

# Computer networking exam

## Terrain exploration

Write a client-server application that mimics the exploration of an unknown map. The server will encode the map as a 1D array of characters. In the beginning the entire map is unknown (initialized with 'u').

u	u	u	u	u
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The clients will be exploring the terrain and will be sending the information they gather to the server.

The client will send an unsigned integer and a character to the server: the number represents the index  $i$  in the array, and the character represents the type of the cell from index  $i$  (can be any character except unknown). For example, if the client sends  $(3, s)$ , the server will update the map as follows:

u	u	u	s	u
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The server will listen to both an UDP and on a TCP socket.

- On the TCP socket it will receive from the clients 3 bytes (the index as an unsigned short (2 bytes) and the character (1 byte)). The server will decode the information and update the map at the corresponding position if the map is unknown at that position.
- On the UDP socket, the server will periodically broadcast the configuration of the current map on port P.

The clients:

- On the TCP socket, they will periodically send to the server a random index and a random character different than 'u' (3 bytes).
- On the UDP socket, they will receive the server the configuration of the map stored by the server.

The application will end when all the characters in the map are different from 'u' (all the positions have been explored).

### Rubric:

- 1p: default.
- 4p: On a TCP socket the client sends a number and a character to the server, and the server responds back with a string of characters.
- 2.5p: The program uses both TCP and UDP sockets.
- 2.5p: The server can handle multiple clients at once.