SC2008
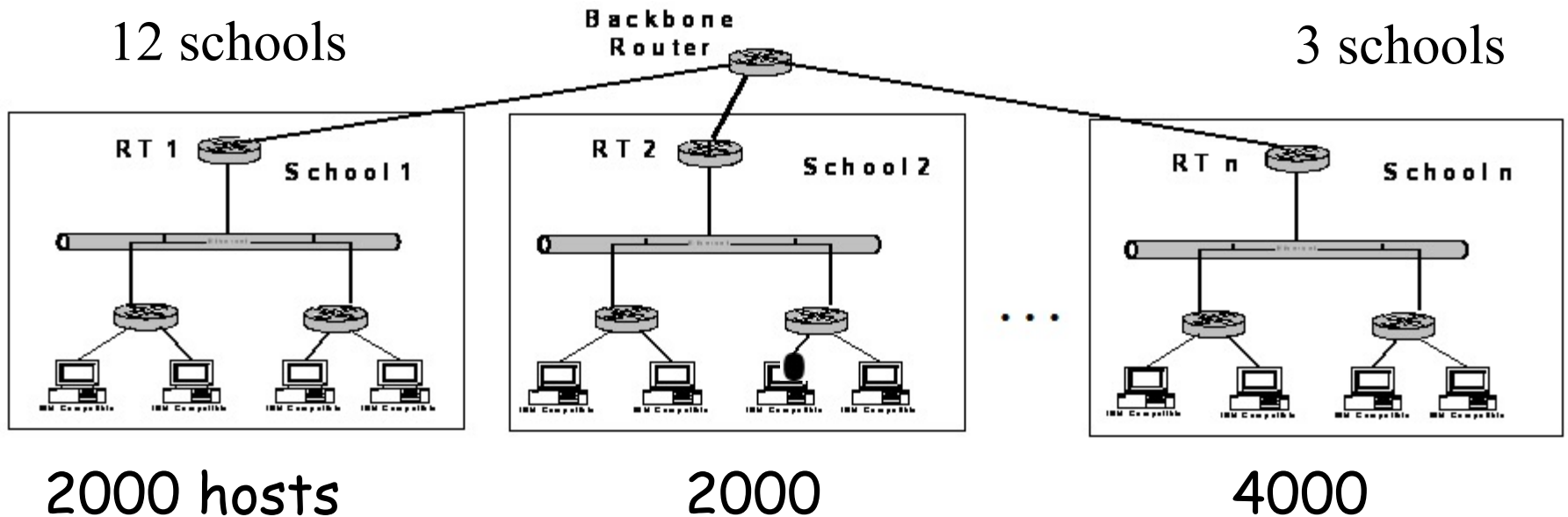# CE3005:Computer Networks
CZ3006: Netcentric Computing

