```
1   #include "ClientHandler.h"
2   #include "MapsList.h"
3   #include <iostream>
4   #include <string>
5
6   ClientHandler::ClientHandler(ServerProtocol&& client,
7                               GamesList& games, std::mutex& mutex_cout):
8       client(std::move(client)), games(games),
9       connected(false), mutex_cout(mutex_cout){}
10
11  ClientHandler::~ClientHandler(){}
12
13  void ClientHandler::run(){
14      try{
15          while(!this->connected){
16              char action = this->client.getProtocol().receiveChar();
17              std::string player_name = this->client.getProtocol().receiveString()
;
18              this->client.setName(player_name);
19              if (action == CREATE_GAME_ACTION) {
20                  this->createGame();
21              } else if (action == JOIN_GAME_ACTION) {
22                  this->joinGame();
23              }
24          }
25      } catch(const SocketException& e){
26          std::lock_guard<std::mutex> lock(this->mutex_cout);
27          std::cout << "[INFO] Un cliente se desconecto" << std::endl;
28      } catch(const std::exception& e){
29          std::lock_guard<std::mutex> lock(this->mutex_cout);
30          std::cout << "[ERROR] Error con un cliente: " << e.what() << std::endl;
31      }
32      this->running = false;
33  }
34
35  void ClientHandler::stop(){
36      this->client.getProtocol().stop();
37  }
38
39  void ClientHandler::createGame(){
40      maps_list_t maps_list = MapsList::getAllMaps();
41
42      size_t size = maps_list.size();
43      this->client.getProtocol().sendLength(size);
44
45      for (size_t i = 0; i < size; i++){
46          this->client.getProtocol().sendString(maps_list[i]);
47      }
48
49      if (size == 0){
50          return;
51      }
52
53      std::string map = this->client.getProtocol().receiveString();
54      if (map.empty()){
55          return;
56      }
57      std::string game_name = this->client.getProtocol().receiveString();
58      int max_players = this->client.getProtocol().receiveLength();
59
60      this->games.checkGames();
61
62      bool result = this->games.addGame(game_name, map, max_players, this->client)
;
63      if (!result){
64          this->client.getProtocol().sendChar(false);
```

```
65      } else {
66          this->connected = true;
67      }
68  }
69
70  void ClientHandler::joinGame(){
71      games_list_t games_list = this->games.getJoinableGames(this->client.getName(
));
72
73      size_t size = games_list.size();
74      this->client.getProtocol().sendLength(size);
75
76      for (size_t i = 0; i < size; i++){
77          this->client.getProtocol().sendString(games_list[i]);
78      }
79
80      if (size == 0){
81          return;
82      }
83
84      std::string game_name = this->client.getProtocol().receiveString();
85      if (game_name.empty()){
86          return;
87      }
88
89      bool result = this->games.addPlayer(game_name, this->client);
90
91      if (!result){
92          this->client.getProtocol().sendChar(false);
93      } else {
94          this->connected = true;
95      }
96  }
```

```cpp
1   #ifndef __CLIENTHANDLER_H__
2   #define __CLIENTHANDLER_H__
3
4   #include "Socket.h"
5   #include "Server.h"
6   #include "Thread.h"
7   #include "Player.h"
8   #include "GamesList.h"
9   #include <mutex>
10
11  class ClientHandler: public Thread{
12      private:
13          Player client;
14          GamesList& games;
15          bool connected;
16          std::mutex& mutex_cout;
17
18          /* Crea una partida nueva */
19          void createGame();
20
21          /* Agrega un jugador a una partida */
22          void joinGame();
23
24      public:
25          /* Constructor */
26          ClientHandler(ServerProtocol&& cli, GamesList& games, std::mutex& mtx_cout);
27
28          /* Destructor */
29          ~ClientHandler();
30
31          /* Ejecuta el client handler */
32          void run();
33
34          /* Se desconecta abruptamente del cliente */
35          void stop();
36  };
37
38  #endif
```

```cpp
1   #include "GamesList.h"
2   #include "Path.h"
3   #include "Server.h"
4   #include <iostream>
5   #include <string>
6
7   typedef std::unordered_map<std::string, std::unique_ptr<Game>>::iterator games_it;
8
9   GamesList::GamesList(Server& server, std::mutex& mutex_cout):
10      server(server), mutex_cout(mutex_cout){}
11
12  GamesList::~GamesList(){
13      for (games_it it = this->games.begin(); it != this->games.end(); ++it){
14          it->second->join();
15          std::lock_guard<std::mutex> lock(this->mutex_cout);
16          std::cout << "[INFO] Partida terminada: " << it->first << std::endl;
17      }
18  }
19
20  bool GamesList::addGame(string& name, string& map, int max, Player& player){
21      std::lock_guard<std::mutex> lock(this->mutex);
22      auto it = this->games.find(name);
23      if (it != this->games.end()){
24          return false;
25      }
26
27      try{
28          Game* g = new Game(max, SERVER_CONFIG_FILE, MAPS_PATH + map, this->server);
29          std::unique_ptr<Game> game(g);
30          this->games[name] = std::move(game);
31          std::lock_guard<std::mutex> lock(this->mutex_cout);
32          std::cout << "[INFO] Nueva partida creada: " << name << std::endl;
33      } catch(const std::exception& e){
34          std::lock_guard<std::mutex> lock(this->mutex_cout);
35          std::cout << "[ERROR] Error al crear partida: " << name;
36          std::cout << "-> " << e.what() << std::endl;
37          return false;
38      }
39
40      std::string player_name = player.getName();
41      bool result = this->games[name]->addPlayer(player);
42      if (result){
43          std::lock_guard<std::mutex> lock(this->mutex_cout);
44          std::cout << "[INFO] El jugador '" << player_name;
45          std::cout << "' se unio a la partida '" <<  name << "'" << std::endl;
46      }
47
48      return result;
49  }
50
51  games_list_t GamesList::getJoinableGames(const std::string& player_name){
52      std::lock_guard<std::mutex> lock(this->mutex);
53      games_list_t joinables;
54
55      for (games_it it = this->games.begin(); it != this->games.end(); ++it){
56          if (it->second->playerCanJoin(player_name)){
57              joinables.push_back(it->first);
58          }
59      }
60      return std::move(joinables);
61  }
62
63  bool GamesList::addPlayer(const std::string& game_name, Player& player){
64      std::lock_guard<std::mutex> lock(this->mutex);
```

```cpp
65      std::string player_name = player.getName();
66      bool result = this->games[game_name]->addPlayer(player);
67      if (result){
68          std::lock_guard<std::mutex> lock(this->mutex_cout);
69          std::cout << "[INFO] El jugador '" << player_name;
70          std::cout << "' se unio a la partida '" << game_name << "'" << std::endl;
71      }
72      if (this->games[game_name]->isFull()){
73          std::lock_guard<std::mutex> lock(this->mutex_cout);
74          std::cout << "[INFO] Partida iniciada: " << game_name << std::endl;
75          this->games[game_name]->start();
76      }
77      return result;
78  }
79
80  void GamesList::checkGames(){
81      std::lock_guard<std::mutex> lock(this->mutex);
82      auto it = this->games.begin();
83      while (it != this->games.end()){
84          if (! it->second->isRunning()){
85              it->second->join();
86              std::lock_guard<std::mutex> lock(this->mutex_cout);
87              std::cout << "[INFO] Partida terminada: " << it->first << std::endl;
88              it = this->games.erase(it);
89          } else {
90              ++it;
91          }
92      }
93  }
```

```cpp
1   #ifndef __GAMESLIST_H__
2   #define __GAMESLIST_H__
3
4   #include <vector>
5   #include <string>
6   #include <unordered_map>
7   #include <memory>
8   #include <mutex>
9   #include "Game.h"
10
11  typedef std::vector<std::string> games_list_t;
12
13  class Server;
14
15  class GamesList{
16      private:
17          Server& server;
18          std::unordered_map<std::string, std::unique_ptr<Game>> games;
19          std::mutex mutex;
20          std::mutex& mutex_cout;
21
22          typedef const std::string string;
23
24      public:
25          /* Constructor */
26          GamesList(Server& server, std::mutex& mutex_cout);
27
28          /* Destructor */
29          ~GamesList();
30
31          /* Agrega una patida nueva a la lista */
32          bool addGame(string& game_name, string& map, int max_players, Player& pl
    ayer);
33
34          /* Devuelve una lista con las partidas a las cuales se puede
35           * unir el jugador */
36          games_list_t getJoinableGames(const std::string& player_name);
37
38          /* Agrega un jugador a la partida */
39          bool addPlayer(const std::string& game_name, Player& player);
40
41          /* Verifica las partidas que terminaron */
42          void checkGames();
43  };
44
45  #endif
```

```cpp
1   #include "MapsList.h"
2   #include "Path.h"
3   #include <string>
4
5   maps_list_t MapsList::getAllMaps(){
6       maps_list_t maps_list;
7
8       struct dirent* entry;
9       DIR* dir = opendir(MAPS_PATH.c_str());
10      if (!dir){
11          std::move(maps_list);
12      }
13
14      while((entry = readdir(dir))){  // NOLINT (La solucion que propone esta depr
    ecated)
15          std::string file(entry->d_name);
16          if (file.rfind(YAML_EXTENSION) != std::string::npos){
17              maps_list.push_back(file);
18          }
19      }
20
21      closedir(dir);
22      return std::move(maps_list);
23  }
```

```cpp
1   #ifndef __MAPSLIST_H__
2   #define __MAPSLIST_H__
3
4   #include <dirent.h>
5   #include <vector>
6   #include <string>
7
8   typedef std::vector<std::string> maps_list_t;
9
10  class MapsList{
11      public:
12          /* Devuelve una lista con todos los mapas */
13          static maps_list_t getAllMaps();
14  };
15
16  #endif
```

```
1   #include <string>
2   #include <memory>
3   #include <iostream>
4   #include "Server.h"
5   #include "ClientHandler.h"
6
7   #define MAX_CLIENT_WAIT 100
8
9   Server::Server(const std::string& service, std::mutex& mutex_cout):
10      socket(Socket::Server(service.c_str(), MAX_CLIENT_WAIT)),
11      games_list(*this, mutex_cout), mutex_cout(mutex_cout){}
12
13  Server::~Server(){
14      for (std::unique_ptr<Thread>& client: this->clients){
15          client->stop();
16          client->join();
17      }
18  }
19
20  void Server::run(){
21      while (this->running){
22          try{
23              Socket client = this->socket.acceptClient();
24              {
25                  std::lock_guard<std::mutex> lock(this->mutex_cout);
26                  std::cout << "[INFO] Nuevo cliente conectado." << std::endl;
27              }
28              ServerProtocol protocol(std::move(client));
29              this->addConnectedClient(std::move(protocol));
30
31              this->check();
32          } catch(const std::exception& e){
33              if (this->running){
34                  std::lock_guard<std::mutex> lock(this->mutex_cout);
35                  std::cout << "[ERROR]" << e.what() << std::endl;
36              }
37          }
38      }
39  }
40
41  void Server::stop(){
42      this->running = false;
43      this->socket.stop();
44  }
45
46  void Server::check(){
47      //Elimino threads que ya terminaron
48      this->games_list.checkGames();
49      std::lock_guard<std::mutex> lock(this->mutex);
50      auto it = this->clients.begin();
51      while (it != this->clients.end()){
52          if (!(*it)->isRunning()){
53              (*it)->join();
54              it = this->clients.erase(it);
55          } else {
56              ++it;
57          }
58      }
59  }
60
61  void Server::addConnectedClient(ServerProtocol&& protocol){
62      std::lock_guard<std::mutex> lock(this->mutex);
63      Thread* t = new ClientHandler(std::move(protocol), games_list, mutex_cout);
64      std::unique_ptr<Thread> th(t);
65      th->start();
66      this->clients.push_back(std::move(th));
```

```
67  }
```

```
1    #ifndef __SERVER_H__
2    #define __SERVER_H__
3
4    #include <string>
5    #include <list>
6    #include <memory>
7    #include <mutex>
8    #include "Socket.h"
9    #include "Thread.h"
10   #include "GamesList.h"
11
12   class Server: public Thread{
13       private:
14           Socket socket;
15           std::list<std::unique_ptr<Thread>> clients;
16           GamesList games_list;
17           std::mutex& mutex_cout;
18           std::mutex mutex;
19
20           /* Elimina los clientes que terminaron su comunicacion
21            * de la lista */
22           void check();
23
24       public:
25           /* Crea el server y lo asocia al puerto indicado */
26           Server(const std::string& service, std::mutex& mutex_cout);
27
28           /* Desconecta el server */
29           ~Server();
30
31           /* Ejecuta el server */
32           void run();
33
34           /* Avisa al server que debe dejar de ejecutarse */
35           void stop();
36
37           /*Agrega un nuevo cliente ya conectado */
38           void addConnectedClient(ServerProtocol&& protocol);
39   };
40
41   #endif
```

```
1    #include "DataSender.h"
2    #include <map>
3    #include <string>
4    #include <vector>
5
6    typedef std::vector<Player> Players;
7
8    DataSender::DataSender(World& world, Players& players, GameParameters& params):
9        objects(world.getObjectsList()), girders(world.getGirdersList()),
10       players(players), mutex(world.getMutex()), active(false),
11       sleep_time(params.getDataSenderSleep()){
12           for (size_t i = 0; i < this->players.size(); i++){
13               std::unique_ptr<PlayerDataSender> s(new PlayerDataSender(this->playe
     rs[i]));
14               this->players_data_senders.push_back(std::move(s));
15               this->players_data_senders[i]->start();
16           }
17       }
18
19   DataSender::~DataSender(){
20       for (size_t i = 0; i < this->players.size(); i++){
21           this->players_data_senders[i]->stop();
22           this->players_data_senders[i]->join();
23       }
24   }
25
26   void DataSender::run(){
27       while(this->running){
28           std::this_thread::sleep_for(std::chrono::milliseconds(this->sleep_time))
     ;
29           std::lock_guard<std::mutex> lock(this->mutex);
30           this->active = false;
31           std::list<physical_object_ptr>::iterator it = this->objects.begin();
32
33           while(it != this->objects.end()){
34               if ((*it)->isDead() && !(*it)->getBody()){
35                   Buffer data = ServerProtocol::sendDeadObject(*it);
36
37                   this->sendBuffer(data);
38                   it = this->objects.erase(it);
39                   continue;
40               }
41
42               if ((*it)->isMoving()){
43                   Buffer data = ServerProtocol::sendObject(*it);
44                   this->sendBuffer(data);
45                   this->active = true;
46               }
47               ++it;
48           }
49
50           this->notifyAll();
51       }
52   }
53
54   void DataSender::sendBackgroundImage(Buffer& image){
55       this->sendBuffer(image);
56       this->notifyAll();
57   }
58
59   void DataSender::sendStartGame(){
60       Buffer data = ServerProtocol::sendStartGame();
61       this->sendBuffer(data);
62       this->notifyAll();
63   }
64
```

```
65  void DataSender::sendTurnData(int turn_time, int time_after_shoot){
66      Buffer data = ServerProtocol::sendTurnData(turn_time, time_after_shoot);
67      this->sendBuffer(data);
68      this->notifyAll();
69  }
70
71  void DataSender::sendPlayersId(){
72      Buffer length = ServerProtocol::sendLengthBuffer(this->players.size());
73      this->sendBuffer(length);
74      for (Player& player: this->players){
75          Buffer data = ServerProtocol::sendPlayerId(player);
76          this->sendBuffer(data);
77      }
78      this->notifyAll();
79  }
80
81  void DataSender::sendGirders(){
