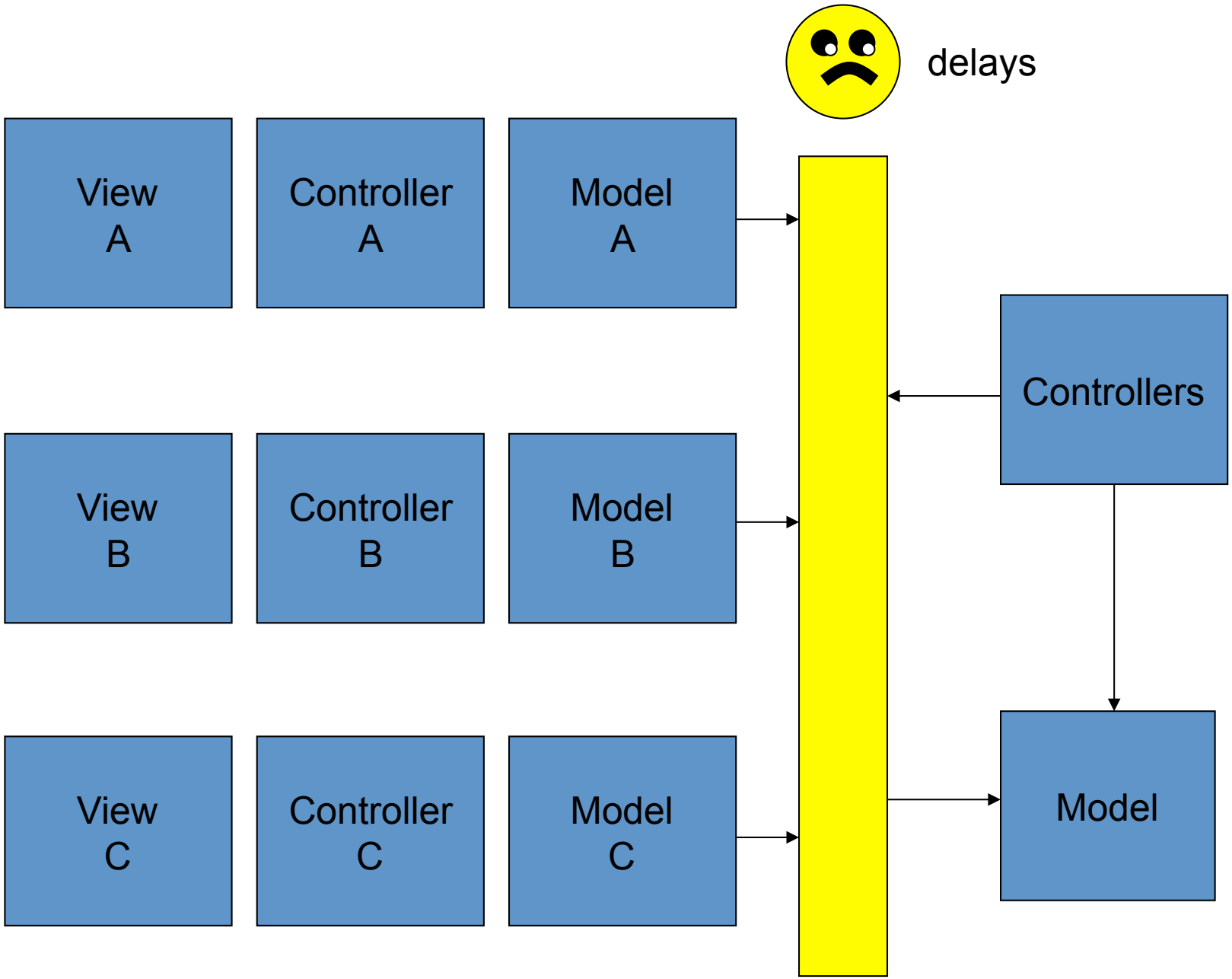
G54GAM - Games

- Multiplayer Games


delays
View A
Controller A
Model A
View B
Controller B
Model B
View C
Controller C
Model C
Controllers
Model

Lag

- Network delays lead to logical Inconsistencies
- A player shoots at another player
  - The player/client thinks they hit
  - The **fire** command takes some time to get to the server
  - The server thinks the player missed
- Two players try to pick up the same gold
  - We both arrived at the gold at the same time
  - Who picked up the gold?
  - We both did, we both saw that we did
  - Who gets to keep it?

