B4 - Synthesis Pool

B-SYN-400

Jetpack to Tech3

getting a little closer to Tech3

3.2

Jetpack to Tech3

binary name: serverJ2T3
language: C or C++
compilation: via Makefile, including re, clean and fclean rules

- The totality of your source files, except all useless files (binary, temp files, obj files,...), must be included in your delivery.
- All the bonus files (including a potential specific Makefile) should be in a directory named *bonus*.
- Error messages have to be written on the error output, and the program should then exit with the 84 error code (0 if there is no error).

The goal of this project is to create the server of a muliplayer version of the game Jetpack Joyride.

Terminal

```
~/B-SYN-400> ./serverJ2T3 -p <port> -g <gravity> -m <map>
```

You don't have to code the client, the binary is provided.

Terminal

```
~/B-SYN-400> ./clientJ2T3 -h <ip> -p <port> [-d]
```

You can use -d flag to enable debug mode.

Terminal

```
~/B-SYN-400> ./clientJ2T3 -h 127.0.0.1 -p 4242 -d 2>&1 > log.txt
```

Terminal

```
~/B-SYN-400> cat log.txt
[DEBUG] Connected to server
[DEBUG] Sent message to server: "ID
MAP
"
[DEBUG] Command received: ID
[DEBUG] Args: 1
[DEBUG] ID set: 1
[DEBUG] Command received: MAP
[DEBUG] Args: 1.000000 170 10 _____e_ccccc_e__cccc
[DEBUG] Sent message to server: "READY
"
```

PROTOCOL

The server's network layer needs to be handled.
The server must be able to accept 2 clients and implement the following protocol:

- **ID** client asks for its ID (positive and unique).
  client request: ID
  server response: ID `<value>`
- **MAP** client asks for the map.
  client request: MAP
  server response: MAP `<gravity> <width> <height> <cells>`, where `<cells>` is a character string of length `width*height` that represents the map's contents ('_' for an empty space, 'c' for a coin and 'e' for an electric fence)
- **READY** client tells that it has received its id and map and that it's waiting for the game to start.
  client message: READY
- **FIRE** client tells the server about the change in the state of the jetpack ('0' if deactivated, '1' if activated).
  client message: FIRE `<state>`
- **START** server tells that the 2 players are connected and ready and that the game is beginning.
  server message: START
- **PLAYER** server sends the state of a player.
  server message: PLAYER `<playerID> <x> <y> <score> <fire state>`
- **COIN** server tells that a player has found a coin.
  server message: COIN `<playerID> <x> <y>`
- **FINISH** server tells that the game is over and who the winner is.
  server message: FINISH `<winnerID>` or FINISH -1 if there is no winner.

Each message sent by the server or the client ends with a '\n'.

All invalid commands will be ignored.

The server should not be blocking!
Only one select is authorized (not related to non-blocking sockets, which, for their part are forbidden, so no `fcntl(s, O_NONBLOCK)`).

Gameplay

The following gameplay should be added to the server:

- **Map**
  The file representing the map (given as parameter in the program) must be loaded with memory in order to be sent to the clients and used by the server.
- **Waiting for players**
  The server must wait for the two players to connect, retrieve their respective IDs and the map and then send the message **READY**.
  The server will then send the message **START**.
- **Frames**
  The base frame is in the lower left-hand corner, the abscissa axis is horizontal and positioned toward the right.
  The ordinate axis is vertical and positioned toward the top.
- **Start-up**
  At the beginning of the game the players are positioned at the middle of the left-hand edge. Their coordinates are (0, height/2).
- **Magnitude**
  The players are considered to have a 1x1 size and a mass of 1 (in order to apply gravity).
- **Movements**
  The players are subject to a horizontal movement of 5 squares per second, in the direction of increasing abscissas. The players must also be subject to gravity (passed as parameter in your binary).
  Activating a player's jetpack will reverse gravity for him/her.
- **Map limits**
  The players must not leave the map, neither through the top nor the bottom. Horizontal movements must always be carried out, even if the player is against the ceiling or the ground.
- **Collisions**
  When a player collides with a coin, he/she wins one point and the coin is removed. If two players collide with the same coin, both players win a point.
  When a player collides with an electric square, he/she dies. Players cannot collide with one another.
- **End of game**
  The game is over when the players come to the end of the map or when a player dies. If a player dies, the other player wins the game. If both players reach the end of the map, the one who has the better score wins. In all other cases, there is no winner.

EXAMPLES

Here's an example of communication between the client and the server:

```
SERVER <-- CLIENT

First client connection
1 <-- ID
  --> ID 3
1 <-- MAP
  --> MAP 2.5 8 4 __________e______e_______cccc__
1 <-- READY

Second client connection
2 <-- ID
  --> ID 21
2 <-- MAP
  --> MAP 2.5 8 4 __________e______e_______cccc__
2 <-- READY

Beginning of game
--> START
--> PLAYER 3 0 0 0 0
--> PLAYER 21 0 0 0 0
...
2 <-- FIRE 1
...
--> COIN 3 2 0
--> COIN 21 2 1
...
--> PLAYER 3 2.3 0 1 1
--> PLAYER 21 2.3 1.2 1 0
...
--> COIN 3 3 0
--> FINISH 3
```

Here's an example of a map file:

```
________________________e_____________________________________________________________
________________________e______cccccc__________________________________________________
________________________e_____ccccccc_____________________eeeeeeeeeee_____________
________________________e____cc_______________________________________________________
________________________e___cc______e_____________________cccc____________________
___________________________cc_______e_____________________cccc____________________
____________________cccccc_________e_____________________________________________
____________________cccccc_________e_________________eeeeeeeeeeee__________________
___________________________________e_____________________________________________
___________________________________e_____________________________________________
```