82      Buffer length = ServerProtocol::sendLengthBuffer(this->girders.size());
83      this->sendBuffer(length);
84      for (physical_object_ptr& girder: this->girders){
85          Buffer data = ServerProtocol::sendGirder(girder);
86          this->sendBuffer(data);
87      }
88      this->notifyAll();
89  }
90
91  void DataSender::sendWeaponsAmmo(std::map<std::string, unsigned int>& weapons){
92      Buffer length = ServerProtocol::sendLengthBuffer(weapons.size());
93      this->sendBuffer(length);
94      std::map<std::string, unsigned int>::iterator it;
95      for (it = weapons.begin(); it != weapons.end(); ++it){
96          Buffer data = ServerProtocol::sendWeaponAmmo(it->first, it->second);
97          this->sendBuffer(data);
98      }
99      this->notifyAll();
100 }
101
102 void DataSender::sendStartTurn(int worm_id, int player_id, float wind){
103     Buffer data = ServerProtocol::sendStartTurn(worm_id, player_id, wind);
104     this->sendBuffer(data);
105     this->notifyAll();
106 }
107
108 void DataSender::sendWeaponChanged(const std::string &weapon){
109     Buffer data = ServerProtocol::sendWeaponChanged(weapon);
110     this->sendBuffer(data);
111     this->notifyAll();
112 }
113
114 void DataSender::sendWeaponShot(const std::string& weapon){
115     Buffer data = ServerProtocol::sendWeaponShot(weapon);
116     this->sendBuffer(data);
117     this->notifyAll();
118 }
119
120 void DataSender::sendMoveAction(char action){
121     if (action == MOVE_RIGHT || action == MOVE_LEFT){
122         return;
123     }
124     Buffer data = ServerProtocol::sendMoveAction(action);
125     this->sendBuffer(data);
126     this->notifyAll();
127 }
128
129 void DataSender::sendUpdateScope(int angle) {
130     Buffer data = ServerProtocol::sendUpdateScope(angle);
```

```
131     this->sendBuffer(data);
132     this->notifyAll();
133 }
134
135 void DataSender::sendEndGame(const std::string& winner){
136     Buffer data = ServerProtocol::sendEndGame(winner);
137     this->sendBuffer(data);
138     this->notifyAll();
139 }
140
141 void DataSender::sendEndTurn(){
142     Buffer data = this->players[0].getProtocol().sendEndTurn();
143     this->sendBuffer(data);
144     this->notifyAll();
145 }
146
147 bool DataSender::isActive(){
148     std::lock_guard<std::mutex> lock(this->mutex);
149     return this->active;
150 }
151
152 void DataSender::sendBuffer(const Buffer& buffer){
153     for (size_t i = 0; i < this->players.size(); i++){
154         if (this->players[i].isConnected()){
155             this->players_data_senders[i]->sendData(buffer);
156         }
157     }
158 }
159
160 void DataSender::notifyAll(){
161     for (size_t i = 0; i < this->players.size(); i++){
162         if (this->players[i].isConnected()){
163             this->players_data_senders[i]->notify();
164         }
165     }
166 }
```

```
1   #ifndef __DATASENDER_H__
2   #define __DATASENDER_H__
3
4   #include "Thread.h"
5   #include "World.h"
6   #include "PhysicalObject.h"
7   #include "Player.h"
8   #include "ServerProtocol.h"
9   #include "PlayerDataSender.h"
10  #include "Buffer.h"
11  #include <list>
12  #include <memory>
13  #include <vector>
14  #include <map>
15  #include <string>
16
17  // Clase que se encarga de enviar datos a los jugadores
18  class DataSender: public Thread{
19      private:
20          std::list<physical_object_ptr>& objects;
21          std::list<physical_object_ptr>& girders;
22          std::vector<Player>& players;
23          std::vector<std::unique_ptr<PlayerDataSender>> players_data_senders;
24          std::mutex& mutex;
25          bool active;
26          int sleep_time;
27
28          // Envia la informacion del buffer a todos los jugadores
29          void sendBuffer(const Buffer& buffer);
30          void notifyAll();
31
32      public:
33          DataSender(World& world, std::vector<Player>& players, GameParameters& p
    aram);
34          ~DataSender();
35
36          //Envia constantemente los datos de los objetos
37          void run() override;
38
39          //Envia la imagen de fondo
40          void sendBackgroundImage(Buffer& image);
41
42          //Envia los datos del turno
43          void sendTurnData(int turn_time, int time_after_shoot);
44
45          //Envia los datos de los jugadores
46          void sendPlayersId();
47
48          //Envia los datos de las vigas
49          void sendGirders();
50
51          //Envia las municiones de las armas
52          void sendWeaponsAmmo(std::map<std::string, unsigned int>& weapons);
53
54          //Envia que el jugador cambio de arma
55          void sendWeaponChanged(const std::string &weapon);
56
57          //Envia que el gusano actual salto
58          void sendMoveAction(char action);
59
60          //Envia que el jugador cambio el angulo de la mira
61          void sendUpdateScope(int angle);
62
63          //Envia que el jugador disparo un arma
64          void sendWeaponShot(const std::string& weapon);
65
```

```
66          //Envia la senial de comienzo del juego
67          void sendStartGame();
68
69          //Envia la senial de que inicia un nuevo turno
70          void sendStartTurn(int worm_id, int player_id, float wind);
71
72          //Envia la senial de terminar turno
73          void sendEndTurn();
74
75          //Envia la senial de que el juego termino
76          void sendEndGame(const std::string& winner);
77
78          //Devuelve true si sigue enviando datos
79          bool isActive();
80  };
81
82
83  #endif
```

```
1   #include "PlayerDataReceiver.h"
2   #include <string>
3
4   PlayerDataReceiver::PlayerDataReceiver(Player& player, DataSender& sender):
5       player(player), data_sender(sender), is_my_turn(false){}
6
7   PlayerDataReceiver::~PlayerDataReceiver(){}
8
9   void PlayerDataReceiver::run(){
10      try{
11          while (this->running){
12              Buffer data = this->player.getProtocol().receiveBuffer();
13              std::lock_guard<std::mutex> lock(this->mutex);
14              if (this->is_my_turn){
15                  this->analizeReceivedData(data);
16              }
17          }
18      } catch(const std::exception& e){
19          this->player.disconnect();
20      }
21  }
22
23  void PlayerDataReceiver::beginTurn(){
24      std::lock_guard<std::mutex> lock(this->mutex);
25      this->is_my_turn = true;
26  }
27
28  void PlayerDataReceiver::endTurn(){
29      std::lock_guard<std::mutex> lock(this->mutex);
30      this->is_my_turn = false;
31  }
32
33  void PlayerDataReceiver::analizeReceivedData(Buffer& buffer){
34      char action = buffer.getNext();
35
36      if (action == ACTION) {
37          char worm_action = buffer.getNext();
38          if (worm_action == MOVE_ACTION){
39              char move = buffer.getNext();
40              if (this->player.getCurrentWorm().move(move)){
41                  this->data_sender.sendMoveAction(move);
42              }
43          } else if (worm_action == CHANGE_WEAPON_ACTION) {
44              std::string weapon(ServerProtocol::receiveStringBuffer(buffer));
45              this->data_sender.sendWeaponChanged(weapon);
46              this->player.changeWeapon(weapon);
47          } else if (worm_action == MOVE_SCOPE) {
48              int32_t angle = ServerProtocol::receiveIntBuffer(buffer);
49              this->data_sender.sendUpdateScope(angle);
50          } else if (worm_action == SHOOT_WEAPON) {
51              int angle = ServerProtocol::receiveIntBuffer(buffer);
52              int power = ServerProtocol::receiveIntBuffer(buffer);
53              int time = ServerProtocol::receiveIntBuffer(buffer);
54              const std::string& weapon = this->player.getCurrentWorm().getCurrent
    Weapon();
55              this->data_sender.sendWeaponShot(weapon);
56              this->player.getCurrentWorm().shoot(angle, power, time);
57          } else if (worm_action == SHOOT_SELF_DIRECTED) {
58              int pos_x = ServerProtocol::receiveIntBuffer(buffer) / UNIT_TO_SEND;
59              int pos_y = ServerProtocol::receiveIntBuffer(buffer) / UNIT_TO_SEND;
60              const std::string& weapon = this->player.getCurrentWorm().getCurrent
    Weapon();
61              this->data_sender.sendWeaponShot(weapon);
62              this->player.getCurrentWorm().shoot(b2Vec2(pos_x, pos_y));
63          }
64      }
```

```
65  }
```

```cpp
#ifndef __PLAYERDATARECEIVER_H__
#define __PLAYERDATARECEIVER_H__

#include "Thread.h"
#include "Player.h"
#include "DataSender.h"
#include <mutex>

/* Clase que se encarga de recibir datos del jugador
 * y de analizarlos */
class PlayerDataReceiver: public Thread{
    private:
        Player& player;
        DataSender& data_sender;
        bool is_my_turn;
        std::mutex mutex;

        /* Analiza los datos recibidos */
        void analizeReceivedData(Buffer& data);

    public:
        /* Constructor */
        PlayerDataReceiver(Player& player, DataSender& data_sender);

        /* Destructor */
        ~PlayerDataReceiver();

        /* Comienza a recibir datos */
        void run() override;

        /* Comienza el turno */
        void beginTurn();

        /* Termina el turno */
        void endTurn();
};

#endif
```

```cpp
#include "PlayerDataSender.h"

PlayerDataSender::PlayerDataSender(Player& player): player(player){}

PlayerDataSender::~PlayerDataSender(){}

void PlayerDataSender::run(){
    while (true){
        std::unique_lock<std::mutex> lock(this->mutex);
        while (this->queue.empty() && this->running){
            this->condition_variable.wait(lock);
        }

        if (!this->running){
            break;
        }
        try{
            this->player.getProtocol().sendBuffer(this->queue.front());
            this->queue.pop();
        } catch(const SocketException& e){
            this->player.disconnect();
        }
    }
}

void PlayerDataSender::sendData(Buffer buffer){
    std::unique_lock<std::mutex> lock(this->mutex);
    this->queue.push(buffer);
}

void PlayerDataSender::notify(){
    this->condition_variable.notify_one();
}

void PlayerDataSender::stop(){
    Thread::stop();
    this->notify();
}
```

```cpp
1   #ifndef __PLAYERDATASENDER_H__
2   #define __PLAYERDATASENDER_H__
3
4   #include "Thread.h"
5   #include "Player.h"
6   #include "Buffer.h"
7   #include <mutex>
8   #include <condition_variable>
9   #include <queue>
10
11  //Cola bloqueante para enviar datos a un jugador
12  class PlayerDataSender: public Thread{
13      private:
14          std::mutex mutex;
15          std::condition_variable condition_variable;
16          Player& player;
17          std::queue<Buffer> queue;
18
19      public:
20          explicit PlayerDataSender(Player& player);
21
22          ~PlayerDataSender();
23
24          //Envia datos al jugador
25          void run() override;
26
27          //Agrega un nuevo dato a la cola
28          void sendData(Buffer buffer);
29
30          //Notifica que hay nuevos datos
31          void notify();
32
33          //Termina el envio de datos
34          void stop() override;
35  };
36
37  #endif
```

```cpp
1   #include "ServerProtocol.h"
2   #include "Game.h"
3   #include "Weapon.h"
4   #include "Girder.h"
5   #include "ObjectSizes.h"
6   #include "Player.h"
7   #include "DataSender.h"
8   #include <string>
9
10  ServerProtocol::ServerProtocol(Socket&& socket): Protocol(std::move(socket)){}
11
12  ServerProtocol::ServerProtocol(ServerProtocol&& other):
13      Protocol(std::move(other)) {}
14
15  ServerProtocol::~ServerProtocol(){}
16
17  Buffer ServerProtocol::sendObject(physical_object_ptr& object){
18      Buffer buffer;
19      buffer.setNext(MOVING_OBJECT);
20
21      const std::string& type = object->getType();
22      if (type == TYPE_WORM){
23          ServerProtocol::send_worm(object, buffer);
24      } else if (type == TYPE_WEAPON){
25          ServerProtocol::send_weapon(object, buffer);
26      }
27      return std::move(buffer);
28  }
29
30  Buffer ServerProtocol::sendDeadObject(physical_object_ptr& object){
31      Buffer buffer;
32      buffer.setNext(DEAD_OBJECT);
33
34      const std::string& type = object->getType();
35      if (type == TYPE_WORM){
36          buffer.setNext(WORM_TYPE);
37      } else if (type == TYPE_WEAPON){
38          buffer.setNext(WEAPON_TYPE);
39      }
40
41      uint32_t id = object->getId();
42      ServerProtocol::sendIntBuffer(buffer, id);
43
44      return std::move(buffer);
45  }
46
47  void ServerProtocol::send_worm(physical_object_ptr& object, Buffer& buffer){
48      Worm* worm = (Worm*)object.get();
49      buffer.setNext(WORM_TYPE);
50      int32_t id = worm->getId();
51
52      b2Vec2 position = worm->getPosition();
53
54      ServerProtocol::sendIntBuffer(buffer, id);
55      ServerProtocol::sendIntBuffer(buffer, worm->getPlayerId());
56      ServerProtocol::sendIntBuffer(buffer, position.x * UNIT_TO_SEND);
57      ServerProtocol::sendIntBuffer(buffer, position.y * UNIT_TO_SEND);
58      ServerProtocol::sendIntBuffer(buffer, worm->getLife());
59      buffer.setNext(worm->getDir());
60      buffer.setNext(worm->isColliding());
61  }
62
63  void ServerProtocol::send_weapon(physical_object_ptr& object, Buffer& buffer){
64      buffer.setNext(WEAPON_TYPE);
65      ServerProtocol::sendIntBuffer(buffer, object->getId());
66
```

```
67
68        b2Vec2 position = object->getPosition();
69        Weapon* weapon = (Weapon*)object.get();
70        std::string name = weapon->getName();
71
72        ServerProtocol::sendStringBuffer(buffer, name);
73        ServerProtocol::sendIntBuffer(buffer, position.x * UNIT_TO_SEND);
74        ServerProtocol::sendIntBuffer(buffer, position.y * UNIT_TO_SEND);
75    }
76
77    Buffer ServerProtocol::sendStartGame(){
78        Buffer buffer;
79        buffer.setNext(START_GAME_ACTION);
80        return buffer;
81    }
82
83    Buffer ServerProtocol::sendEndTurn(){
84        Buffer buffer;
85        buffer.setNext(END_TURN);
86        return buffer;
87    }
88
89    Buffer ServerProtocol::sendStartTurn(int worm_id, int player_id, float wind){
90        Buffer buffer;
91        buffer.setNext(START_TURN);
92        ServerProtocol::sendIntBuffer(buffer, worm_id);
93        ServerProtocol::sendIntBuffer(buffer, player_id);
94        ServerProtocol::sendIntBuffer(buffer, wind * UNIT_TO_SEND);
95        return buffer;
96    }
97
98    Buffer ServerProtocol::sendTurnData(int turn_time, int time_after_shoot){
99        Buffer buffer;
100       ServerProtocol::sendIntBuffer(buffer, turn_time);
101       ServerProtocol::sendIntBuffer(buffer, time_after_shoot);
102       return buffer;
103   }
104
105   Buffer ServerProtocol::sendPlayerId(const Player& player){
106       Buffer buffer;
107       ServerProtocol::sendIntBuffer(buffer, player.getId());
108       ServerProtocol::sendStringBuffer(buffer, player.getName());
109       return buffer;
110   }
111
112   Buffer ServerProtocol::sendGirder(physical_object_ptr& object){
113       Girder* girder = (Girder*)object.get();
114
115       Buffer buffer;
116       ServerProtocol::sendIntBuffer(buffer, girder->getSize());
117
118       b2Vec2 position = object->getPosition();
119       ServerProtocol::sendIntBuffer(buffer, position.x * UNIT_TO_SEND);
120       ServerProtocol::sendIntBuffer(buffer, position.y * UNIT_TO_SEND);
121       ServerProtocol::sendIntBuffer(buffer, girder->getRotation());
122       return buffer;
123   }
124
125   Buffer ServerProtocol::sendWeaponAmmo(const std::string& weapon_name, int ammo){
126       Buffer buffer;
127       ServerProtocol::sendStringBuffer(buffer, weapon_name);
128       ServerProtocol::sendIntBuffer(buffer, ammo);
129       return buffer;
130   }
131
132   Buffer ServerProtocol::sendWeaponChanged(const std::string &weapon){
```

```
133       Buffer buffer;
134       buffer.setNext(CHANGE_WEAPON_ACTION);
135       ServerProtocol::sendStringBuffer(buffer, weapon);
136       return buffer;
137   }
138
139   Buffer ServerProtocol::sendWeaponShot(const std::string &weapon){
140       Buffer buffer;
141       buffer.setNext(SHOOT_WEAPON_ACTION);
