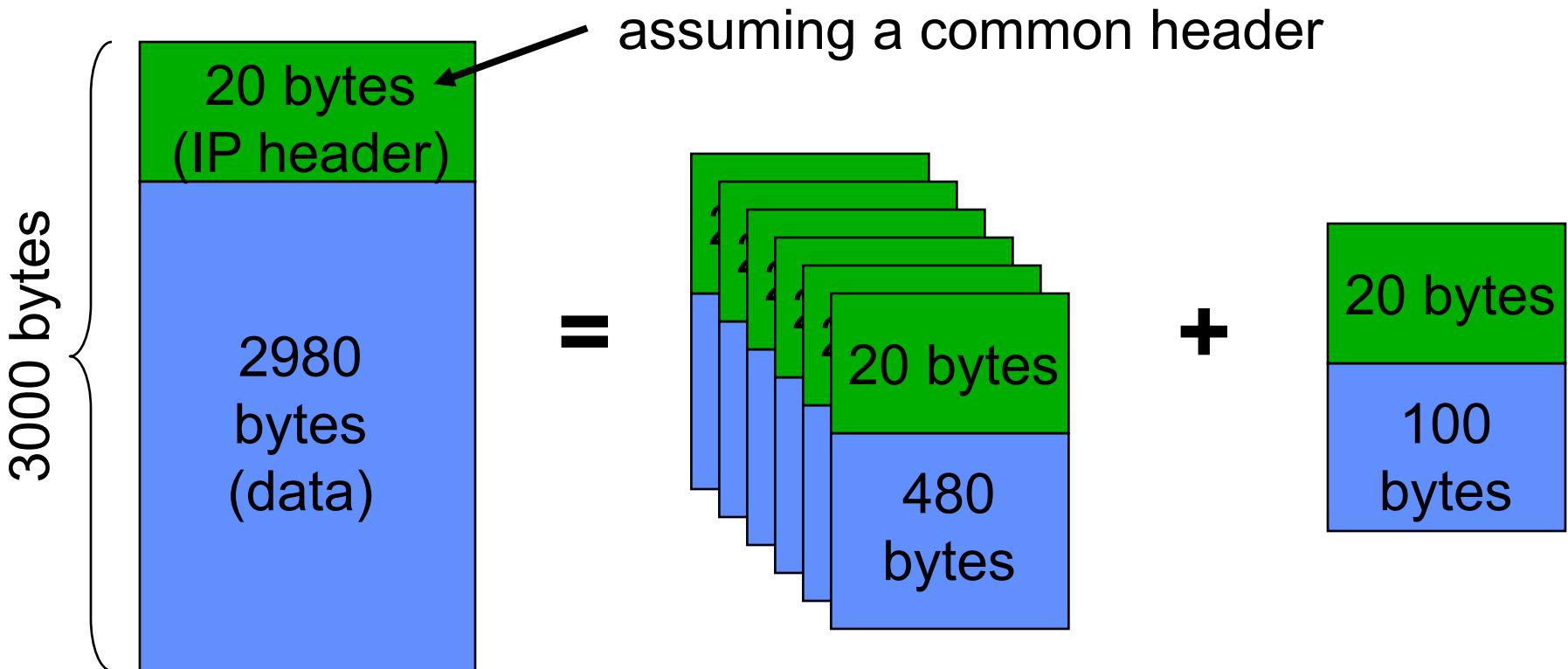
Max. data in each fragment = $500 - 20 = 480$ bytes

Number of fragments = $2980 / 480 = 6.21 = 7$ fragments

Characteristics:

- **Each fragment has 422 in the identification number.**
- **The offset for the 7 fragments are 0, 480, 960, 1440, 1920, 2400, and 2880. The offsets in the headers are 0, 60, 120, 180, 240, 300, and 360, respectively.**
- **First six fragments will have the “More Fragments (MF)” flags set, and the last fragment’s flag will be zero.**

Q4: IP Fragmentation



$$\text{Number of fragments} = \frac{3000-20}{500-20} = 6.21$$

Q4: IP Fragmentation

The diagram illustrates the fragmentation of a single IP datagram. On the left, a large blue box represents the original packet, which is 3000 bytes long. It contains a green header section labeled "20 bytes (IP header)" and a blue data section labeled "2980 bytes (data)". On the right, a table shows the details of the 8 resulting fragments. Each fragment is 500 bytes long, has an ID of 422, and uses protocol 1. The MF offset column indicates the starting byte of each fragment relative to the start of the original data section.

	Fragment length	ID	MF offset
0	1	500	422 1 0
480	2	500	422 1 60
960	3	500	422 1 120
1440	4	500	422 1 180
1920	5	500	422 1 240
2400	6	500	422 1 300
2880	7	120	422 0 360

‘offset’ is in 8-byte unit
(ie 60 means $60 \times 8 = 480$ bytes)