# Communication Networks

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Exercise 12 – NAT & IPv6

12.1 NAT (Exam Question 2018)

Consider the network topology below. Alice has multiple PCs at home (10.0.0.11-13) which share a single public IP address (1.2.3.4) via a NAT device. Further, she operates a surveillance camera server which is directly connected to the Internet with a public IP address (5.6.7.8). The camera transmits the live video signal as a stream of UDP packets with source port 1000 to a configurable destination IP address and port.
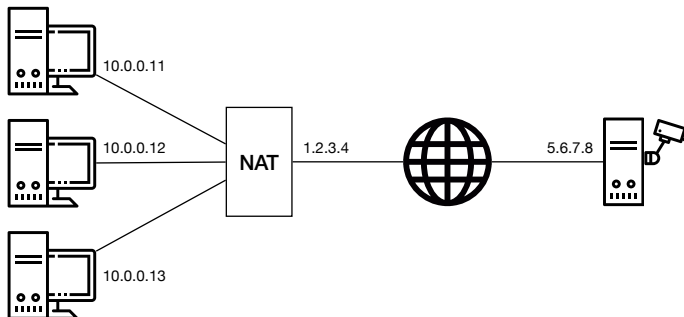
Alice operates three PCs and one camera server

a) Alice wants to receive the live video stream on one of her PCs and thus configures the camera to send the video signal to IP 10.0.0.11 and port 1234. However, she does not receive it on her PC. Why? Where is this traffic sent to?

b) Now Alice configures the camera to send the video signal to IP 1.2.3.4 and port 1234. But she still does not receive it on any of her PCs. Why? Where is this traffic sent to?

c) What can Alice do such that she receives the video signal at her PC with IP address 10.0.0.11 and at port 1234 assuming that she *cannot* modify the configuration of the NAT? Describe step-by-step what she can do if she has the following possibilities:

- send one single UDP packet with arbitrary source and destination addresses and ports from each of her PCs;

- observe the received packets at each of her PCs and the camera server;

- specify the destination IP address and port for the video signal.

12.2 IPv6 Computations

Answer the following questions to IPv6.

a) Currently, all global unicast IPv6 addresses are inside 2000::/3. Assume that every network in the Internet gets an entire /64 prefix. How many different /64 prefixes can you distribute? How many hosts can be inside one of these /64 prefixes? Compare these numbers with the total amount of IPv4 addresses.

b) Simplify the notation of the following IPv6 addresses:

Full IPv6 address	Simplified IPv6 address
000a:1234:abda:0000:0000:0140:0000:0001	
0000:0000:0000:0000:0000:0003:0000:0010	
000a:0031:003f:0000:0000:0000:0000:0000	
0000:0000:0000:0000:0000:0000:0000:000b	

c) For the following pairs of IPv6 addresses, find the longest prefix that contains both addresses.

Address 1	Address 2	Prefix
2000::a35a	2000::ac3f	
2005::2e90:12fa:1	2005::2eb0:0:1	
200a::789:3	200a:5c::	

12.3 Putting Everything Together (v6)

Your laptop with the MAC address c0:6e:98:00:c2:43 just rebooted and has no IPv6 address at all. One of its interfaces is connected to a network with the IPv6 prefix 2000:0:0:36::/64 and one router with the address 2000:0:0:36::10. Describe all the steps that your laptop performs to autoconfigure a link-local and a global unicast IPv6 address for this interface. You can use M64(c0:6e:98:00:c2:43) to indicate the 64-bit representation of your MAC address. For each packet that your laptop sends or receives, describe the used source and destination IPv6 address.