142       ServerProtocol::sendStringBuffer(buffer, weapon);
143       return buffer;
144   }
145
146   Buffer ServerProtocol::sendMoveAction(char action){
147       Buffer buffer;
148       buffer.setNext(MOVE_ACTION);
149       buffer.setNext(action);
150       return buffer;
151   }
152
153   Buffer ServerProtocol::sendUpdateScope(int angle) {
154       Buffer buffer;
155       buffer.setNext(MOVE_SCOPE);
156       ServerProtocol::sendIntBuffer(buffer, angle);
157       return buffer;
158   }
159
160   Buffer ServerProtocol::sendEndGame(const std::string& winner){
161       Buffer buffer;
162       buffer.setNext(END_GAME);
163       ServerProtocol::sendStringBuffer(buffer, winner);
164       return buffer;
165   }
```

```
1   #ifndef __SERVERPROTOCOL_H__
2   #define __SERVERPROTOCOL_H__
3
4   #include "Socket.h"
5   #include "Protocol.h"
6   #include "PhysicalObject.h"
7   #include <mutex>
8   #include <string>
9
10  class Player;
11
12  class ServerProtocol : public Protocol{
13      private:
14          //Carga los datos del gusano en el buffer
15          static void send_worm(physical_object_ptr& object, Buffer& buffer);
16
17          //Carga los datos del arma en el buffer
18          static void send_weapon(physical_object_ptr& weapon, Buffer& buffer);
19
20      public:
21          explicit ServerProtocol(Socket&& socket);
22          ServerProtocol(ServerProtocol&& other);
23          ~ServerProtocol();
24
25          //Carga un nuevo objeto en el buffer
26          static Buffer sendObject(physical_object_ptr& object);
27
28          //Carga la informacion de un objeto muerto en el buffer
29          static Buffer sendDeadObject(physical_object_ptr& object);
30
31          //Carga la informacion de comienzo de juego
32          static Buffer sendStartGame();
33
34          //Carga la informacion de nuevo turno en el buffer
35          static Buffer sendStartTurn(int worm_id, int player_id, float wind);
36
37          //Carga la informacion del turno en el buffer
38          static Buffer sendTurnData(int turn_time, int time_after_shoot);
39
40          //Carga la informacion de un nuevo jugador en el buffer
41          static Buffer sendPlayerId(const Player& player);
42
43          //Carga la informacion de una viga en el buffer
44          static Buffer sendGirder(physical_object_ptr& girder);
45
46          //Carga la informacion de un arma en el buffer
47          static Buffer sendWeaponAmmo(const std::string& weapon_name, int ammo);
48
49          //Carga la informacion de cambio de arma en el buffer
50          static Buffer sendWeaponChanged(const std::string &weapon);
51
52          //Carga la informacion de arma disparada en el buffer
53          static Buffer sendWeaponShot(const std::string &weapon);
54
55          //Carga la informacion de que el gusano salto
56          static Buffer sendMoveAction(char action);
57
58          //Carga la informacion de cambio de angulo en el buffer
59          static Buffer sendUpdateScope(int angle);
60
61          //Carga la informacion de fin del juego en el buffer
62          static Buffer sendEndGame(const std::string& winner);
63
64          //Carga la informacion de fin del turno
65          static Buffer sendEndTurn();
66  };
```

```
67
68  #endif
```

```cpp
1   #include "Game.h"
2   #include "Girder.h"
3   #include "WeaponFactory.h"
4   #include "Server.h"
5   #include <map>
6   #include <string>
7   #include <vector>
8
9   #define TURN_STEP 100 //milliseconds
10
11  Game::Game(size_t players, const std::string& config_file,
12                      const std::string& map, Server& server):
13      players(players), server(server),
14      parameters(config_file, map),
15      world(this->parameters){
16          this->running = true;
17      }
18
19  Game::~Game(){
20      this->world.stop();
21      this->world.join();
22      if (data_sender){
23          this->data_sender->stop();
24          this->data_sender->join();
25      }
26  }
27
28  bool Game::addPlayer(Player& player){
29      if (this->isFull()){
30          return false;
31      }
32
33      return this->turn.addPlayer(player);
34  }
35
36  bool Game::isFull(){
37      return this->players <= this->turn.getPlayersSize();
38  }
39
40  bool Game::playerCanJoin(const std::string& player_name){
41      if (this->isFull()){
42          return false;
43      }
44      return this->turn.playerCanJoin(player_name);
45  }
46
47  void Game::run(){
48      this->configure();
49      this->world.start();
50      this->data_sender->start();
51      std::this_thread::sleep_for(std::chrono::milliseconds(100));
52      this->waitToWorld();
53
54
55      while (!this->turn.gameEnded(this->world.getMutex())){
56          this->player_turn_active = true;
57          this->turn.beginTurn();
58          int worm_id = this->turn.getCurrentPlayer().getCurrentWorm().getId();
59          int player_id = this->turn.getCurrentPlayer().getId();
60          this->data_sender->sendStartTurn(worm_id, player_id, this->world.getWind
    ());
61
62          size_t current_turn_time = 0;
63          size_t max_turn_time = this->parameters.getTurnTime() * 1000;
64          bool time_reduced = false;
65          while(current_turn_time < max_turn_time){
```

```cpp
66              std::this_thread::sleep_for(std::chrono::milliseconds(TURN_STEP));
67              current_turn_time += TURN_STEP;
68              Worm& current_worm = this->turn.getCurrentPlayer().getCurrentWorm();
69              if (current_worm.damageReceived() || this->turn.gameEnded(world.getM
    utex())){
70                  current_turn_time = max_turn_time;
71              }else if (!time_reduced && current_worm.hasShot()){
72                  current_turn_time = max_turn_time - parameters.getTimeAfterShoot
    () * 1000;
73                  time_reduced = true;
74              }
75          }
76
77          this->turn.endTurn();
78          this->data_sender->sendEndTurn();
79          this->waitToWorld();
80          this->world.update();
81      }
82      std::this_thread::sleep_for(std::chrono::milliseconds(50));
83      this->data_sender->sendEndGame(this->turn.getWinner());
84      this->world.stop();
85      this->data_sender->stop();
86      this->data_sender->join();
87      for (Player& player: this->turn.getPlayers()){
88          if (player.isConnected()){
89              this->server.addConnectedClient(std::move(player.getProtocol()));
90          }
91      }
92      this->running = false;
93  }
94
95  void Game::configure(){
96      DataSender* s = new DataSender(world, turn.getPlayers(), parameters);
97      this->data_sender.reset(s);
98      this->turn.startGame(*this->data_sender);
99
100     this->data_sender->sendStartGame();
101     this->data_sender->sendBackgroundImage(this->parameters.getBackgroundImage()
    );
102     int turn_time = this->parameters.getTurnTime();
103     int time_after_shoot = this->parameters.getTimeAfterShoot();
104     this->data_sender->sendTurnData(turn_time, time_after_shoot);
105     this->data_sender->sendPlayersId();
106
107     //Asignacion de gusanos
108     std::vector<b2Vec2>& worms_list = this->parameters.getWorms();
109     size_t size = worms_list.size();
110     for (size_t i = 0; i < size; i++){
111         this->turn.addWorm(this->world, this->parameters, worms_list[i], i);
112     }
113     this->turn.distributeWorms(size, this->parameters.getWormsLifeToAdd());
114
115     //Creacion de vigas
116     int max_height = 0;
117     std::vector<GirderParams>& list = this->parameters.getGirders();
118     size = list.size();
119     for (size_t i = 0; i < size; i++){
120         Girder* g = new Girder(world, parameters, list[i].len, list[i].rotation)
    ;
121         physical_object_ptr girder(g);
122         this->world.addObject(girder, b2Vec2(list[i].pos_x, list[i].pos_y));
123         if (list[i].pos_y > max_height){
124             max_height = list[i].pos_y;
125         }
126     }
127     this->parameters.setMaxHeight(max_height);
```

```cpp
128        this->data_sender->sendGirders();
129
130        //Municion de las armas
131        std::map<std::string, unsigned int>& ammo = this->parameters.getWeaponsAmmo(
    );
132        this->data_sender->sendWeaponsAmmo(ammo);
133        for (Player& player: this->turn.getPlayers()){
134            player.setWeaponsAmmo(ammo);
135        }
136    }
137
138    void Game::endTurn(){
139        this->player_turn_active = false;
140    }
141
142    void Game::waitToWorld(){
143        while (this->world.isActive() || this->data_sender->isActive()){
144            int sleep = this->parameters.getGameWaitingWorldSleep();
145            std::this_thread::sleep_for(std::chrono::milliseconds(sleep));
146        }
147    }
```

```cpp
1    #ifndef __GAME_H__
2    #define __GAME_H__
3
4    #include <vector>
5    #include <memory>
6    #include "Turn.h"
7    #include "GameParameters.h"
8    #include "Thread.h"
9    #include "Player.h"
10   #include "Worm.h"
11   #include "World.h"
12   #include "DataSender.h"
13   #include <string>
14
15   class Player;
16   class Server;
17
18   class Game: public Thread{
19       private:
20           size_t players;
21           Server& server;
22           GameParameters parameters;
23           World world;
24           Turn turn;
25           std::unique_ptr<DataSender> data_sender;
26           bool player_turn_active;
27
28           /* Realiza la configuracion inicial de la partida */
29           void configure();
30
31           /* Espera a que los objetos dejen de moverse */
32           void waitToWorld();
33
34           typedef const std::string string;
35
36       public:
37           /* Constructor */
38           Game(size_t players, string& config_file, string& map, Server& server);
39
40           /* Destructor */
41           ~Game();
42
43           /* Agrega un jugador a la partida */
44           bool addPlayer(Player& player);
45
46           /* Devuelve true si la partida esta llena */
47           bool isFull();
48
49           /* Devuelve true si el jugador puede unirse a la partida */
50           bool playerCanJoin(const std::string& player_name);
51
52           /* Comienza la partida */
53           void run() override;
54
55           /* Finaliza el turno */
56           void endTurn();
57   };
58
59   #endif
```

```cpp
1   #include "GameParameters.h"
2   #include "ConfigFields.h"
3   #include "Path.h"
4   #include <algorithm>
5   #include <random>
6   #include <map>
7   #include <string>
8   #include <vector>
9
10  #define WORLD_MAX_HEIGHT "world_max_height"
11
12  typedef std::vector<std::vector<float>> worms_vector;
13  typedef std::vector<std::vector<float>> girders_vector;
14
15  GameParameters::GameParameters(const std::string& config_file,
16                          const std::string& config_editor_file){
17      //Compruebo que existan todos los parametros necesarios
18      YAML::Node config(YAML::LoadFile(config_file));
19      YAML::Node config_editor(YAML::LoadFile(config_editor_file));
20
21      params[DATA_SENDER_SLEEP] = config[DATA_SENDER_SLEEP].as<float>();
22      params[GAME_WAIT_WORLD_SLEEP] = config[GAME_WAIT_WORLD_SLEEP].as<float>();
23      params[WORLD_SLEEP_AFTER_STEP] = config[WORLD_SLEEP_AFTER_STEP].as<float>();
24      params[WORLD_TIME_STEP] = config[WORLD_TIME_STEP].as<float>();
25      params[TURN_TIME] = config[TURN_TIME].as<float>();
26      params[TIME_AFTER_SHOOT] = config[TIME_AFTER_SHOOT].as<float>();
27
28      params[WORMS_LIFE] = config_editor[WORMS_LIFE].as<float>();
29      params[WORMS_LIFE_TO_ADD] = config[WORMS_LIFE_TO_ADD].as<float>();
30      params[WORM_VELOCITY] = config[WORM_VELOCITY].as<float>();
31      params[WORM_EXPLOSION_VELOCITY] = config[WORM_EXPLOSION_VELOCITY].as<float>(
    );
32      params[WORM_JUMP_VELOCITY] = config[WORM_JUMP_VELOCITY].as<float>();
33      params[WORM_ROLLBACK_VELOCITY] = config[WORM_ROLLBACK_VELOCITY].as<float>();
34      params[WORM_JUMP_HEIGHT] = config[WORM_JUMP_HEIGHT].as<float>();
35      params[WORM_ROLLBACK_HEIGHT] = config[WORM_ROLLBACK_HEIGHT].as<float>();
36      params[WORM_HEIGHT_TO_DAMAGE] = config[WORM_HEIGHT_TO_DAMAGE].as<float>();
37      params[WORM_MAX_HEIGHT_DAMAGE] = config[WORM_MAX_HEIGHT_DAMAGE].as<float>();
38      params[WEAPONS_VELOCITY] = config[WEAPONS_VELOCITY].as<float>();
39      params[WIND_MIN_VELOCITY] = config[WIND_MIN_VELOCITY].as<float>();
40      params[WIND_MAX_VELOCITY] = config[WIND_MAX_VELOCITY].as<float>();
41      params[GRAVITY] = config[GRAVITY].as<float>();
42      params[AIR_MISSILES_SEPARATION] = config[AIR_MISSILES_SEPARATION].as<float>(
    );
43      params[GIRDER_ANGLE_FRICTION] = config[GIRDER_ANGLE_FRICTION].as<float>();
44      params[WORLD_MAX_HEIGHT] = 99999;
45
46      weapon_radius = config[WEAPON_RADIUS].as<std::map<std::string, int>>();
47      weapon_ammo =
48              config_editor[WEAPON_AMMO].as<std::map<std::string, unsigned int
    >>();
49      weapon_damage = config[WEAPON_DAMAGE].as<std::map<std::string, int>>();
50      weapon_fragments = config[WEAPON_FRAGMENTS].as<std::map<std::string, int>>()
    ;
51
52      worms_vector worms_file = config_editor[WORMS_DATA].as<worms_vector>();
53      for (std::vector<float>& worm: worms_file){
54          this->worms.push_back(b2Vec2(worm[0], worm[1]));
55      }
56
57      girders_vector girders_file = config_editor[GIRDERS_DATA].as<girders_vector>
    ();
58      for (std::vector<float>& girder: girders_file){
59          this->girders.push_back(GirderParams(girder[0], girder[1], girder[2], gi
    rder[3]));
60      }
```

```cpp
61
62      std::vector<int> bg = config_editor[BACKGROUND_IMAGE].as<std::vector<int>>()
    ;
63      Buffer buffer(bg.size());
64      for (int byte: bg){
65          buffer.setNext(byte);
66      }
67      this->background_image = std::move(buffer);
68  }
69
70  GameParameters::~GameParameters(){}
71
72  int GameParameters::getWormLife(){
73      return this->params[WORMS_LIFE];
74  }
75
76  int GameParameters::getWormsLifeToAdd(){
77      return this->params[WORMS_LIFE_TO_ADD];
78  }
79
80  std::vector<b2Vec2>& GameParameters::getWorms(){
81      std::random_device rd;
82      std::mt19937 random(rd());
83
84      std::shuffle(this->worms.begin(), this->worms.end(), random);
85      return this->worms;
86  }
87
88  std::vector<GirderParams>& GameParameters::getGirders(){
89      return this->girders;
90  }
91
92  std::map<std::string, unsigned int>& GameParameters::getWeaponsAmmo(){
93      return this->weapon_ammo;
94  }
95
96  float GameParameters::getWormVelocity(){
97      return this->params[WORM_VELOCITY];
98  }
99
100 float GameParameters::getWormExplosionVelocity(){
101     return this->params[WORM_EXPLOSION_VELOCITY];
102 }
103
104 float GameParameters::getWormJumpVelocity(){
105     return this->params[WORM_JUMP_VELOCITY];
106 }
107
108 float GameParameters::getWormRollbackVelocity(){
109     return this->params[WORM_ROLLBACK_VELOCITY];
110 }
111
112 float GameParameters::getWormJumpHeight(){
113     return this->params[WORM_JUMP_HEIGHT];
114 }
115
116 float GameParameters::getWormRollbackHeight(){
117     return this->params[WORM_ROLLBACK_HEIGHT];
118 }
119
120 int GameParameters::getWormHeightToDamage(){
121     return this->params[WORM_HEIGHT_TO_DAMAGE];
122 }
123
124 int GameParameters::getWormMaxHeightDamage(){
125     return this->params[WORM_MAX_HEIGHT_DAMAGE];
```

```
126  }
127
128  float GameParameters::getWeaponsVelocity(){
129      return this->params[WEAPONS_VELOCITY];
130  }
131
132  int GameParameters::getWeaponDamage(const std::string& weapon){
133      return this->weapon_damage[weapon];
134  }
135  int GameParameters::getWeaponRadius(const std::string& weapon){
136
137      return this->weapon_radius[weapon];
138  }
139
140  int GameParameters::getWeaponFragments(const std::string& weapon){
141      return this->weapon_fragments[weapon];
142  }
143
144  float GameParameters::getWindMinVelocity(){
145      return this->params[WIND_MIN_VELOCITY];
146  }