IP addressing

Q1: Assign suitable subnet address/subnet mask
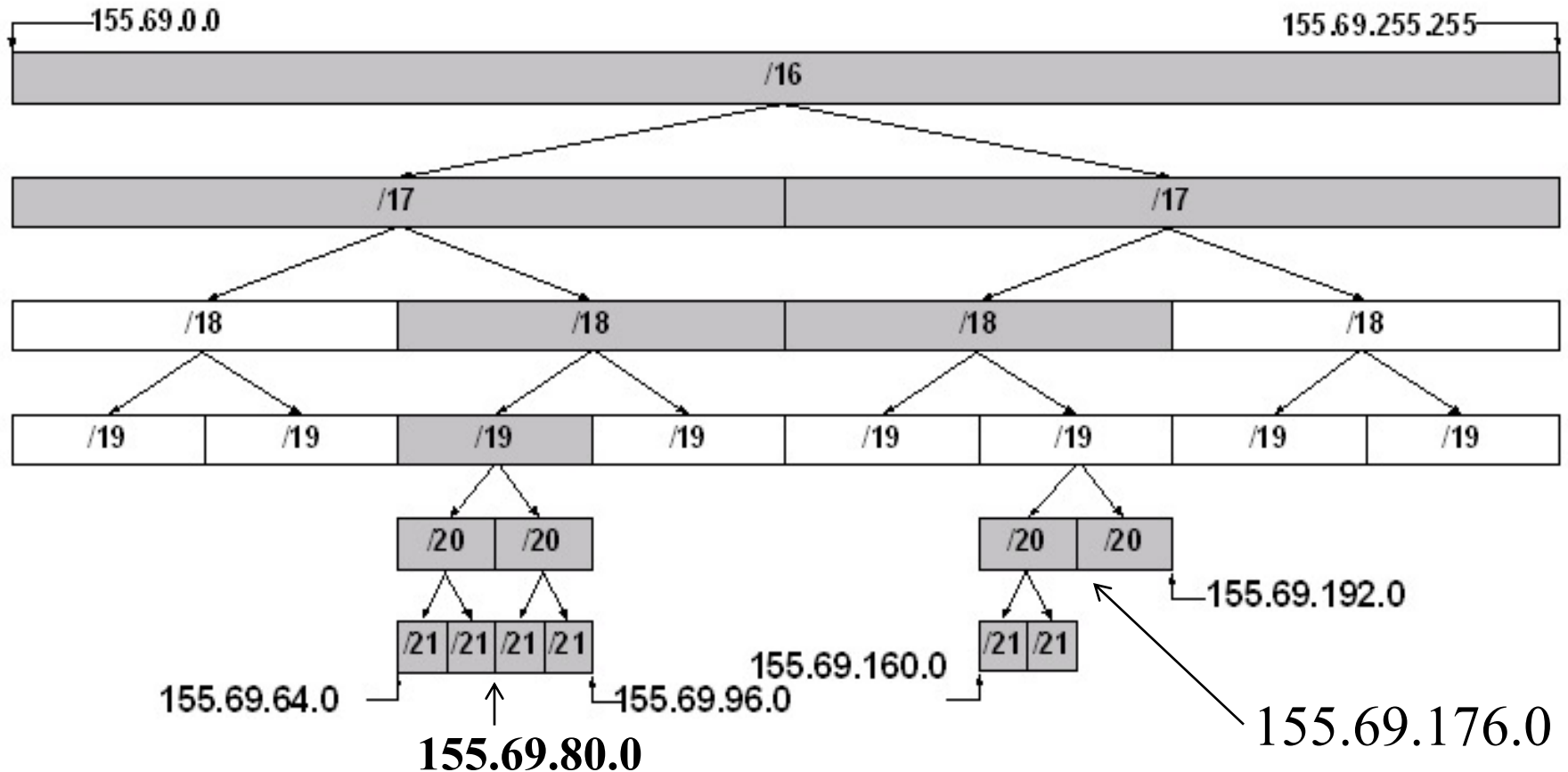
12 schools

Backbone Router

3 schools

RT 1   School 1

RT 2   School 2

RT n   School n

. . .

2000 hosts   2000   4000

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

An organization is assigned a /16 IP address block. The organization has created several subnets for its network. It is known that one of the subnets is 145.32.128.0/255.255.224.0. What is the broadcast address for this 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

