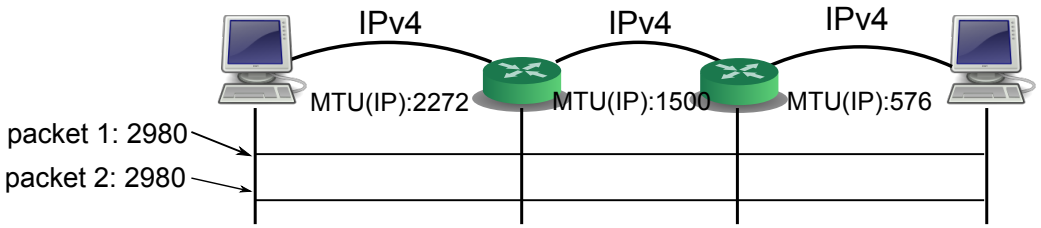
1 IP Datagram Fragmentation

1. Which of the IP header fields are used for fragmentation?

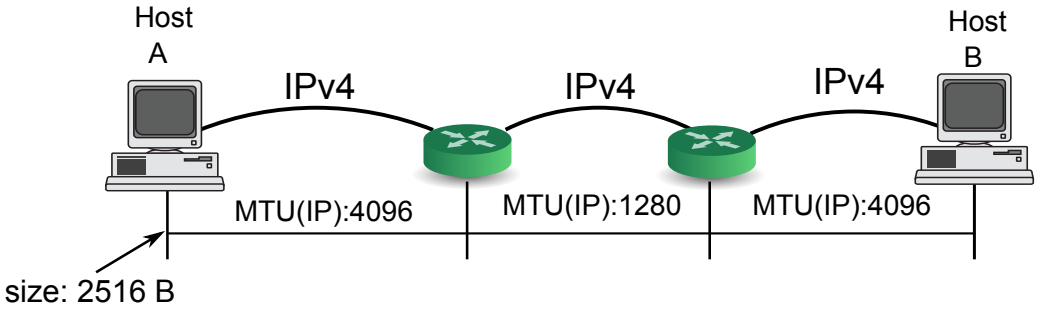
2. Why must fragment length be a multiple of 8 bytes?

3. Two successive IPv4 packets with a size $L = 3000$ byte (including the IP header) are sent over links with MTUs of 2272 byte, 1500 byte, and 576 byte respectively as shown below. How will the packets be fragmented (use random identification numbers)? What overhead will be introduced (assume 20 byte IP headers)?



packet	fragment	length	Identification	MF	offset	data

4. An IPv4 packet with a size L = 2536 byte (including the IP header) is sent over links with MTUs of 4096 byte, 1280 byte, and 2048 byte. How will the packet be fragmented (use random identification numbers)? What overhead will be introduced (assume 20 byte IP headers)?



packet	fragment	length	Identification	MF	offset	data

5. What is the difference between fragmentation and segmentation?

2 IPv4

1. How would you setup a private home network with 128 hosts?
   - Which address ranges are you allowed to use?
   - What is the minimum number of host bits that your subnet needs to have?

2. How many hosts can be addressed in the subnet 192.168.1.0/26? What is the address range? What is the associated netmask in the *a.b.c.d* notation?

3. What addresses would you assign to three subnets A, B and C considering the following constraints: networks A and B should be able to contain 5000 hosts each and network C should be able to support 500 hosts. All addresses must be allocated from 130.83.128.0/17.

4. A sender with the IP 130.75.64.184 and netmask 255.255.248.0 wants to send an IP packet to the address 130.75.68.10. Is the destination address on the same subnet or will the packet need to be routed? What is the address of the attached network in *a.b.c.d/p* notation?

5. What is the default route?

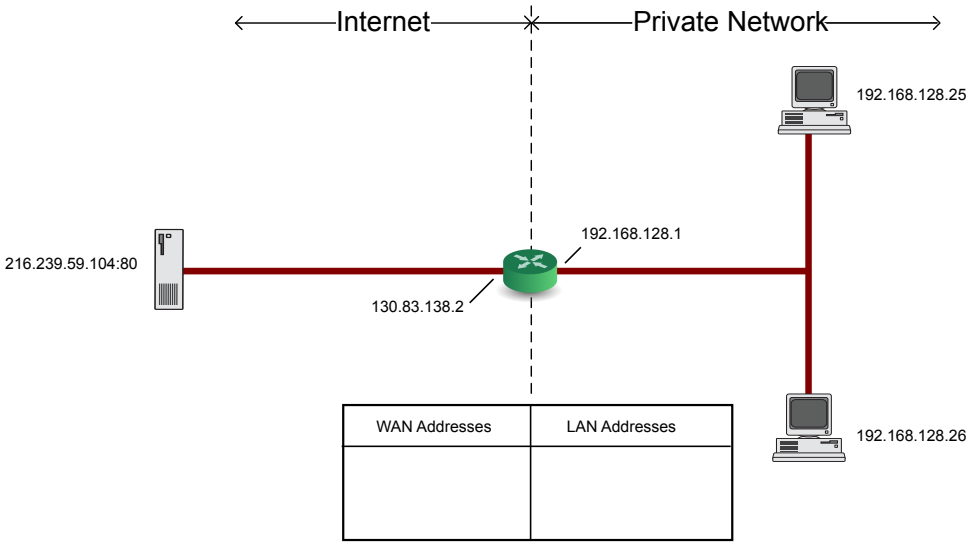
3 IPv6

1. What are the main differences between IPv4 and IPv6 and what is the motivation behind these?

2. How can the IPv4 address 137.226.4.59 be expressed as an IPv6 address? When can this notation be used?

4 Network Address Translation (NAT)

1. Two hosts with the private IP numbers 192.168.128.25 and 192.168.128.26 want to access 216.239.59.104:80 from behind a NAT router. Outline what the address translation process could look like. (The NAT router has the external address 130.83.138.2.)



2. What problem arises when running a web server behind a NAT router? What could be done about it?

3. From the point of view of the IP layer model, why is NAT problematic?