147
148  float GameParameters::getWindMaxVelocity(){
149      return this->params[WIND_MAX_VELOCITY];
150  }
151
152  float GameParameters::getGravity(){
153      return this->params[GRAVITY];
154  }
155
156  float GameParameters::getAirMissilesSeparation(){
157      return this->params[AIR_MISSILES_SEPARATION];
158  }
159
160  int GameParameters::getMaxGirderRotationToFriction(){
161      return this->params[GIRDER_ANGLE_FRICTION];
162  }
163
164  void GameParameters::setMaxHeight(int height){
165      this->params[WORLD_MAX_HEIGHT] = height + 10;
166  }
167
168  int GameParameters::getMaxHeight(){
169      return this->params[WORLD_MAX_HEIGHT];
170  }
171
172  int GameParameters::getDataSenderSleep(){
173      return this->params[DATA_SENDER_SLEEP];
174  }
175
176  int GameParameters::getGameWaitingWorldSleep(){
177      return this->params[GAME_WAIT_WORLD_SLEEP];
178  }
179
180  int GameParameters::getWorldSleepAfterStep(){
181      return this->params[WORLD_SLEEP_AFTER_STEP];
182  }
183
184  float GameParameters::getWorldTimeStep(){
185      return this->params[WORLD_TIME_STEP];
186  }
187
188  int GameParameters::getTurnTime(){
189      return this->params[TURN_TIME];
190  }
191
```

```
192  int GameParameters::getTimeAfterShoot(){
193      return this->params[TIME_AFTER_SHOOT];
194  }
195
196  Buffer& GameParameters::getBackgroundImage(){
197      return this->background_image;
198  }
199
200  GameParameters::GirderParams::GirderParams(size_t len, float pos_x,
201                                             float pos_y, int rotation):
202      len(len), pos_x(pos_x), pos_y(pos_y), rotation(rotation){}
```

```
1   #ifndef __GAMEPARAMETERS_H__
2   #define __GAMEPARAMETERS_H__
3
4   #include <string>
5   #include <vector>
6   #include <map>
7   #include "b2Math.h"
8   #include "yaml.h"
9   #include "Buffer.h"
10
11  // Clase que lee los archivos de configuracion
12  // y devuelve los parametros obtenidos
13  class GameParameters{
14      public:
15          class GirderParams;
16
17      private:
18          std::map<std::string, float> params;
19          std::map<std::string, int> weapon_radius;
20          std::map<std::string, unsigned int> weapon_ammo;
21          std::map<std::string, int> weapon_damage;
22          std::map<std::string, int> weapon_fragments;
23
24          std::vector<b2Vec2> worms;
25          std::vector<GirderParams> girders;
26          Buffer background_image;
27
28      public:
29          //Inicializa todos los parametros necesarios para la partida
30          GameParameters(const std::string& config, const std::string& editor_file
    );
31          ~GameParameters();
32
33          //Devuelve la vida del worm
34          int getWormLife();
35
36          //Devuelve la vida a agregar de los worms
37          int getWormsLifeToAdd();
38
39          //Devuelve los worms del mapa
40          std::vector<b2Vec2>& getWorms();
41
42          //Devuelve la vigas del mapa
43          std::vector<GirderParams>& getGirders();
44
45          //Devuelve la municion de las armas
46          std::map<std::string, unsigned int>& getWeaponsAmmo();
47
48          //Devuelve la velocidad del worm
49          float getWormVelocity();
50
51          //Devuelve la velocidad del worm debido a una explosion
52          float getWormExplosionVelocity();
53
54          //Devuelve la velocidad de salto del worm
55          float getWormJumpVelocity();
56
57          //Devuelve la velocidad del rollback del worm
58          float getWormRollbackVelocity();
59
60          //Devuelve la altura de salto del worm
61          float getWormJumpHeight();
62
63          //Devuelve la altura del rollback del worm
64          float getWormRollbackHeight();
65
```

```
66
67          //Devuelve la altura en la cual el worm sufre daño
68          int getWormHeightToDamage();
69
70          //Devuelve el daño maximo por caida
71          int getWormMaxHeightDamage();
72
73
74          //Devuelve la velocidad del arma
75          float getWeaponsVelocity();
76
77          //Devuelve el daño del arma
78          int getWeaponDamage(const std::string& weapon);
79
80          //Devuelve el radio de daño del arma
81          int getWeaponRadius(const std::string& weapon);
82
83          //Devuelve la cantidad de fragmentos del arma
84          int getWeaponFragments(const std::string& weapon);
85
86          //Devuelve la velocidad minima del viento
87          float getWindMinVelocity();
88
89          //Devuelve la velocidad maxima del viento
90          float getWindMaxVelocity();
91
92          //Devuelve la gravedad
93          float getGravity();
94
95          //Devuelve la separacion de los misiles aereos
96          float getAirMissilesSeparation();
97
98          //Devuelve la rotacion maxima para la cual
99          //el gusano no desliza
100         int getMaxGirderRotationToFriction();
101
102         //Establece la altura maxima
103         void setMaxHeight(int height);
104
105         //Devuelve la altura maxima
106         int getMaxHeight();
107
108         //Devuelve el tiempo de sleep del DataSender
109         int getDataSenderSleep();
110
111         //Devuelve el tiempo de sleep del World
112         int getGameWaitingWorldSleep();
113
114         //Devuelve el tiempo de sleep del step del World
115         int getWorldSleepAfterStep();
116
117         //Devuelve el time step del World
118         float getWorldTimeStep();
119
120         //Devuelve el tiempo del turno
121         int getTurnTime();
122
123         //Devuelve el tiempo adicional luego de un disparo
124         int getTimeAfterShoot();
125
126         //Devuelve la imagen de fondo
127         Buffer& getBackgroundImage();
128  };
129
130  class GameParameters::GirderParams{
131      public:
```

```
132              size_t len;
133              float pos_x;
134              float pos_y;
135              int rotation;
136
137              GirderParams(size_t len, float pos_x, float pos_y, int rotation);
138     };
139
140     typedef GameParameters::GirderParams GirderParams;
141     #endif
142     #endif
```

```
1     #include "Player.h"
2     #include <map>
3     #include <string>
4
5     Player::Player(ServerProtocol&& protocol): protocol(std::move(protocol)),
6         id(-1), connected(true){}
7
8     Player::Player(Player&& other):
9         protocol(std::move(other.protocol)), name(std::move(other.name)),
10        worms(std::move(other.worms)), id(other.id), connected(other.connected){}
11
12    Player::~Player(){}
13
14    void Player::setId(int id){
15        this->id = id;
16    }
17
18    int Player::getId() const{
19        return this->id;
20    }
21
22    Worm& Player::getCurrentWorm(){
23        return this->worms.getCurrentWorm();
24    }
25
26    void Player::beginTurn(){
27        this->worms.beginTurn();
28    }
29
30    void Player::addWorm(World& world,
31                    GameParameters& params, const b2Vec2& position, int id){
32        physical_object_ptr worm(new Worm(world, params, id, this->id, this->weapons
      ));
33        this->worms.add(worm);
34        world.addObject(worm, position);
35    }
36
37    void Player::distributeWorms(size_t max, int life_to_add){
38        this->worms.distribute(max, life_to_add);
39    }
40
41    bool Player::isDead(){
42        return this->worms.isEmpty();
43    }
44
45    ServerProtocol& Player::getProtocol(){
46        return this->protocol;
47    }
48
49    void Player::setName(const std::string& name){
50        this->name = name;
51    }
52
53    const std::string& Player::getName() const{
54        return this->name;
55    }
56
57    bool Player::isConnected() const{
58        return this->connected;
59    }
60
61    void Player::disconnect(){
62        this->connected = false;
63        this->worms.kill();
64    }
65
```

```
66   void Player::setWeaponsAmmo(const std::map<std::string, unsigned int>& ammo){
67       this->weapons.updateAmmo(ammo);
68   }
69
70   void Player::changeWeapon(const std::string& weapon){
71       this->weapons.changeWeapon(weapon);
72   }
```

```
1    #ifndef __PLAYER_H__
2    #define __PLAYER_H__
3
4    #include "WormsList.h"
5    #include "ServerProtocol.h"
6    #include "Worm.h"
7    #include "World.h"
8    #include "GameParameters.h"
9    #include "WeaponList.h"
10   #include <string>
11   #include <map>
12
13   class Player{
14       private:
15           ServerProtocol protocol;
16           std::string name;
17           WormsList worms;
18           WeaponList weapons;
19           int id;
20           bool connected;
21
22       public:
23           explicit Player(ServerProtocol&& protocol);
24
25           Player(Player&& other);
26
27           ~Player();
28
29           //Setea el id del jugador por el pasado
30           void setId(int id);
31
32           //Devuelve el id del jugador
33           int getId() const;
34
35           //Devuelve el gusano actual del jugador
36           Worm& getCurrentWorm();
37
38           //Empieza el turno del jugador
39           void beginTurn();
40
41           //Agrega un nuevo gusano al jugador
42           void addWorm(World& world, GameParameters& param, const b2Vec2& pos, int
     id);
43
44           //Agrega vida a los gusanos del jugador
45           //en caso de que tenga menos gusanos que otros jugadores
46           void distributeWorms(size_t max, int life_to_add);
47
48           //Devuelve true si el jugador esta muerto
49           bool isDead();
50
51           //Devuelve true si el jugador esta desconectado
52           bool isConnected() const;
53
54           //Desconecta al jugador
55           void disconnect();
56
57           //Setea la municion de las armas
58           void setWeaponsAmmo(const std::map<std::string, unsigned int>& ammo);
59
60           //Cambia el arma actual del jugador
61           void changeWeapon(const std::string& weapon);
62
63           //Setea el nombre del jugador
64           void setName(const std::string& name);
65
```

```
66          //Devuelve el nombre del jugador
67          const std::string& getName() const;
68
69          //Devuelve el protocolo del jugador
70          ServerProtocol& getProtocol();
71  };
72
73  #endif
```

```
1   #include "Turn.h"
2   #include <string>
3   #include <vector>
4
5   Turn::Turn(): current(0){}
6
7   Turn::~Turn(){
8       for (std::unique_ptr<PlayerDataReceiver>& receiver: this->receivers){
9           receiver->stop();
10          receiver->join();
11      }
12  }
13
14  bool Turn::addPlayer(Player& player){
15      if (!this->playerCanJoin(player.getName())){
16          return false;
17      }
18      player.setId(this->players.size());
19      player.getProtocol().sendChar(true);
20      this->players.push_back(std::move(player));
21      return true;
22  }
23
24  bool Turn::playerCanJoin(const std::string& player_name){
25      for (Player& player: this->players){
26          if (player.getName() == player_name){
27              return false;
28          }
29      }
30      return true;
31  }
32
33  size_t Turn::getPlayersSize() const{
34      return this->players.size();
35  }
36
37  Player& Turn::getCurrentPlayer(){
38      return this->players.at(this->current);
39  }
40
41  void Turn::startGame(DataSender& data_sender){
42      for (Player& player: this->players){
43          PlayerDataReceiver* r = new PlayerDataReceiver(player, data_sender);
44          std::unique_ptr<PlayerDataReceiver> receiver(r);
45          receiver->start();
46          this->receivers.push_back(std::move(receiver));
47      }
48  }
49
50  void Turn::beginTurn(){
51      do {
52          this->advanceCurrent();
53      } while (this->getCurrentPlayer().isDead());
54      this->getCurrentPlayer().beginTurn();
55      this->receivers[this->current]->beginTurn();
56  }
57
58  void Turn::endTurn(){
59      this->receivers[this->current]->endTurn();
60  }
61
62  std::vector<Player>& Turn::getPlayers(){
63      return this->players;
64  }
65
66  void Turn::advanceCurrent(){
```

```cpp
67          this->current++;
68          if (this->current >= this->players.size()){
69              this->current = 0;
70          }
71  }
72
73  void Turn::addWorm(World& world, GameParameters& params, b2Vec2 pos, int id){
74      this->players[this->current].addWorm(world, params, pos, id);
75      this->advanceCurrent();
76  }
77
78  void Turn::distributeWorms(size_t size, int life_to_add){
79      int quantity = (size / this->players.size());
80      if (size % this->players.size() != 0){
81          quantity += 1;
82      }
83
84      for (Player& player: this->players){
85          player.distributeWorms(quantity, life_to_add);
86      }
87  }
88
89  bool Turn::gameEnded(std::mutex& mutex){
90      std::lock_guard<std::mutex> lock(mutex);
91      this->winner.clear();
92      size_t players_alive = 0;
93      for (Player& player: this->players){
94          if (!player.isDead()){
95              players_alive++;
96              this->winner = player.getName();
97          }
98      }
99      return players_alive <= 1;
100 }
101
102 const std::string& Turn::getWinner(){
103     for (std::unique_ptr<PlayerDataReceiver>& receiver: this->receivers){
104         receiver->stop();
105     }
106     return this->winner;
107 }
```

```cpp
1   #ifndef __SERVERTURN_H__
2   #define __SERVERTURN_H__
3
4   #include "Player.h"
5   #include "PlayerDataReceiver.h"
6   #include "DataSender.h"
7   #include <vector>
8   #include <string>
9   #include <memory>
10
11  class Turn{
12      private:
13          std::vector<Player> players;
14          std::vector<std::unique_ptr<PlayerDataReceiver>> receivers;
15          std::string winner;
16          size_t current;
17
18          void advanceCurrent();
19
20      public:
21          Turn();
22          ~Turn();
23
24          //Agrega un nuevo jugador
25          bool addPlayer(Player& player);
26
27          //Devuelve true si el jugador se puede unir a la partida
28          bool playerCanJoin(const std::string& player_name);
29
30          //Devuelve la cantidad de jugadores
31          size_t getPlayersSize() const;
32
33          //Devuelve un vector con los jugadores
34          std::vector<Player>& getPlayers();
35
36          //Devuelve el jugador actual
37          Player& getCurrentPlayer();
38
39          //Realiza la configuracion inicial
40          void startGame(DataSender& data_sender);
41
42          //Empieza un nuevo turno, cambiando el jugador actual
43          void beginTurn();
44
45          //Termina el turno del jugador actual
46          void endTurn();
47
48          //Agrega un gusano al proximo jugador
49          void addWorm(World& world, GameParameters& params, b2Vec2 pos, int id);
50
51          //Agrega vida a los jugadores con menos gusanos
52          void distributeWorms(size_t size, int life_to_add);
53
54          //Devuelve true si queda uno o ningun jugador vivo
55          bool gameEnded(std::mutex& mutex);
56
57          //Devuelve el nombre del jugador ganador
58          const std::string& getWinner();
59  };
60
61  #endif
```

```cpp
#include "WeaponList.h"
#include "WeaponNames.h"
#include "WeaponFactory.h"
#include <map>
#include <string>

WeaponList::WeaponList(): current_weapon(DEFAULT_WEAPON){}

WeaponList::~WeaponList(){}

void WeaponList::updateAmmo(const std::map<std::string, unsigned int>& ammo){
    this->ammo = ammo;
}

bool WeaponList::shoot(){
    if (this->ammo[this->current_weapon] == 0){
        return false;
    }
    this->ammo[this->current_weapon]--;
    return true;
}

physical_object_ptr WeaponList::getCurrentWeapon(World& world,
                                        GameParameters& parameters){
    WeaponFactory factory(world, parameters);
    return factory.getWeapon(this->current_weapon);
}

void WeaponList::changeWeapon(const std::string& weapon){
    this->current_weapon = weapon;
}
```

```cpp
#ifndef __WEAPONLIST_H__
#define __WEAPONLIST_H__

#include <map>
#include <string>
#include "PhysicalObject.h"

class GameParameters;

class WeaponList{