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
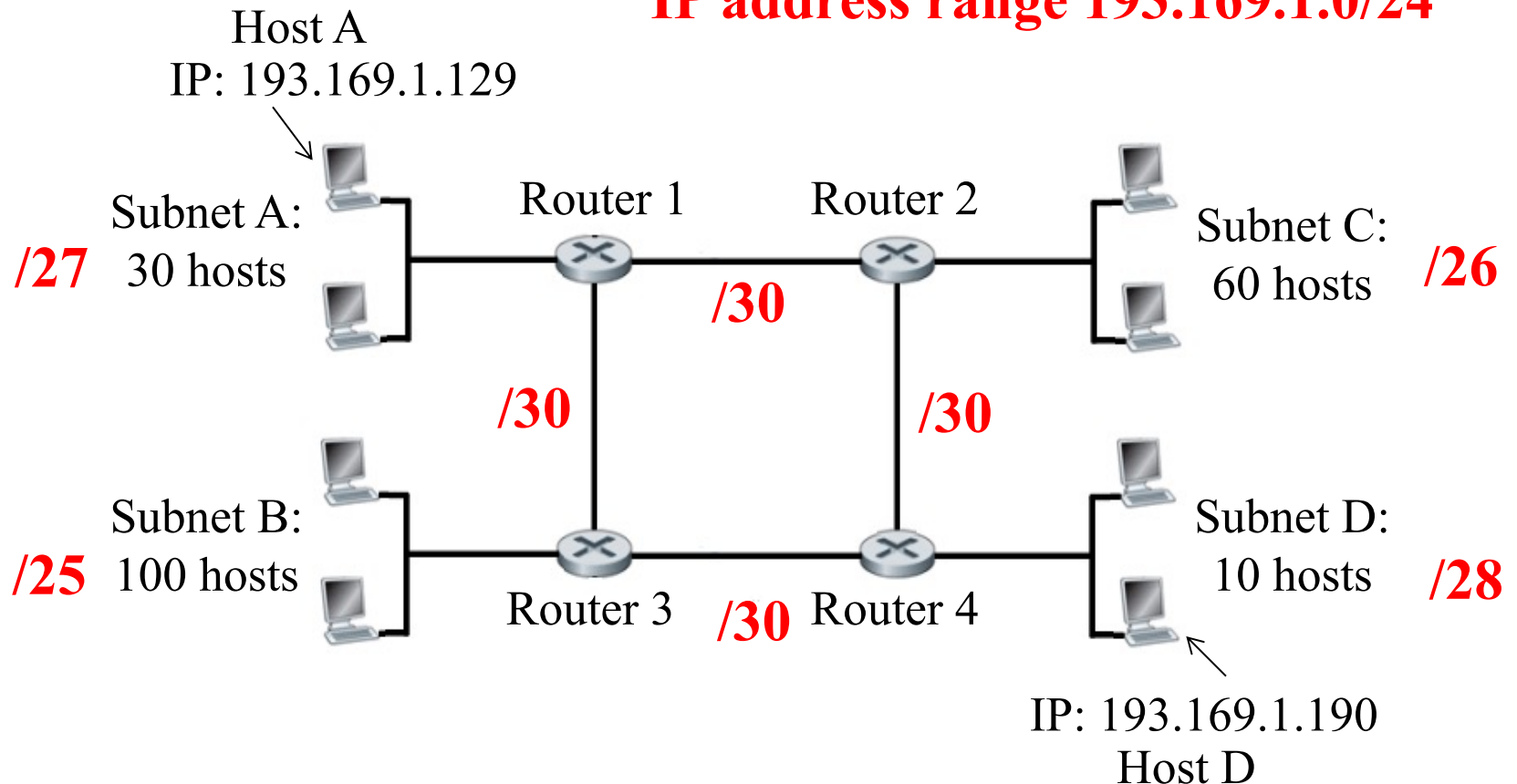

So, broadcast address of subnet 145.32.128.0/19:

