

# COMPUTER NETWORKS

## EXERCISES LIST 3

1. For each of the given IP addresses (in CIDR notation), check if that's a network, broadcast or host address. Give the corresponding network, broadcast and another host address from that network. Compute the number of host addresses in this network.
  - 10.1.2.3/8
  - 156.17.0.0/16
  - 156.17.64.4/30
2. Repeat the exercise above for following addresses:
  - 99.99.99.99/27
  - 99.99.99.99/31
  - 99.99.99.99/32
3. Partition network 10.10.0.0/16 into 5 disjoint networks, i.e., each IP address from the network 10.10.0.0/16 should belong to one of these 5 networks. How the number of addressable hosts has changed? What is the minimal size of subnetwork that can be obtained as a result of partitioning.
4. Routing table consists of following entries (subnetwork, destination):
  - (0.0.0.0/0, to 5.5.5.5 via eth2)
  - (10.0.0.0/23, to 10.1.1.1 via eth0)
  - (10.0.2.0/24, to 10.1.1.1 via eth0)
  - (10.0.3.0/24, to 10.1.1.1 via eth0)
  - (10.0.1.0/24, to 10.2.3.4 via eth1)
  - (10.0.0.128/25, to 10.1.1.1 via eth0)
  - (10.0.1.8/29, to 10.1.1.1 via eth0)
  - (10.0.1.16/29, to 10.1.1.1 via eth0)
  - (10.0.1.24/29, to 10.1.1.1 via eth0)

Give equivalent but minimized table (i.e. without superfluous entries).

5. Repeat the exercise above for following entries:
  - (0.0.0.0/0, to 5.5.5.5 via eth2)
  - (10.0.0.0/8, to 10.1.1.1 via eth0)
  - (10.3.0.0/24, to 10.2.3.4 via eth1)
  - (10.3.0.32/27, to 10.1.1.1 via eth0)
  - (10.3.0.64/27, to 10.1.1.1 via eth0)
  - (10.3.0.96/27, to 10.1.1.1 via eth0)
6. How to reorder entries in a routing table, to make „best match” and „first match” rules equivalent. (Assume „first match” algorithm works as follows: browse from the start of list and stop at first matching rule.) Be ready to present a formal reasoning.
7. „First match” rule is time inefficient for large routing tables. Let  $w$  be length of an address (for IPv4  $w = 32$ ). Show that it's possible to devise a data structure for a routing table, such that insert and search (i.e. decision about packet's destination) operations take  $O(w)$  time.

*Marcin Bienkowski*  
Translation: *Krzysztof Bałowski*