    private:
        std::map<std::string, unsigned int> ammo;
        std::string current_weapon;

    public:
        WeaponList();

        ~WeaponList();

        //Actualiza la municion de las armas
        void updateAmmo(const std::map<std::string, unsigned int>& ammo);

        //Devuelve si puede disparar el arma, y disminuye la municion
        bool shoot();

        //Devuelve el arma actual
        physical_object_ptr getCurrentWeapon(World& world, GameParameters& param
    s);

        //Cambia el arma actual
        void changeWeapon(const std::string& weapon);
};

#endif
```

```cpp
1    #include "WormsList.h"
2
3    WormsList::WormsList(): current(0){}
4
5    WormsList::~WormsList(){}
6
7    Worm& WormsList::getCurrentWorm(){
8        Worm* worm = (Worm*)this->list[this->current].get();
9        return *worm;
10   }
11
12   void WormsList::beginTurn(){
13       do {
14           this->current++;
15           if (this->current >= this->list.size()){
16               this->current = 0;
17           }
18       } while (this->getCurrentWorm().isDead());
19       this->getCurrentWorm().beginTurn();
20   }
21
22   void WormsList::add(physical_object_ptr worm){
23       this->list.push_back(worm);
24   }
25
26   WormsList::WormsList(WormsList&& other):
27       list(std::move(other.list)), current(other.current){}
28
29   void WormsList::distribute(size_t max, int life_to_add){
30       if (this->list.size() < max){
31           for (physical_object_ptr& worm_ptr: this->list){
32               Worm* worm = (Worm*)worm_ptr.get();
33               worm->addLife(life_to_add);
34           }
35       }
36   }
37
38   bool WormsList::isEmpty(){
39       for (physical_object_ptr& worm: this->list){
40           if (!worm->isDead()){
41               return false;
42           }
43       }
44       return true;
45   }
46
47   void WormsList::kill(){
48       for (physical_object_ptr& worm: this->list){
49           if (!worm->isDead()){
50               worm->kill();
51           }
52       }
53   }
```

```cpp
1    #ifndef __WORMSLIST_H__
2    #define __WORMSLIST_H__
3
4    #include <vector>
5    #include "Worm.h"
6
7    class WormsList{
8        private:
9            std::vector<physical_object_ptr> list;
10           size_t current;
11
12       public:
13           /* Constructor */
14           WormsList();
15
16           /* Destructor */
17           ~WormsList();
18
19           /* Devuelve el worm actual */
20           Worm& getCurrentWorm();
21
22           /* Comienza el turno, cambiando el gusano actual */
23           void beginTurn();
24
25           /* Agrega un worm a la lista */
26           void add(physical_object_ptr worm);
27
28           /* Constructor por movimiento */
29           WormsList(WormsList&& other);
30
31           /* Aumenta la vida de los worms si la cantidad de
32            * worms es menor que la de otros jugadores */
33           void distribute(size_t max, int life_to_add);
34
35           /* Devuelve true si todos los worms estan muertos */
36           bool isEmpty();
37
38           /* Mata a todos los worms */
39           void kill();
40   };
41
42   #endif
```

```cpp
1   #include "CollisionData.h"
2   #include "PhysicalObject.h"
3   #include <string>
4
5   CollisionData::CollisionData(std::string type, PhysicalObject* object):
6       type(type), object(object){}
7
8   CollisionData::~CollisionData(){}
9
10  const std::string& CollisionData::getType(){
11      return this->type;
12  }
13
14  PhysicalObject* CollisionData::getObject(){
15      return this->object;
16  }
```

```cpp
1   #ifndef __COLLISIONDATA_H__
2   #define __COLLISIONDATA_H__
3
4   #include <string>
5
6
7   class PhysicalObject;
8
9   //Datos de un objeto para determinar colisiones
10  class CollisionData{
11      private:
12          std::string type;
13          PhysicalObject* object;
14
15      public:
16          CollisionData(std::string type, PhysicalObject* object);
17          ~CollisionData();
18
19          //Devuelve el tipo del objeto fisico
20          const std::string& getType();
21
22          //Devuelve el objeto fisico
23          PhysicalObject* getObject();
24  };
25
26  #endif
```

```cpp
1  #include "CollisionListener.h"
2  #include "PhysicalObject.h"
3  #include "Worm.h"
4  #include "Girder.h"
5  CollisionListener::CollisionListener(){}
6
7
8  CollisionListener::~CollisionListener(){}
9
10 void CollisionListener::BeginContact(b2Contact* contact){
11     CollisionData* dataA =
12             (CollisionData*)contact->GetFixtureA()->GetBody()->GetUserData()
   ;
13     CollisionData* dataB =
14             (CollisionData*)contact->GetFixtureB()->GetBody()->GetUserData()
   ;
15     if (dataA->getObject()->isDead() || dataB->getObject()->isDead()){
16         return;
17     }
18     if (dataA->getType() == TYPE_WEAPON){
19         if (dataB->getType() == TYPE_WORM){
20             int shooter_id = ((Weapon*)dataA->getObject())->getShooterId();
21             int worm_id = dataB->getObject()->getId();
22             if (shooter_id == worm_id){
23                 return;
24             }
25         }
26         dataA->getObject()->collideWithSomething(dataB);
27     } else if (dataB->getType() == TYPE_WEAPON){
28         if (dataA->getType() == TYPE_WORM){
29             int shooter_id = ((Weapon*)dataB->getObject())->getShooterId();
30             int worm_id = dataA->getObject()->getId();
31             if (shooter_id == worm_id){
32                 return;
33             }
34         }
35         dataB->getObject()->collideWithSomething(dataA);
36     }
37
38     if (dataA->getType() == TYPE_WORM && contact->GetFixtureA()->IsSensor() &&
39             (dataB->getType() == TYPE_GIRDER || dataB->getType() == TYPE_BORDER)
   ){
40         dataA->getObject()->collideWithSomething(dataB);
41
42     } else if (dataB->getType() == TYPE_WORM &&
43             contact->GetFixtureB()->IsSensor() &&
44             (dataA->getType() == TYPE_GIRDER || dataA->getType() == TYPE_BOR
   DER)){
45         dataB->getObject()->collideWithSomething(dataA);
46     }
47 }
48
49 void CollisionListener::EndContact(b2Contact* contact){
50     CollisionData* dataA =
51             (CollisionData*)contact->GetFixtureA()->GetBody()->GetUserData()
   ;
52     CollisionData* dataB =
53             (CollisionData*)contact->GetFixtureB()->GetBody()->GetUserData()
   ;
54
55     if (dataA->getType() == TYPE_WORM &&
56             contact->GetFixtureA()->IsSensor() && dataB->getType() == TYPE_GIRDE
   R){
57         bool friction = ((Girder *) dataB->getObject())->hasFriction();
```

```cpp
60         ((Worm *) dataA->getObject())->endCollissionGirder(friction);
61     } else if (dataB->getType() == TYPE_WORM &&
62             contact->GetFixtureB()->IsSensor() && dataA->getType() == TYPE_G
   IRDER){
63         bool friction = ((Girder *) dataA->getObject())->hasFriction();
64         ((Worm *) dataB->getObject())->endCollissionGirder(friction);
65     }
66
67     if (dataA->getType() == TYPE_WEAPON){
68         ((Weapon*)dataA->getObject())->removeShooterId();
69     }
70     if (dataB->getType() == TYPE_WEAPON){
71         ((Weapon*)dataB->getObject())->removeShooterId();
72     }
73 }
74
75 bool CollisionListener::ShouldCollide(b2Fixture* fixtureA, b2Fixture* fixtureB){
76     CollisionData* dataA = (CollisionData*)fixtureA->GetBody()->GetUserData();
77     CollisionData* dataB = (CollisionData*)fixtureB->GetBody()->GetUserData();
78
79     if (dataA->getType() == TYPE_WORM && dataB->getType() == TYPE_WORM){
80         return false;
81     }
82     if (dataA->getType() == TYPE_WEAPON && dataB->getType() == TYPE_WEAPON){
83         return false;
84     }
85     return true;
86 }
```

```
1   #ifndef __COLLISIONLISTENER_H__
2   #define __COLLISIONLISTENER_H__
3
4   #include <string>
5   #include "CollisionData.h"
6   #include "b2WorldCallbacks.h"
7   #include "b2Contact.h"
8   #include <list>
9
10  class CollisionListener: public b2ContactListener, public b2ContactFilter{
11      public:
12          CollisionListener();
13          ~CollisionListener();
14
15          //Analiza la colision entre dos objetos
16          void BeginContact(b2Contact* contact) override;
17
18          //Analiza el fin de colision entre dos objetos
19          void EndContact(b2Contact* contact) override;
20
21          //Analiza si dos objetos deben colisionar o no
22          bool ShouldCollide(b2Fixture* fixtureA, b2Fixture* fixtureB) override;
23  };
24
25  #endif
```

```
1   #include "RayCastWeaponExploded.h"
2   #include "Worm.h"
3
4   RayCastWeaponExploded::RayCastWeaponExploded(): closest(NULL){}
5
6   RayCastWeaponExploded::~RayCastWeaponExploded(){}
7
8   b2Body* RayCastWeaponExploded::getClosestWorm(){
9       if (!this->closest){
10          return NULL;
11      }
12      CollisionData* data = (CollisionData*)this->closest->GetUserData();
13      if (data->getType() != TYPE_WORM){
14          this->closest = NULL;
15          return NULL;
16      }
17
18      this->affected_worms.push_back(this->closest);
19      b2Body* closest_worm = this->closest;
20      this->closest = NULL;
21      return closest_worm;
22  }
23
24  float32 RayCastWeaponExploded::ReportFixture(b2Fixture* fixture,
25                          const b2Vec2& point, const b2Vec2& normal, float32 fract
    ion){
26      b2Body* closest_body = fixture->GetBody();
27      for (b2Body* affected_worm: this->affected_worms){
28          if (affected_worm == closest_body){
29              return -1;
30          }
31      }
32      this->closest = closest_body;
33      return fraction;
34  }
```

```cpp
1   #ifndef __RAYCASTWEAPONEXPLODED_H__
2   #define __RAYCASTWEAPONEXPLODED_H__
3
4   #include "b2Body.h"
5   #include "b2Fixture.h"
6   #include "b2WorldCallbacks.h"
7   #include <vector>
8
9   class RayCastWeaponExploded: public b2RayCastCallback{
10      private:
11          std::vector<b2Body*> affected_worms;
12          b2Body* closest;
13
14      public:
15          RayCastWeaponExploded();
16          ~RayCastWeaponExploded();
17
18          //Devuelve el gusano mas cercano a la explosion, si hay
19          b2Body* getClosestWorm();
20
21          //Busca al objeto mas cercano a la explosion
22          float32 ReportFixture(b2Fixture* fixture, const b2Vec2& point,
23                      const b2Vec2& normal, float32 fraction) override;
24  };
25
26  #endif
27
```

```cpp
1   #include "BottomBorder.h"
2   #include "b2PolygonShape.h"
3   #include "b2Fixture.h"
4
5   BottomBorder::BottomBorder(World& world):
6       PhysicalObject(world, 0, TYPE_BORDER){}
7
8   BottomBorder::~BottomBorder(){}
9
10  void BottomBorder::getBodyDef(b2BodyDef& body_def, const b2Vec2& pos){
11      body_def.type = b2_staticBody;
12      body_def.position.Set(pos.x, pos.y);
13  }
14
15  void BottomBorder::createFixtures(){
16      b2PolygonShape boxShape;
17      boxShape.SetAsBox(100000,1);
18
19      b2FixtureDef boxFixtureDef;
20      boxFixtureDef.shape = &boxShape;
21      boxFixtureDef.density = 1;
22      this->body->CreateFixture(&boxFixtureDef);
23  }
```

```cpp
1   #ifndef __BOTTOMBORDER_H__
2   #define __BOTTOMBORDER_H__
3
4   #include "PhysicalObject.h"
5   #include <string>
6
7   //Determina el borde inferior del mundo
8   class BottomBorder: public PhysicalObject{
9       private:
10          std::string type;
11
12      protected:
13          void getBodyDef(b2BodyDef& body_def, const b2Vec2& pos) override;
14          void createFixtures() override;
15
16      public:
17          explicit BottomBorder(World& world);
18          ~BottomBorder();
19  };
20  #endif
```

```cpp
1   #include "Girder.h"
2   #include "b2PolygonShape.h"
3   #include "b2Fixture.h"
4   #include "Math.h"
5
6   Girder::Girder(World& world, GameParameters& params, size_t size, int angle):
7       PhysicalObject(world, 0, TYPE_GIRDER), size(size), rotation(angle),
8       max_rotation_to_friction(params.getMaxGirderRotationToFriction()){}
9
10  Girder::~Girder(){}
11
12  void Girder::getBodyDef(b2BodyDef& body_def, const b2Vec2& pos){
13      body_def.type = b2_staticBody;
14      body_def.position.Set(pos.x, pos.y);
15  }
16
17  void Girder::createFixtures(){
18      b2PolygonShape boxShape;
19      boxShape.SetAsBox(this->size / 2.0, girder_height / 2,
20              b2Vec2(0, 0), Math::degreesToRadians(this->rotation));
21
22      b2FixtureDef boxFixtureDef;
23      boxFixtureDef.shape = &boxShape;
24      boxFixtureDef.density = 1;
25      this->body->CreateFixture(&boxFixtureDef);
26  }
27
28  size_t Girder::getSize(){
29      return this->size;
30  }
31
32  int Girder::getRotation(){
33      return this->rotation;
34  }
35
36  bool Girder::hasFriction(){
37      int angle = this->getAngle();
38      return angle < this->max_rotation_to_friction || angle == 90;
39  }
40
41  int Girder::getAngle(){
42      int angle = this->rotation;
43      if (angle > 90){
44          angle = 180 - angle;
45      }
46      return angle;
47  }
```

```
1   #ifndef __GIRDER_H__
2   #define __GIRDER_H__
3
4   #include "PhysicalObject.h"
5   #include "GameParameters.h"
6
7   class Girder: public PhysicalObject{
8       private:
9           size_t size;
10          int rotation;
11          int max_rotation_to_friction;
12
13      protected:
14          void getBodyDef(b2BodyDef& body_def, const b2Vec2& pos) override;
15          void createFixtures() override;
16
17      public:
18          Girder(World& world, GameParameters& parameters, size_t size, int rotati
    on);
19          ~Girder();
20
21          //Devuelve la longitud de la viga
22          size_t getSize();
23
24          //Devuelve la rotacion de la viga
25          int getRotation();
26
27          //Devuelve true si la viga tiene friccion
28          bool hasFriction();
29
30          //Devuelve la rotacion normalizada
31          int getAngle();
32  };
33
34  #endif
```

```
1   #include "PhysicalObject.h"
2   #include "World.h"
3   #include <string>
4
5   PhysicalObject::PhysicalObject(World& world, int id, const std::string& type):
6       world(world), body(NULL), is_dead(false), id(id),
7       type(type), last_position(-1, -1),
8       last_position_sent(false), data_updated(false),
9       collision_data(type, this){}
10
11  PhysicalObject::~PhysicalObject(){}
12
13  void PhysicalObject::initializeBody(b2Body* body){
14      this->body = body;
15      this->body->SetUserData(&this->collision_data);
16      this->createFixtures();
17      this->setInitialVelocity();
18  }
19
20  void PhysicalObject::destroyBody(){
21      this->body = NULL;
22      this->is_dead = true;
23  }
24
25  b2Vec2 PhysicalObject::getPosition(){
26      if (this->body){
27          return this->body->GetPosition();
28      }
29      return b2Vec2(-100, 0);
30  }
31
32  b2Body* PhysicalObject::getBody(){
33      return this->body;
34  }
35
36  bool PhysicalObject::isMoving(){
37      if (!this->body || this->is_dead){
38          return false;
39      }
40      b2Vec2 pos = this->body->GetPosition();
41      int last_x = this->last_position.x * UNIT_TO_SEND;
42      int last_y = this->last_position.y * UNIT_TO_SEND;
43      bool moved_x = (int)(pos.x * UNIT_TO_SEND) != last_x;
44      bool moved_y = (int)(pos.y * UNIT_TO_SEND) != last_y;
45      this->last_position = pos;
46      bool moved = moved_x || moved_y;
47      if (moved || this->data_updated){
48          this->last_position_sent = false;
49          this->data_updated = false;
50          return true;
51      }
52      if (!this->body->IsAwake() && !this->last_position_sent){
53          this->last_position_sent = true;
54          this->data_updated = false;
55          return true;
56      }
57      return false;
58  }
59
60  bool PhysicalObject::isActive(){
61      if (!this->body){
62          return false;
63      }
64      return this->body->IsAwake();
65  }
66
```

```
67  bool PhysicalObject::isDead(){
68      return this->is_dead;
69  }
70
71  bool PhysicalObject::isWindAffected(){
72      return false;
73  }
74