In binary: 145.32.10011111.11111111

Dotted decimal: 145.32.159.255

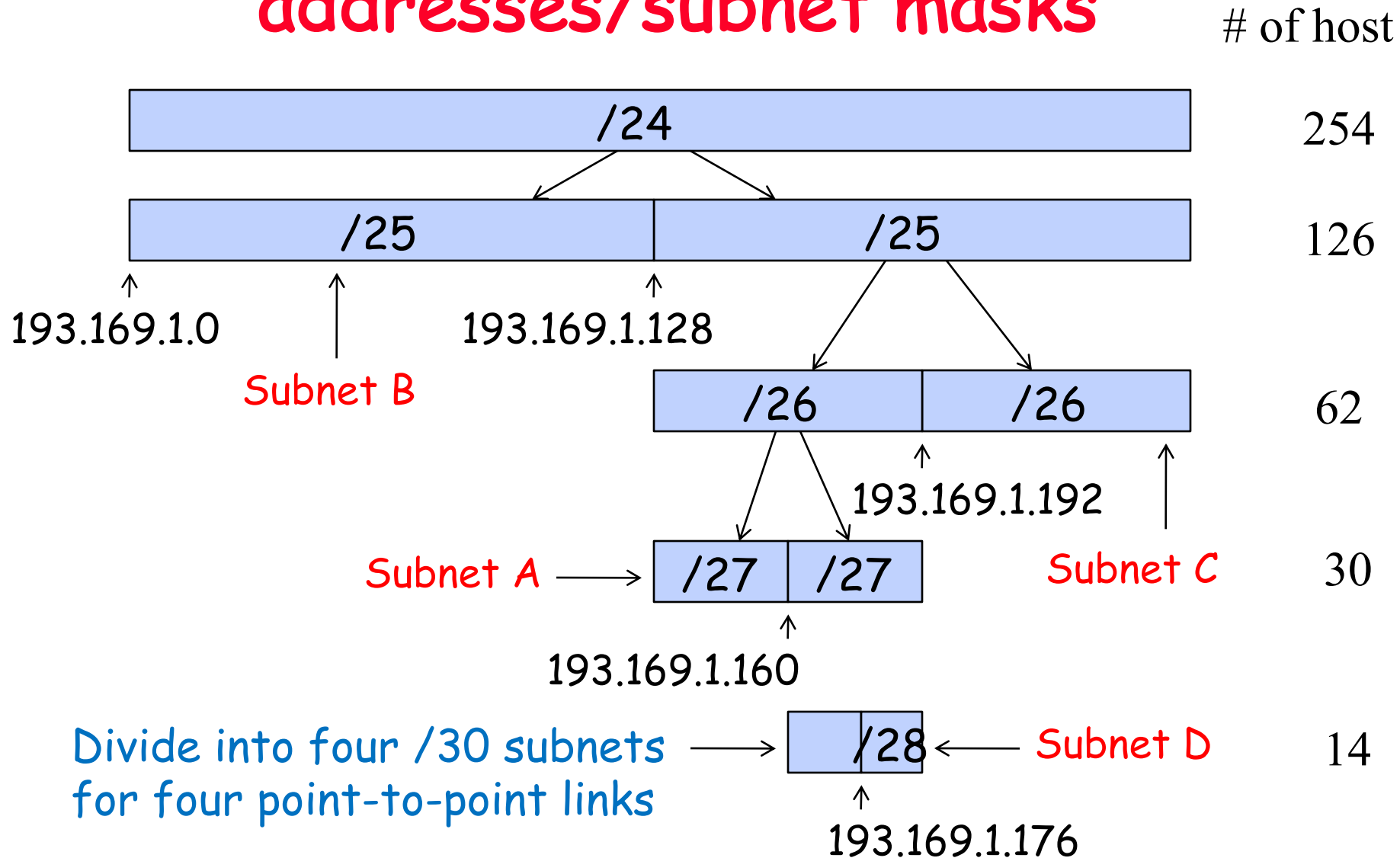# Q3: Assign suitable IP addresses/subnet masks