75  void PhysicalObject::kill(){
76      this->is_dead = true;
77  }
78
79  int PhysicalObject::getId(){
80      return this->id;
81  }
82
83  const std::string& PhysicalObject::getType(){
84      return this->type;
85  }
86
87  void PhysicalObject::setInitialVelocity(){}
88
89  void PhysicalObject::collideWithSomething(CollisionData *other){}
```

```
1   #ifndef __PHYSICALOBJECT_H__
2   #define __PHYSICALOBJECT_H__
3
4   #include "b2Body.h"
5   #include "CollisionData.h"
6   #include "ObjectSizes.h"
7   #include "ObjectTypes.h"
8   #include <string>
9   #include <memory>
10
11  class World;
12
13  class PhysicalObject{
14      protected:
15          World& world;
16          b2Body* body;
17          bool is_dead;
18          int id;
19          const std::string& type;
20          b2Vec2 last_position;
21          bool last_position_sent;
22          bool data_updated;
23          CollisionData collision_data;
24
25          virtual void createFixtures() = 0;
26          virtual void setInitialVelocity();
27
28      public:
29          PhysicalObject(World& world, int id, const std::string& type);
30          virtual ~PhysicalObject();
31
32          //Inicializa el cuerpo del objeto
33          void initializeBody(b2Body* body);
34
35          //Destruye el cuerpo del objeto
36          void destroyBody();
37
38          //Devuelve la posicion del objeto
39          b2Vec2 getPosition();
40
41          //Devuelve el cuerpo del objeto
42          b2Body* getBody();
43
44          //Devuelve true si el objeto se esta moviendo
45          virtual bool isMoving();
46
47          //Devuelve true si el objeto esta activo
48          virtual bool isActive();
49
50          //Devuelve true si el objeto esta muerto
51          virtual bool isDead();
52
53          //Devuelve true si el objeto es afectado por el viento
54          virtual bool isWindAffected();
55
56          //Mata al objeto
57          void kill();
58
59          //Devuelve el id del objeto
60          int getId();
61
62          //Devuelve el tipo del objeto
63          const std::string& getType();
64
65          virtual void getBodyDef(b2BodyDef& body_def, const b2Vec2& pos) = 0;
66
```

```
67          //Colisiona con otro objeto
68          virtual void collideWithSomething(CollisionData *other);
69  };
70
71  typedef std::shared_ptr<PhysicalObject> physical_object_ptr;
72
73  #endif
```

```
1   #include "AirAttack.h"
2   #include "WeaponFactory.h"
3   #include "Worm.h"
4   #include <string>
5
6   AirAttack::AirAttack(World& world, GameParameters& parameters):
7       Weapon(world, parameters, 0),
8       missiles_separation(parameters.getAirMissilesSeparation()){}
9
10  AirAttack::~AirAttack(){}
11
12  const std::string& AirAttack::getName(){
13      return AIR_ATTACK_NAME;
14  }
15
16  void AirAttack::shoot(char dir, int angle, int power, int time, int shooter){}
17
18  void AirAttack::shoot(Worm& shooter, b2Vec2 pos){
19      int missiles = this->parameters.getWeaponFragments(AIR_ATTACK_NAME);
20      float pos_x = pos.x - missiles * this->missiles_separation / 2;
21      float pos_y = this->parameters.getMaxHeight();
22      WeaponFactory factory(this->world, this->parameters);
23      for (int i = 0; i < missiles; i++, pos_x += this->missiles_separation){
24          physical_object_ptr missile = factory.getWeapon(AIR_ATTACK_MISSILE_NAME)
;
25          this->world.addObject(missile, b2Vec2(pos_x, pos_y));
26      };
27  }
```

```
1   #ifndef __SERVERAIRATTACK_H__
2   #define __SERVERAIRATTACK_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class AirAttack: public Weapon{
8       private:
9           float missiles_separation;
10
11      public:
12          AirAttack(World& world, GameParameters& parameters);
13          ~AirAttack();
14
15          const std::string& getName() override;
16
17          void shoot(char dir, int angle, int power, int time, int shooter_id) ove
    rride;
18
19          void shoot(Worm& shooter, b2Vec2 pos) override;
20  };
21
22  #endif
```

```
1   #include "AirAttackMissile.h"
2   #include <string>
3
4   AirAttackMissile::AirAttackMissile(World& world, GameParameters& parameters):
5       Weapon(world, parameters,
6           parameters.getWeaponDamage(AIR_ATTACK_MISSILE_NAME),
7           parameters.getWeaponRadius(AIR_ATTACK_MISSILE_NAME)){}
8
9   AirAttackMissile::~AirAttackMissile(){}
10
11  const std::string& AirAttackMissile::getName(){
12      return AIR_ATTACK_MISSILE_NAME;
13  }
14
15  bool AirAttackMissile::isWindAffected(){
16      return true;
17  }
```

```
1   #ifndef __SERVERAIRATTACKMISSILE_H__
2   #define __SERVERAIRATTACKMISSILE_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class AirAttackMissile: public Weapon{
8       public:
9           AirAttackMissile(World& world, GameParameters& parameters);
10          ~AirAttackMissile();
11
12          const std::string& getName() override;
13
14          bool isWindAffected() override;
15  };
16
17  #endif
```

```
1   #include "Banana.h"
2   #include "b2Fixture.h"
3   #include "b2CircleShape.h"
4   #include <string>
5
6   Banana::Banana(World& world, GameParameters& parameters):
7       Weapon(world, parameters,
8           parameters.getWeaponDamage(BANANA_NAME),
9           parameters.getWeaponRadius(BANANA_NAME)){}
10
11  Banana::~Banana(){}
12
13  const std::string& Banana::getName(){
14      return BANANA_NAME;
15  }
16
17  void Banana::createFixtures(){
18      b2CircleShape circleShape;
19      circleShape.m_p.Set(0, 0);
20      circleShape.m_radius = weapon_size / 2;
21
22      b2FixtureDef fixtureDef;
23      fixtureDef.shape = &circleShape;
24      fixtureDef.density = 4;
25      fixtureDef.restitution = 0.9; //rebotable
26      this->body->CreateFixture(&fixtureDef);
27  }
```

```
1   #ifndef __SERVERBANANA_H__
2   #define __SERVERBANANA_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class Banana: public Weapon{
8       protected:
9           void createFixtures() override;
10
11      public:
12          Banana(World& world, GameParameters& parameters);
13          ~Banana();
14
15          const std::string& getName() override;
16  };
17
18  #endif
```

```
1   #include "Bat.h"
2   #include <string>
3
4   Bat::Bat(World& world, GameParameters& parameters):
5       Weapon(world, parameters, parameters.getWeaponDamage(BAT_NAME),
6           parameters.getWeaponRadius(BAT_NAME)){}
7
8   Bat::~Bat(){}
9
10  const std::string& Bat::getName(){
11      return BAT_NAME;
12  }
13
14  void Bat::setInitialVelocity(){
15      this->explode();
16  }
17
18  void Bat::explode(){
19      b2Vec2 center = this->body->GetPosition();
20      this->attackWormExplosion(center, this->angle);
21
22      this->waiting_to_explode = false;
23      this->is_dead = true;
24  }
```

```
1   #ifndef __SERVERBAT_H__
2   #define __SERVERBAT_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class Bat: public Weapon{
8       public:
9           Bat(World& world, GameParameters& parameters);
10          ~Bat();
11
12          const std::string& getName() override;
13
14          void setInitialVelocity() override;
15
16          void explode() override;
17  };
18
19  #endif
```

```
1   #include "Bazooka.h"
2   #include <string>
3
4   Bazooka::Bazooka(World& world, GameParameters& parameters):
5       Weapon(world, parameters,
6           parameters.getWeaponDamage(BAZOOKA_NAME),
7           parameters.getWeaponRadius(BAZOOKA_NAME)){}
8
9   Bazooka::~Bazooka(){}
10
11  const std::string& Bazooka::getName(){
12      return BAZOOKA_NAME;
13  }
14
15  bool Bazooka::isWindAffected(){
16      return true;
17  }
```

```
1   #ifndef __SERVERBAZOOKA_H__
2   #define __SERVERBAZOOKA_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class Bazooka: public Weapon{
8       public:
9           Bazooka(World& world, GameParameters& parameters);
10          ~Bazooka();
11
12          const std::string& getName() override;
13
14          bool isWindAffected() override;
15  };
16
17  #endif
```

```
1   #include "Dynamite.h"
2   #include <string>
3
4   Dynamite::Dynamite(World& world, GameParameters& parameters):
5       Weapon(world, parameters, parameters.getWeaponDamage(DYNAMITE_NAME),
6           parameters.getWeaponRadius(DYNAMITE_NAME)){}
7
8   Dynamite::~Dynamite(){}
9
10  const std::string& Dynamite::getName(){
11      return DYNAMITE_NAME;
12  }
```

```
1   #ifndef __SERVERDYNAMITE_H__
2   #define __SERVERDYNAMITE_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class Dynamite: public Weapon{
8       public:
9           Dynamite(World& world, GameParameters& parameters);
10          ~Dynamite();
11
12          const std::string& getName() override;
13  };
14
15  #endif
```

```
1   #include "FragmentableWeapon.h"
2   #include "WeaponFactory.h"
3   #include "Fragment.h"
4   #include "Math.h"
5   #include <string>
6
7   FragmentableWeapon::FragmentableWeapon(World& world, GameParameters& parameters,
8                                              int damage, int fragments, i
    nt radius):
9       Weapon(world, parameters, damage, radius), fragments(fragments){}
10
11  FragmentableWeapon::~FragmentableWeapon(){}
12
13  void FragmentableWeapon::explode(){
14      WeaponFactory factory(this->world, this->parameters);
15      for (float angle = 0; angle < 360; angle+= (360 / fragments)){
16          physical_object_ptr fragment = factory.getWeapon(this->getName() + FRAGM
    ENT);
17
18          b2Vec2 center = this->body->GetPosition() +
19                          0.3 * b2Vec2(Math::cosDegrees(angle), Math::sinDegrees(a
    ngle));
20          ((Fragment *) fragment.get())->setShootPosition(center);
21          ((Fragment*)fragment.get())->shoot(angle);
22          this->world.addWeaponFragment(fragment);
23      }
24      Weapon::explode();
25  }
```

```
1  #ifndef __FRAGMENTABLEWEAPON_H__
2  #define __FRAGMENTABLEWEAPON_H__
3
4  #include "Weapon.h"
5  #include <string>
6
7  class FragmentableWeapon: public Weapon{
8      protected:
9          int fragments;
10
11     public:
12         FragmentableWeapon(World& world, GameParameters& parameters,
13                                 int damage, int fragments, int radius);
14         virtual ~FragmentableWeapon();
15
16         //Explota el arma y lanza fragmentos
17         void explode();
18 };
19
20 #endif
```

```
1  #include "Fragment.h"
2
3  Fragment::Fragment(World& world, GameParameters& params, int dam, int radius):
4      Weapon(world, params, dam, radius){}
5
6  Fragment::~Fragment(){}
7
8  void Fragment::setShootPosition(b2Vec2 pos){
9      this->shoot_position = pos;
10 }
11
12 b2Vec2 Fragment::getShootPosition(){
13     return this->shoot_position;
14 }
15
16 void Fragment::shoot(int angle){
17     Weapon::shoot(1, angle, -1, -1, -1);
18 }
```

```
1   #ifndef __SERVERFRAGMENT_H__
2   #define __SERVERFRAGMENT_H__
3
4   #include "Weapon.h"
5
6   class Fragment: public Weapon{
7       private:
8           b2Vec2 shoot_position;
9
10      public:
11          Fragment(World& world, GameParameters& parameters, int damage, int radiu
    s);
12          ~Fragment();
13
14          void setShootPosition(b2Vec2 pos);
15          b2Vec2 getShootPosition();
16
17          void shoot(int angle);
18  };
19
20  #endif
```

```
1   #include "GreenGrenade.h"
2   #include <string>
3
4   GreenGrenade::GreenGrenade(World& world, GameParameters& parameters):
5       Weapon(world, parameters,
6           parameters.getWeaponDamage(GREEN_GRENADE_NAME),
7           parameters.getWeaponRadius(GREEN_GRENADE_NAME)){}
8
9   GreenGrenade::~GreenGrenade(){}
10
11  const std::string& GreenGrenade::getName(){
12      return GREEN_GRENADE_NAME;
13  }
```

```
1   #ifndef __SERVERGREENGRENADE_H__
2   #define __SERVERGREENGRENADE_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class GreenGrenade: public Weapon{
8       public:
9           GreenGrenade(World& world, GameParameters& parameters);
10          ~GreenGrenade();
11
12          const std::string& getName() override;
13  };
14
15  #endif
```

```
1   #include "HolyGrenade.h"
2   #include <string>
3
4   HolyGrenade::HolyGrenade(World& world, GameParameters& parameters):
5       Weapon(world, parameters,
6           parameters.getWeaponDamage(HOLY_GRENADE_NAME),
7           parameters.getWeaponRadius(HOLY_GRENADE_NAME)){}
8
9   HolyGrenade::~HolyGrenade(){}
10
11  const std::string& HolyGrenade::getName(){
12      return HOLY_GRENADE_NAME;
13  }
```

```
1   #ifndef __SERVERHOLYGRENADE_H__
2   #define __SERVERHOLYGRENADE_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class HolyGrenade: public Weapon{
8       public:
9           HolyGrenade(World& world, GameParameters& parameters);
10          ~HolyGrenade();
11
12          const std::string& getName() override;
13  };
14
15  #endif
```

```
1   #include "Mortar.h"
2   #include <string>
3
4   Mortar::Mortar(World& world, GameParameters& parameters):
5       FragmentableWeapon(world, parameters,
6           parameters.getWeaponDamage(MORTAR_NAME),
7           parameters.getWeaponFragments(MORTAR_NAME),
8           parameters.getWeaponRadius(MORTAR_NAME)){}
9
10  Mortar::~Mortar(){}
11
12  const std::string& Mortar::getName(){
13      return MORTAR_NAME;
14  }
15
16  bool Mortar::isWindAffected(){
17      return true;
18  }
```

```cpp
1   #include "MortarFragment.h"
2   #include <string>
3
4   MortarFragment::MortarFragment(World& world, GameParameters& parameters):
5       Fragment(world, parameters,
6           parameters.getWeaponDamage(MORTAR_FRAGMENTS_NAME),
7           parameters.getWeaponRadius(MORTAR_FRAGMENTS_NAME)){}
8
9   MortarFragment::~MortarFragment(){}
10
11  const std::string& MortarFragment::getName(){
12      return MORTAR_FRAGMENTS_NAME;
13  }
14
15  bool MortarFragment::isWindAffected(){
16      return true;
17  }
```

```cpp
1   #ifndef __SERVERMORTARFRAGMENT_H__
2   #define __SERVERMORTARFRAGMENT_H__
3
4   #include "Fragment.h"
5   #include <string>
6
7   class MortarFragment: public Fragment{
8       public:
9           MortarFragment(World& world, GameParameters& parameters);
10          ~MortarFragment();
11
12          const std::string& getName() override;
13
14          bool isWindAffected() override;
15  };
16
17  #endif
```

```
1   #ifndef __SERVERMORTAR_H__
2   #define __SERVERMORTAR_H__
3
4   #include "FragmentableWeapon.h"
5   #include <string>
6
7   class Mortar: public FragmentableWeapon{
8       public:
9           Mortar(World& world, GameParameters& parameters);
10          ~Mortar();
11
12          const std::string& getName() override;
13
14          bool isWindAffected() override;
15  };
16
17  #endif
```

```
1   #include "RedGrenade.h"
2   #include <string>
3
4   RedGrenade::RedGrenade(World& world, GameParameters& parameters):
5       FragmentableWeapon(world, parameters,
6           parameters.getWeaponDamage(RED_GRENADE_NAME),
7           parameters.getWeaponFragments(RED_GRENADE_NAME),
8           parameters.getWeaponRadius(RED_GRENADE_NAME)){}
9
10  RedGrenade::~RedGrenade(){}
11
12  const std::string& RedGrenade::getName(){
13      return RED_GRENADE_NAME;
14  }
```

```
1   #include "RedGrenadeFragment.h"
2   #include <string>
3
4   RedGrenadeFragment::RedGrenadeFragment(World& world, GameParameters& params):
5       Fragment(world, params,
6           params.getWeaponDamage(RED_GRENADE_FRAGMENTS_NAME),
7           params.getWeaponRadius(RED_GRENADE_FRAGMENTS_NAME)){}
8
9   RedGrenadeFragment::~RedGrenadeFragment(){}
10
11  const std::string& RedGrenadeFragment::getName(){
12      return RED_GRENADE_FRAGMENTS_NAME;
13  }
```

```
1   #ifndef __SERVERREDGRENADEFRAGMENT_H__
2   #define __SERVERREDGRENADEFRAGMENT_H__
3
4   #include "Fragment.h"
5   #include <string>
6
7   class RedGrenadeFragment: public Fragment{
8       public:
9           RedGrenadeFragment(World& world, GameParameters& parameters);
10          ~RedGrenadeFragment();
11
12          const std::string& getName() override;
13  };
14
15  #endif
```

```
1   #ifndef __SERVERREDGRENADE_H__
2   #define __SERVERREDGRENADE_H__
3