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

IP address range 193.169.1.0/24

Host A
IP: 193.169.1.129

Subnet A:
/27 30 hosts

Router 1   Router 2

/30

Subnet C:
60 hosts **/26**

/30   **/30**

Subnet B:
/25 100 hosts

Router 3   **/30** Router 4

Subnet D:
10 hosts **/28**

IP: 193.169.1.190
Host D

Q3: Assign suitable IP addresses/subnet masks

of host

/24 — 254

/25 — /25 — 126

193.169.1.0

193.169.1.128

Subnet B

/26 — /26 — 62

193.169.1.192

Subnet A → /27 — /27 — 30

Subnet C

193.169.1.160

Divide into four /30 subnets → /28 ← Subnet D — 14
for four point-to-point links

193.169.1.176

Q3: Assign suitable IP addresses/subnet masks

193.169.1.128-159/27   193.169.1.192-255/26

Subnet   Subnet
A   C

30 hosts

193.169.1.160-163/30
193.169.1.164-167/30   60 hosts
193.169.1.168-171/30
193.169.1.172-175/30

Subnet   Subnet
B   D

100 hosts   10 hosts
193.169.1.0-127/25   193.169.1.176-191/28
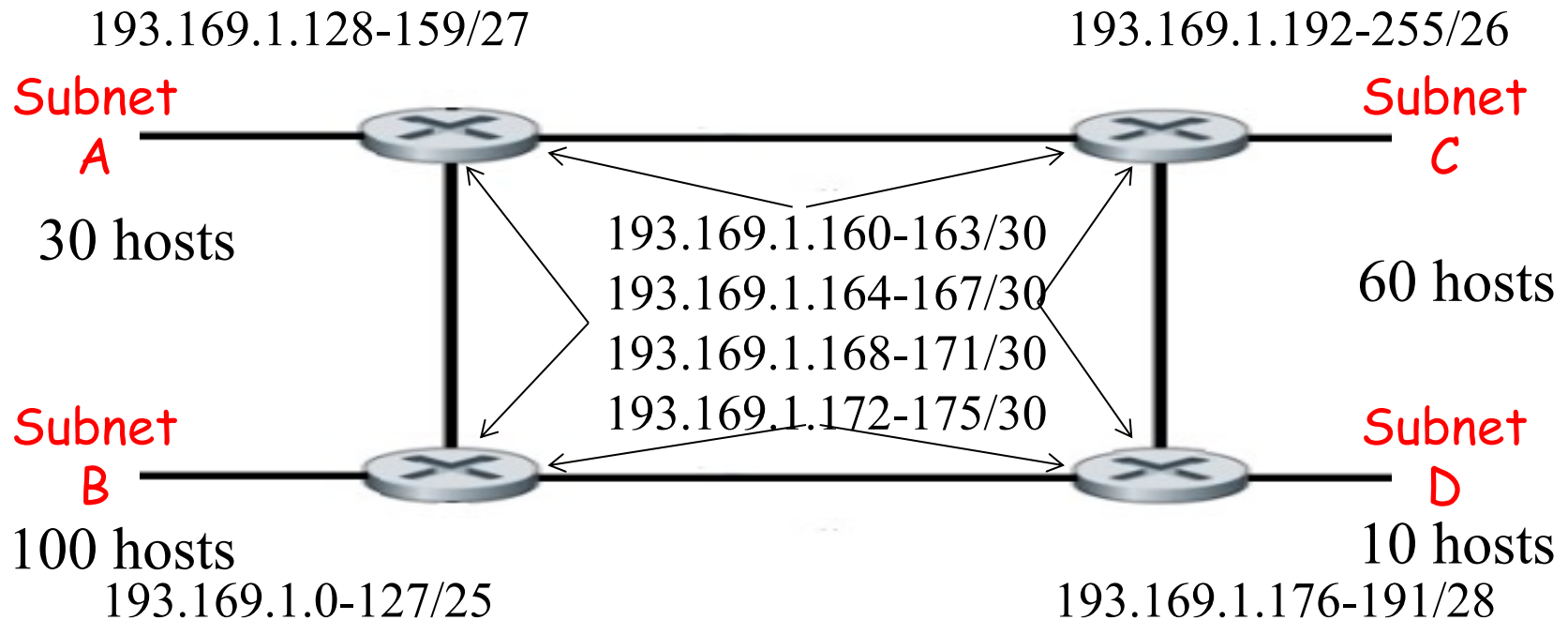
Q4: IP Header

Consider sending a 3000 byte datagram into a link that has an MTU of 500 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are their characteristics?

Q4: IP Header

Consider sending a 3000 byte datagram into a link that has an MTU of 500 bytes. Suppose the original datagram is stamped with the identification number 422. How many fragments are generated? What are their characteristics?
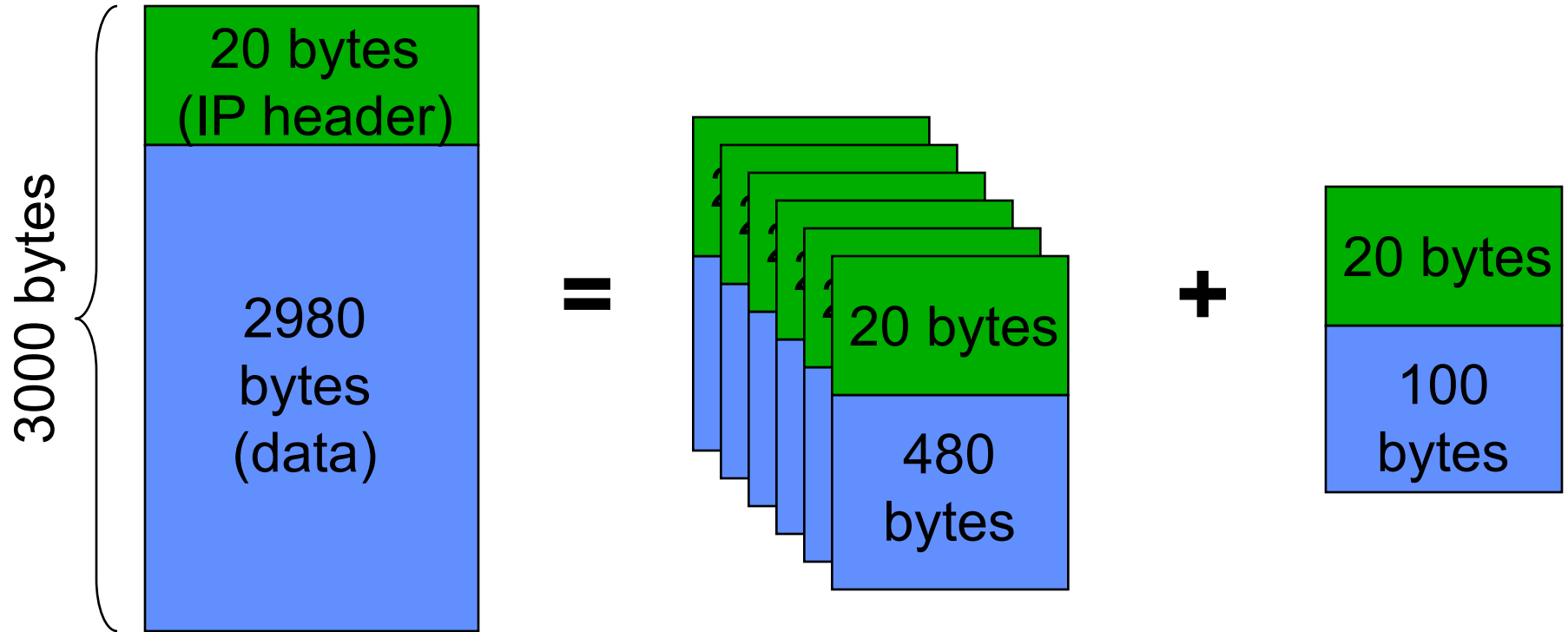
Size of the datagram = 3000 bytes
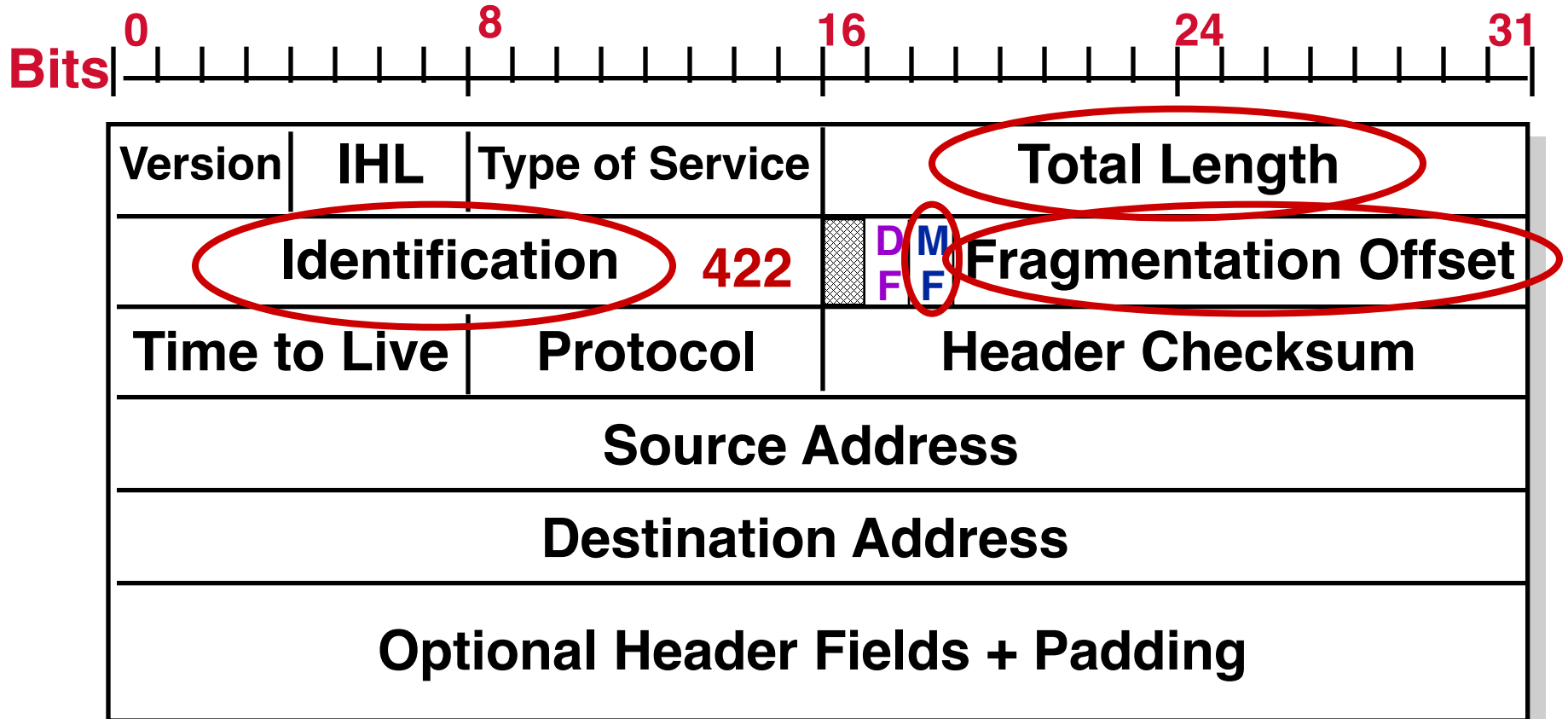
Total data in the datagram = 2980 bytes