4   #include "FragmentableWeapon.h"
5   #include <string>
6
7   class RedGrenade: public FragmentableWeapon{
8       public:
9           RedGrenade(World& world, GameParameters& parameters);
10          ~RedGrenade();
11
12          const std::string& getName() override;
13  };
14
15  #endif
```

```
1   #include "Teleportation.h"
2   #include "Worm.h"
3   #include <mutex>
4   #include <string>
5
6   Teleportation::Teleportation(World& world, GameParameters& parameters):
7       Weapon(world, parameters, 0){}
8
9   Teleportation::~Teleportation(){}
10
11  const std::string& Teleportation::getName(){
12      return TELEPORT_NAME;
13  }
14
15  void Teleportation::shoot(char dir, int angle, int power,
16                                 int time, int shooter_id){}
17
18  void Teleportation::shoot(Worm& shooter, b2Vec2 pos){
19      pos.x += (worm_size / 2);
20      pos.y += (worm_size / 2);
21      std::lock_guard<std::mutex> lock(this->world.getMutex());
22      b2Body* body = shooter.getBody();
23      if (body){
24          shooter.getBody()->SetTransform(pos, 0);
25          shooter.getBody()->SetAwake(true);
26      }
27  }
```

```
1   #ifndef __SERVERTELEPORTATION_H__
2   #define __SERVERTELEPORTATION_H__
3
4   #include "Weapon.h"
5   #include <string>
6
7   class Teleportation: public Weapon{
8       public:
9           Teleportation(World& world, GameParameters& parameters);
10          ~Teleportation();
11
12          const std::string& getName() override;
13
14          void shoot(char dir, int angle, int power, int time, int shooter_id) ove
    rride;
15
16          //Teletransporta al gusano
17          void shoot(Worm& shooter, b2Vec2 pos) override;
18  };
19
20  #endif
```

```
1   #include "Weapon.h"
2   #include "b2Fixture.h"
3   #include "b2CircleShape.h"
4   #include "CollisionData.h"
5   #include "Worm.h"
6   #include "Math.h"
7
8   int Weapon::weapon_id = 1;
9
10  Weapon::Weapon(World& world, GameParameters& params, int damage, int radius):
11      PhysicalObject(world, Weapon::weapon_id++, TYPE_WEAPON),
12      parameters(params),
13      damage(damage), radius(radius),
14      waiting_to_explode(false), time_to_explode(-1),
15      angle(MAX_WEAPON_ANGLE + 1), power(-1),
16      shooter_id(-1), explode_time(world, *this){}
17
18  Weapon::~Weapon(){
19      this->explode_time.join();
20  }
21
22  bool Weapon::isActive(){
23      return this->waiting_to_explode || PhysicalObject::isActive();
24  }
25
26  void Weapon::shoot(char dir, int angle, int power, int time, int shooter_id){
27      if (dir == -1 && angle <= MAX_WEAPON_ANGLE){
28          angle = 180 - angle;
29      }
30      this->time_to_explode = time;
31      this->angle = angle;
32      this->power = power;
33      this->shooter_id = shooter_id;
34  }
35
36  void Weapon::shoot(Worm& shooter, b2Vec2 pos){}
37
38  void Weapon::getBodyDef(b2BodyDef& body_def, const b2Vec2& pos){
39      body_def.type = b2_dynamicBody;
40      body_def.position.Set(pos.x, pos.y);
41      body_def.fixedRotation = true;
42      body_def.bullet = true;
43  }
44
45  void Weapon::createFixtures(){
46      b2CircleShape circleShape;
47      circleShape.m_p.Set(0, 0);
48      circleShape.m_radius = weapon_size / 2;
49
50      b2FixtureDef fixtureDef;
51      fixtureDef.shape = &circleShape;
52      fixtureDef.density = 4;
53      this->body->CreateFixture(&fixtureDef);
54  }
55
56  void Weapon::setInitialVelocity(){
57      if (this->angle <= 360){
58          int velocity = this->parameters.getWeaponsVelocity();
59          if (this->power != -1){
60              velocity *= this->power / 1000;
61          }
62          b2Vec2 linear_velocity(velocity * Math::cosDegrees(this->angle),
63                                 velocity * Math::sinDegrees(this->angle));
64          this->body->SetLinearVelocity(linear_velocity);
65      }
66      this->waiting_to_explode = true;
```

```
67      this->explode_time.setTime(this->time_to_explode);
68      this->explode_time.start();
69  }
70
71
72  void Weapon::explode(){
73      b2Vec2 center = this->body->GetPosition();
74      for (float bullet_angle = 0; bullet_angle < 360; bullet_angle+= 5){
75          this->attackWormExplosion(center, bullet_angle);
76      }
77
78      this->explode_time.stop();
79      this->waiting_to_explode = false;
80      this->is_dead = true;
81  }
82
83  void Weapon::attackWormExplosion(const b2Vec2& center, int angle){
84      b2Vec2 end = center + this->radius *
85                          b2Vec2(Math::cosDegrees(angle), Math::sinDegrees(ang
le));
86      b2Body* closest = this->world.getClosestObject(&explosion, center, end);
87      if (closest){
88          Worm* worm = (Worm*)((CollisionData*)closest->GetUserData())->getObject(
);
89          float distance = b2Distance(center, worm->getPosition());
90
91          //Justo en el borde hace la mitad de danio
92          int worm_damage = this->damage * (1 - distance / (2 * this->radius));
93
94          worm->receiveWeaponDamage(worm_damage, center);
95      }
96  }
97
98  void Weapon::collideWithSomething(CollisionData *other){
99      if (this->time_to_explode == -1){
100         this->explode_time.stop();
101         this->explode();
102     } else if (other->getType() == TYPE_BORDER){
103         this->explode_time.stop();
104         this->is_dead = true;
105     }
106 }
107
108 int Weapon::getShooterId() const{
109     return this->shooter_id;
110 }
111
112 void Weapon::removeShooterId(){
113     this->shooter_id = -1;
114 }
```

```
1   #include "WeaponExplodeTime.h"
2   #include "Weapon.h"
3   #include "World.h"
4
5   WeaponExplodeTime::WeaponExplodeTime(World& world, Weapon& weapon):
6       weapon(weapon), world(world), time(-1){}
7
8   WeaponExplodeTime::~WeaponExplodeTime(){}
9
10  void WeaponExplodeTime::setTime(int time){
11      this->time = time;
12  }
13
14  void WeaponExplodeTime::run(){
15      if (this->time > 0){
16          int passed = 0;
17          while (this->running && passed < this->time){
18              std::this_thread::sleep_for(std::chrono::seconds(1));
19              passed++;
20          }
21          if (this->running){
22              std::lock_guard<std::mutex> lock(this->world.getMutex());
23              if (!this->weapon.isDead()){
24                  this->weapon.explode();
25                  this->world.removeTimedWeapon(this->weapon);
26              }
27          }
28      }
29  }
```

```cpp
1   #ifndef __WEAPONEXPLODETIME_H__
2   #define __WEAPONEXPLODETIME_H__
3
4   #include "Thread.h"
5   #include <mutex>
6
7   class Weapon;
8   class World;
9
10  class WeaponExplodeTime: public Thread{
11      private:
12          Weapon& weapon;
13          World& world;
14          int time;
15
16      public:
17          WeaponExplodeTime(World& world, Weapon& weapon);
18          ~WeaponExplodeTime();
19
20          //Setea el tiempo de explosion
21          void setTime(int time);
22
23          //Cuenta el tiempo que falta para que el arma explote
24          void run() override;
25  };
26
27  #endif
```

```cpp
1   #include "WeaponFactory.h"
2   #include "WeaponNames.h"
3   #include <string>
4
5   #include "Bazooka.h"
6   #include "Dynamite.h"
7   #include "RedGrenade.h"
8   #include "RedGrenadeFragment.h"
9   #include "GreenGrenade.h"
10  #include "HolyGrenade.h"
11  #include "Banana.h"
12  #include "Teleportation.h"
13  #include "AirAttack.h"
14  #include "AirAttackMissile.h"
15  #include "Mortar.h"
16  #include "MortarFragment.h"
17  #include "Bat.h"
18
19  WeaponFactory::WeaponFactory(World& world, GameParameters& parameters):
20      world(world), parameters(parameters){}
21
22  WeaponFactory::~WeaponFactory(){}
23
24  physical_object_ptr WeaponFactory::getWeapon(const std::string& name){
25      if (name == BAZOOKA_NAME){
26          return physical_object_ptr(new Bazooka(world, parameters));
27      } else if (name == DYNAMITE_NAME){
28          return physical_object_ptr(new Dynamite(world, parameters));
29      } else if (name == RED_GRENADE_NAME){
30          return physical_object_ptr(new RedGrenade(world, parameters));
31      } else if (name == RED_GRENADE_FRAGMENTS_NAME){
32          return physical_object_ptr(new RedGrenadeFragment(world, parameters));
33      } else if (name == GREEN_GRENADE_NAME){
34          return physical_object_ptr(new GreenGrenade(world, parameters));
35      } else if (name == HOLY_GRENADE_NAME){
36          return physical_object_ptr(new HolyGrenade(world, parameters));
37      } else if (name == MORTAR_NAME){
38          return physical_object_ptr(new Mortar(world, parameters));
39      } else if (name == MORTAR_FRAGMENTS_NAME){
40          return physical_object_ptr(new MortarFragment(world, parameters));
41      } else if (name == BANANA_NAME){
42          return physical_object_ptr(new Banana(world, parameters));
43      } else if (name == BAT_NAME){
44          return physical_object_ptr(new Bat(world, parameters));
45      } else if (name == TELEPORT_NAME){
46          return physical_object_ptr(new Teleportation(world, parameters));
47      } else if (name == AIR_ATTACK_NAME){
48          return physical_object_ptr(new AirAttack(world, parameters));
49      } else if (name == AIR_ATTACK_MISSILE_NAME){
50          return physical_object_ptr(new AirAttackMissile(world, parameters));
51      }
52
53      throw std::runtime_error(name + ": El arma no existe.");
54  }
```

```
1   #ifndef __WEAPONFACTORY_H__
2   #define __WEAPONFACTORY_H__
3
4   #include "World.h"
5   #include "GameParameters.h"
6   #include <string>
7
8   class WeaponFactory{
9       private:
10          World& world;
11          GameParameters& parameters;
12
13      public:
14          WeaponFactory(World& world, GameParameters& parameters);
15          ~WeaponFactory();
16
17          //Devuelve el arma pedida
18          physical_object_ptr getWeapon(const std::string& name);
19  };
20
21  #endif
```

```
1   #ifndef __WEAPON_H__
2   #define __WEAPON_H__
3
4   #include "PhysicalObject.h"
5   #include "GameParameters.h"
6   #include "World.h"
7   #include "WeaponExplodeTime.h"
8   #include <string>
9   #include "WeaponNames.h"
10  #include "RayCastWeaponExploded.h"
11
12  class Worm;
13
14  class Weapon: public PhysicalObject{
15      protected:
16          GameParameters& parameters;
17          int damage;
18          int radius;
19          bool waiting_to_explode;
20          int time_to_explode;
21          float angle;
22          float power;
23          int shooter_id;
24          WeaponExplodeTime explode_time;
25          RayCastWeaponExploded explosion;
26
27          virtual void createFixtures() override;
28          virtual void setInitialVelocity() override;
29
30          //Ataca a los gusanos en el radio de explosion
31          void attackWormExplosion(const b2Vec2& center, int angle);
32
33      public:
34          static int weapon_id;
35
36          Weapon(World& world, GameParameters& parameters, int damage, int radius
    = 0);
37          virtual ~Weapon();
38
39          //Devuelve true si el arma esta en movimiento o esperando para explotar
40          bool isActive() override;
41
42          //Carga los datos para disparar el arma
43          virtual void shoot(char dir, int angle, int power, int time, int shooter
    _id);
44
45          //Dispara un arma teledirigida
46          virtual void shoot(Worm& shooter, b2Vec2 pos);
47
48          //Explota el arma
49          virtual void explode();
50
51          //Establece la accion a realizar cuando el arma colisiona
52          virtual void collideWithSomething(CollisionData *other) override;
53
54          void getBodyDef(b2BodyDef& body_def, const b2Vec2& pos) override;
55
56          //Devuelve el nombre del arma
57          virtual const std::string& getName() = 0;
58
59          //Devuelve el id del tirador
60          int getShooterId() const;
61
62          //Remueve el id del tirador
63          void removeShooterId();
64  };
```

```
65
66  #endif
```

```cpp
1   #include "Worm.h"
2   #include "b2CircleShape.h"
3   #include "b2PolygonShape.h"
4   #include "b2Fixture.h"
5   #include "Protocol.h"
6   #include "WeaponFactory.h"
7   #include "Girder.h"
8   #include "Math.h"
9   #include <algorithm>
10  #include <string>
11
12  Worm::Worm(World& world, GameParameters& parameters,
13                          int id, int player_id, WeaponList& weapons):
14      PhysicalObject(world, id, TYPE_WORM), player_id(player_id),
15      life(parameters.getWormLife()),
16      dir(1), parameters(parameters), weapons(weapons), max_height(0),
17      colliding_with_girder(0), friction(0),
18      movement_allowed(false), angle(0), has_shot(false), damage_received(false){}
19
20  Worm::~Worm(){}
21
22  void Worm::getBodyDef(b2BodyDef& body_def, const b2Vec2& pos){
23      body_def.type = b2_dynamicBody;
24      body_def.position.Set(pos.x, pos.y);
25  }
26
27  void Worm::createFixtures(){
28      b2CircleShape circleShape;
29      circleShape.m_p.Set(0, 0);
30      circleShape.m_radius = worm_size / 2;
31
32      b2FixtureDef fixtureDef;
33      fixtureDef.shape = &circleShape;
34      fixtureDef.density = 10;
35      this->body->CreateFixture(&fixtureDef);
36      this->body->SetFixedRotation(true);
37
38      //Sensor para colisiones
39      b2PolygonShape sensorShape;
40      sensorShape.SetAsBox(worm_size * 0.5 * 0.7, worm_size / 5,
41                                      b2Vec2(0, -1 * worm_size / 2), 0);
42
43      b2FixtureDef sensorFixtureDef;
44      sensorFixtureDef.shape = &sensorShape;
45      sensorFixtureDef.isSensor = true;
46      this->body->CreateFixture(&sensorFixtureDef);
47  }
48
49  int Worm::getPlayerId() const{
50      return this->player_id;
51  }
52
53  int Worm::getLife() const{
54      return this->life;
55  }
56
57  char Worm::getDir() const{
58      return this->dir;
59  }
60
61  bool Worm::isColliding() const{
62      return this->colliding_with_girder && !this->movement_allowed;
63  }
64
65  const std::string& Worm::getCurrentWeapon() const{
66      physical_object_ptr weapon = weapons.getCurrentWeapon(world, parameters);
```

```
67         return ((Weapon*)weapon.get())->getName();
68     }
69
70     void Worm::addLife(int life){
71         this->life += life;
72     }
73
74     void Worm::reduceLife(size_t damage){
75         this->life -= damage;
76         this->damage_received = true;
77         this->data_updated = true;
78         if (this->life <= 0){
79             this->life = 0;
80             this->is_dead = true;
81         }
82     }
83
84     bool Worm::move(char action){
85         if (!this->colliding_with_girder || this->movement_allowed){
86             return false;
87         }
88         this->movement_allowed = false;
89         if (action == MOVE_RIGHT){
90             this->dir = action;
91             b2Vec2 velocity(parameters.getWormVelocity(), 0);
92             this->world.setLinearVelocity(*this, velocity);
93         } else if (action == MOVE_LEFT){
94             this->dir = action;
95             b2Vec2 velocity(-1 * parameters.getWormVelocity(), 0);
96             this->world.setLinearVelocity(*this, velocity);
97         } else {
98             this->movement_allowed = true;
99             if (action == JUMP){
100                b2Vec2 velocity(parameters.getWormJumpVelocity(),
101                                              parameters.getWormJumpHeight());
102                velocity.x *= this->dir;
103                this->world.setLinearVelocity(*this, velocity);
104            } else if (action == ROLLBACK){
105                b2Vec2 velocity(parameters.getWormRollbackVelocity(),
106                                              parameters.getWormRollbackHeight());
107                velocity.x *= -1 * this->dir;
108                this->world.setLinearVelocity(*this, velocity);
109            }
110        }
111        return true;
112    }
113
114    void Worm::shoot(int angle, int power, int time){
115        if (!this->weapons.shoot()){
116            return;
117        }