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

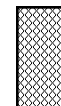Number of fragments = 2980 / 480 = 6.21, i.e., 7 fragments
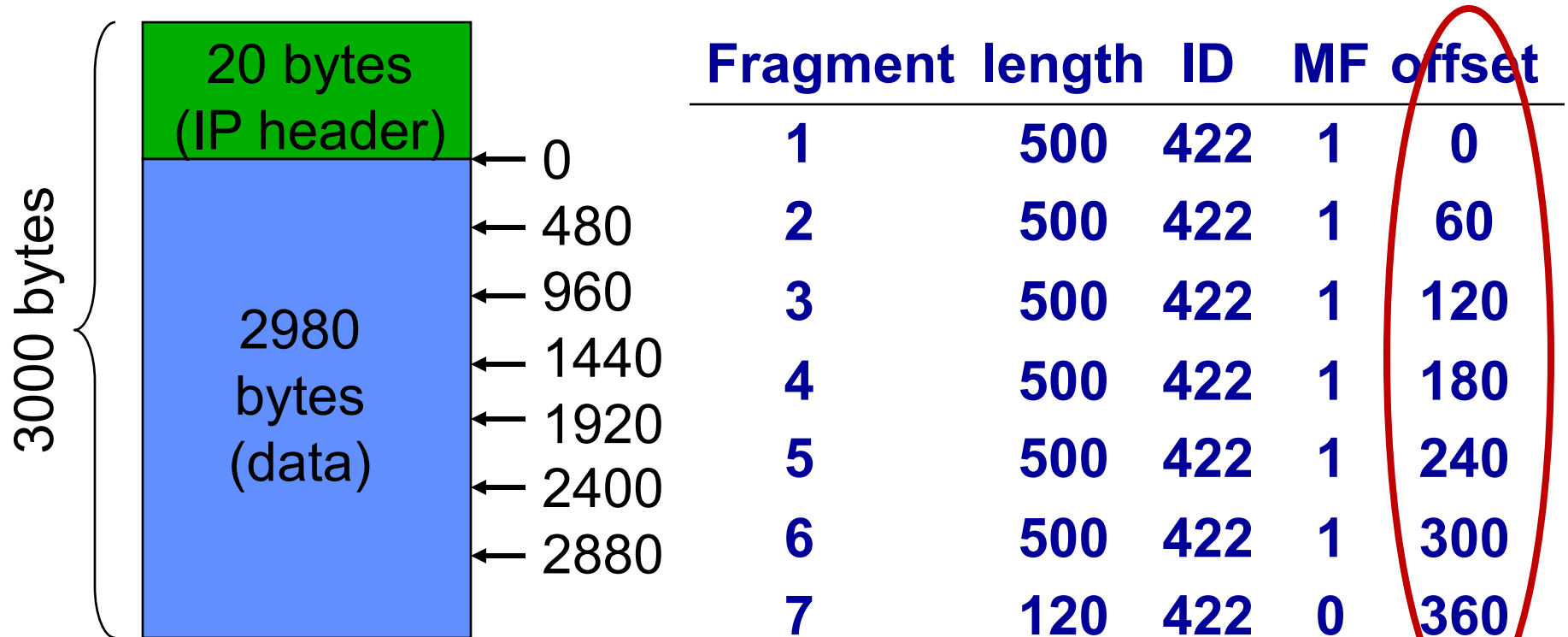
Q4: IP Fragmentation

Q4: IP Header

Bits

0	8	16	24	31

Version	IHL	Type of Service	Total Length		
Identification 422			DF MF	Fragmentation Offset	
Time to Live	Protocol		Header Checksum		
Source Address					
Destination Address					
Optional Header Fields + Padding					

DF: Don't Fragment

MF: More Fragments

Bit not used

Q4: IP Fragmentation

	20 bytes (IP header)

3000 bytes

2980 bytes (data)

0
480
960
1440
1920
2400
2880

Fragment	length	ID	MF	offset
1	500	422	1	0
2	500	422	1	60
3	500	422	1	120
4	500	422	1	180
5	500	422	1	240
6	500	422	1	300
7	120	422	0	360

'offset' is in 8-byte unit
(ie 60 means 60*8 = 480 bytes)

offset = MTU data/8 = 480/8 = 60

In addition to the office hours listed in the previous slide, please feel free to contact Assistant Professor Jun ZHAO as follows to schedule appointments to ask questions. Thanks!

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