118        b2Vec2 pos = this->getPosition();
119        int shooter_id = this->id;
120        float x_add = (worm_size * this->dir);;
121        float y_add = worm_size;
122        if (angle > MAX_WEAPON_ANGLE){
123            shooter_id = -1;
124            x_add *= Math::cosDegrees(this->angle);
125            y_add *= Math::sinDegrees(this->angle);
126        } else {
127            float factor = (this->getCurrentWeapon() == BAT_NAME ? 0.2 : 0.7);
128            x_add *= Math::cosDegrees(angle) * factor;
129            y_add *= Math::sinDegrees(angle) * factor;
130        }
131        pos.x += x_add;
132        pos.x += x_add;
```

```
133        pos.y += y_add;
134
135        physical_object_ptr weapon = weapons.getCurrentWeapon(world, parameters);
136        ((Weapon*)weapon.get())->shoot(this->dir, angle, power, time, shooter_id);
137        this->world.addObject(weapon, pos);
138        this->has_shot = true;
139    }
140
141    void Worm::shoot(b2Vec2 pos){
142        if (!this->weapons.shoot()){
143            return;
144        }
145        physical_object_ptr weapon = weapons.getCurrentWeapon(world, parameters);
146        ((Weapon*)weapon.get())->shoot(*this, pos);
147        this->has_shot = true;
148    }
149
150    void Worm::receiveWeaponDamage(int damage, const b2Vec2 &epicenter){
151        this->reduceLife(damage);
152        b2Vec2 direction = this->body->GetPosition() - epicenter;
153        direction.Normalize();
154        this->body->SetGravityScale(1);
155        this->movement_allowed = true;
156        this->body->SetLinearVelocity(
157                    damage * parameters.getWormExplosionVelocity() * direction);
158    }
159
160    void Worm::collideWithSomething(CollisionData *other){
161        if (other->getType() == TYPE_BORDER){
162            this->kill();
163        } else if (other->getType() == TYPE_GIRDER){
164            int min_height = parameters.getWormHeightToDamage();
165            float current_height = this->body->GetPosition().y;
166            this->max_height -= current_height;
167
168            if (this->max_height >= min_height){
169                this->reduceLife(std::min((int) this->max_height - min_height + 1,
170                                              parameters.getWormMaxHeightDamag
    e()));
171            }
172            this->max_height = 0;
173            this->colliding_with_girder ++;
174            Girder* girder = (Girder*)other->getObject();
175            if (girder->hasFriction()){
176                this->friction++;
177                this->movement_allowed = false;
178                this->angle = girder->getAngle();
179            }
180        }
181    }
182
183    void Worm::endCollissionGirder(char has_friction){
184        this->friction -= has_friction;
185        this->colliding_with_girder --;
186        if (this->friction <= 0){
187            this->friction = 0;
188            this->body->SetGravityScale(1);
189            this->angle = 0;
190        }
191    }
192
193    bool Worm::isActive(){
194        if (!this->colliding_with_girder){
195            float height = this->body->GetPosition().y;
196            this->max_height = std::max(this->max_height, height);
197        } else if (this->friction && !this->movement_allowed){
```

```cpp
198             this->body->SetGravityScale(0);
199             this->body->SetLinearVelocity(b2Vec2(0, 0));
200         }
201         if (!this->body->IsAwake()){
202             this->movement_allowed = false;
203         } else if (!this->friction){
204             this->movement_allowed = true;
205         }
206         return PhysicalObject::isActive();
207 }
208
209 bool Worm::hasShot() const{
210     return this->has_shot;
211 }
212
213 bool Worm::damageReceived() const{
214     return this->damage_received || this->is_dead;
215 }
216
217 void Worm::beginTurn(){
218     this->has_shot = false;
219     this->damage_received = false;
220 }
```

```cpp
1   #ifndef __WORM_H__
2   #define __WORM_H__
3
4   #include "PhysicalObject.h"
5   #include "GameParameters.h"
6   #include "Weapon.h"
7   #include "WeaponList.h"
8   #include <string>
9
10  class Worm: public PhysicalObject{
11      private:
12          int player_id;
13          int life;
14          char dir;
15          GameParameters& parameters;
16          WeaponList& weapons;
17          float max_height;
18          int colliding_with_girder;
19          int friction;
20          bool movement_allowed;
21          int angle;
22
23          bool has_shot;
24          bool damage_received;
25
26      protected:
27          void getBodyDef(b2BodyDef& body_def, const b2Vec2& pos) override;
28          void createFixtures() override;
29
30      public:
31          Worm(World& world, GameParameters& parameters,
32                      int id, int player_id, WeaponList& weapons);
33          ~Worm();
34
35          //Devuelve el id del jugador
36          int getPlayerId() const;
37
38          //Devuelve la vida del worm
39          int getLife() const;
40
41          //Devuelve la direccion del worm
42          char getDir() const;
43
44          //Devuelve true si esta colisionando
45          bool isColliding() const;
46
47          //Devuelve el arma actual
48          const std::string& getCurrentWeapon() const;
49
50          //Aumenta la vida del gusano
51          void addLife(int life);
52
53          //Reduce la vida del gusano
54          void reduceLife(size_t damage);
55
56          //Ejecuta una accion de movimiento del gusano
57          bool move(char action);
58
59          //Dispara un arma no teledirigida
60          void shoot(int angle, int power, int time);
61
62          //Dispara un arma teledirigida
63          void shoot(b2Vec2 pos);
64
65          //Analiza la colision con el objeto
66          void collideWithSomething(CollisionData *other) override;
```

```
67
68        //Analiza el fin del contacto con una viga
69        void endCollissionGirder(char friction);
70
71        //Recibe danio de un arma o una explosion
72        void receiveWeaponDamage(int damage, const b2Vec2 &epicenter);
73
74        //Devuelve true si el gusano esta en movimiento
75        bool isActive() override;
76
77        //Devuelve true si el gusano disparo
78        bool hasShot() const;
79
80        //Devuelve true si el gusano recibio danio
81        bool damageReceived() const;
82
83        //Empieza el turno del gusano
84        void beginTurn();
85   };
86
87   #endif
```

```
1    #include "Wind.h"
2    #include <random>
3
4    Wind::Wind(GameParameters& parameters):
5        min_velocity(parameters.getWindMinVelocity()),
6        max_velocity(parameters.getWindMaxVelocity()){
7            this->update();
8        }
9
10   Wind::~Wind(){}
11
12   float Wind::getVelocity() const{
13       return this->velocity;
14   }
15
16   void Wind::update(){
17       std::mt19937 rng;
18       rng.seed(std::random_device()());
19       std::uniform_real_distribution<float> dist(min_velocity, max_velocity);
20       std::uniform_int_distribution<int> direction(-1, 1); //Acepto velocidad 0
21
22       this->velocity = dist(rng);
23       this->velocity *= direction(rng);
24   }
```

Wind.h

```cpp
1   #ifndef __WIND_H__
2   #define __WIND_H__
3
4   #include "GameParameters.h"
5
6   class Wind{
7       private:
8           float min_velocity;
9           float max_velocity;
10          float velocity;
11
12      public:
13          explicit Wind(GameParameters& parameters);
14          ~Wind();
15
16          //Devuelve la velocidad del viento
17          float getVelocity() const;
18
19          //Actualiza la velocidad del viento
20          void update();
21  };
22
23  #endif
24
```

World.cpp

```cpp
1   #include "World.h"
2   #include "Weapon.h"
3   #include "BottomBorder.h"
4   #include "b2WorldCallbacks.h"
5   #include "Fragment.h"
6   #include <list>
7
8   World::World(GameParameters& parameters):
9       world(b2Vec2(0, parameters.getGravity())),
10      wind(parameters), is_active(true),
11      sleep_time(parameters.getWorldSleepAfterStep()),
12      time_step(parameters.getWorldTimeStep()){
13          this->world.SetAllowSleeping(true);
14          this->world.SetContinuousPhysics(true);
15          this->world.SetContactListener(&this->collision_listener);
16          this->world.SetContactFilter(&this->collision_listener);
17          this->initialize();
18  }
19
20  World::~World(){}
21
22  void World::run(){
23      int32 velocityIterations = 8;   //how strongly to correct velocity
24      int32 positionIterations = 3;   //how strongly to correct position
25
26      while(this->running){
27          std::this_thread::sleep_for(std::chrono::milliseconds(this->sleep_time))
    ;
28
29          this->addAllFragments();
30
31          std::lock_guard<std::mutex> lock(this->mutex);
32
33          this->world.Step(this->time_step, velocityIterations, positionIterations
    );
34
35          this->is_active = false;
36          for (physical_object_ptr& object: this->objects){
37              if (object->isDead()){
38                  this->removeObject(object);
39              } else if (object->isActive()){
40                  this->is_active = true;
41                  b2Body* body = object->getBody();
42                  if (body && object->isWindAffected()){
43                      body->ApplyForceToCenter(b2Vec2(this->wind.getVelocity(), 0)
    , false);
44                  }
45              }
46          }
47      }
48  }
49
50  void World::addAllFragments(){
51      std::lock_guard<std::mutex> lock(this->mutex);
52      for (physical_object_ptr& fragment: this->fragments_to_add){
53          b2BodyDef body_def;
54          b2Vec2 pos = ((Fragment *) fragment.get())->getShootPosition();
55          fragment->getBodyDef(body_def, pos);
56          this->initializeObject(fragment, &body_def);
57      }
58      this->fragments_to_add.clear();
59  }
60
61  bool World::isActive(){
62      std::lock_guard<std::mutex> lock(this->mutex);
63      return this->is_active;
```

```
64   }
65
66   void World::update(){
67       std::lock_guard<std::mutex> lock(this->mutex);
68       this->wind.update();
69   }
70
71   void World::addObject(physical_object_ptr object, const b2Vec2& pos){
72       b2BodyDef body_def;
73       object->getBodyDef(body_def, pos);
74
75       std::lock_guard<std::mutex> lock(this->mutex);
76       this->initializeObject(object, &body_def);
77   }
78
79   void World::initializeObject(physical_object_ptr object, b2BodyDef* body_def){
80       object->initializeBody(this->world.CreateBody(body_def));
81       if (body_def->type != b2_staticBody){
82           this->objects.push_back(object);
83       } else {
84           this->girders.push_back(object);
85       }
86   }
87
88   void World::addWeaponFragment(physical_object_ptr fragment){
89       this->fragments_to_add.push_back(fragment);
90   }
91
92   void World::removeTimedWeapon(Weapon& weapon){
93       b2Body* body = weapon.getBody();
94       if (body){
95           this->world.DestroyBody(body);
96           weapon.destroyBody();
97       }
98   }
99
100  void World::removeObject(physical_object_ptr object){
101      b2Body* body = object->getBody();
102      if (body){
103          this->world.DestroyBody(body);
104          object->destroyBody();
105      }
106  }
107
108  void World::initialize(){
109      physical_object_ptr bottom_border(new BottomBorder(*this));
110      this->addObject(bottom_border, b2Vec2(0, 0));
111  }
112
113  void World::setLinearVelocity(PhysicalObject& object, b2Vec2& velocity){
114      std::lock_guard<std::mutex> lock(this->mutex);
115      b2Body* body = object.getBody();
116      if (body){
117          body->SetGravityScale(1);
118          body->SetLinearVelocity(velocity);
119      }
120  }
121
122  b2Body* World::getClosestObject(RayCastWeaponExploded* callback,
123                                              b2Vec2 center, b2Vec2 end){
124      this->world.RayCast(callback, center, end);
125      return callback->getClosestWorm();
126  }
127
128  float World::getWind() const{
129      return this->wind.getVelocity();
```

```
130  }
131
132  std::list<physical_object_ptr>& World::getObjectsList(){
133      return this->objects;
134  }
135
136  std::list<physical_object_ptr>& World::getGirdersList(){
137      return this->girders;
138  }
139
140  std::mutex& World::getMutex(){
141      return this->mutex;
142  }
```

```
1   #ifndef __WORLD_H__
2   #define __WORLD_H__
3
4   #include "Thread.h"
5   #include "b2World.h"
6   #include "b2Body.h"
7   #include "PhysicalObject.h"
8   #include "CollisionListener.h"
9   #include "RayCastWeaponExploded.h"
10  #include "Wind.h"
11  #include <mutex>
12  #include <list>
13
14  class Weapon;
15
16  class World: public Thread{
17      private:
18          b2World world;
19          Wind wind;
20          std::mutex mutex;
21          CollisionListener collision_listener;
22          std::list<physical_object_ptr> objects;
23          std::list<physical_object_ptr> girders;
24          std::list<physical_object_ptr> fragments_to_add;
25          bool is_active;
26          int sleep_time;
27          float time_step;
28
29          //Inicializa el mundo
30          void initialize();
31
32          //Remueve un objeto del mundo
33          void removeObject(physical_object_ptr object);
34
35          //Inicializa un objeto recien agregado al mundo
36          void initializeObject(physical_object_ptr object, b2BodyDef* body_def);
37
38          //Agrega todos los fragmentos de armas al mundo
39          void addAllFragments();
40
41      public:
42          explicit World(GameParameters& parameters);
43          ~World();
44
45          void run() override;
46
47          //Agrega el objeto al mundo en la posicion indicada
48          void addObject(physical_object_ptr object, const b2Vec2& pos);
49
50          //Agrega un fragmento de arma
51          void addWeaponFragment(physical_object_ptr fragment);
52
53          //Elimina una arma del mundo
54          void removeTimedWeapon(Weapon& weapon);
55
56          //Setea la velocidad de un objeto
57          void setLinearVelocity(PhysicalObject& object, b2Vec2& velocity);
58
59          //Devuelve true si alguno de los objetos esta en movimiento
60          bool isActive();
61
62          //Actualiza el mundo
63          void update();
64
65          //Devuelve la velocidad del viento
66          float getWind() const;
```

```
67
68          //Devuelve el objeto mas cercano entre al centro en la direccion end - c
    enter
69          b2Body* getClosestObject(RayCastWeaponExploded* callback,
70                                   b2Vec2 center, b2Vec2 end);
71
72          //Devuelve la lista de objetos
73          std::list<physical_object_ptr>& getObjectsList();
74
75          //Devuelve la lista de vigas
76          std::list<physical_object_ptr>& getGirdersList();
77
78          //Devuelve el mutex
79          std::mutex& getMutex();
80  };
81
82
83  #endif
```

```cpp
1   #include "Server.h"
2   #include "yaml.h"
3   #include "ConfigFields.h"
4   #include "Path.h"
5   #include <iostream>
6   #include <string>
7   #include <mutex>
8
9   #define EXIT_CHAR 'q'
10
11  int main(int argc, const char* argv[]){
12      std::mutex mutex_cout;
13      try{
14          YAML::Node config(YAML::LoadFile(SERVER_CONFIG_FILE));
15          Server server(config[SERVER_PORT].as<std::string>(), mutex_cout);
16          std::cout << "[LOG] Server iniciado." << std::endl;
17          server.start();
18          while (std::cin.get() != EXIT_CHAR){}
19          {
20              std::lock_guard<std::mutex> lock(mutex_cout);
21              std::cout << "[LOG] Comenzando el cierre del servidor." << std::endl;
22          }
23          server.stop();
24          server.join();
25      } catch(const std::exception& e){
26          std::lock_guard<std::mutex> lock(mutex_cout);
27          std::cout << "[ERROR] " << e.what() << std::endl;
28      }
29      return 0;
30  }
```

Table of Contents