Lag

- Implementation needs to have
  - Speed (otherwise it feels slow and jerky)
  - Synchronisation (to avoid logical inconsistencies)
  - Not use too much bandwidth (remember dial-up)
  - Cope with packet loss
- Client prediction
- Entity interpolation
- Lag compensation

Entity Interpolation

- Client is responsible for frame-to-frame movement simulation and rendering
  - X is moving at speed Y with direction Z, so move it a bit
  - 100Hz
- Server is responsible for the bigger picture, the context and the consequences
  - X has picked up the gold, Y hasn't
  - X has fired a gun and hit Y
  - X has pressed UP so start them moving
  - 20Hz

Lag Compensation

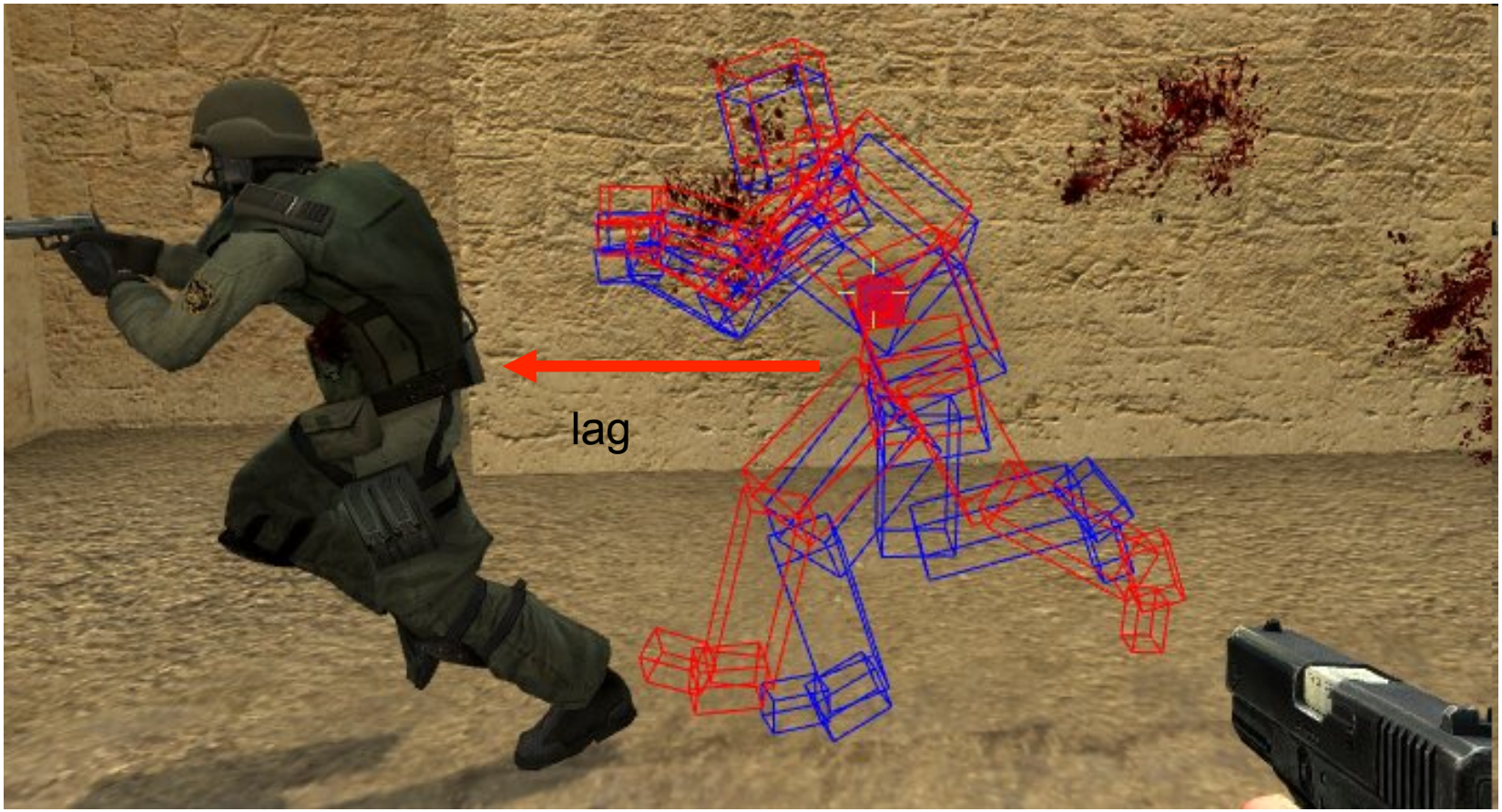
- Dead Reckoning
  - X is moving at speed Y
  - We haven't received a snapshot but need to draw a frame, so move it a bit ourselves
  - It's likely that X will continue to move at speed Y because there's nothing near it
  - …allows smoother graphics than the network allows
- Deltas
  - Only tell the client what has changed, rather than send the full model snapshot
  - Send full snapshot after a network delay so that the client gets back in sync
  - …reduces bandwidth use

Client Prediction

- The player pressed up
- Send the command to the server controller
- While we're waiting for the updated snapshot, start moving anyway
- Rewind if we got it wrong
- …the game feels more responsive than the network allows

Server-side Lag Compensation

- The server keeps a record of current round-trip-time for all the clients (time for a packet to travel from client->server->client)
- Remember where everything was up to a second ago
- When a new command is received, estimate when it was **sent** rather than when it was **received**
- Use a historical snapshot of the model to work out what happened
- …the command is executed hopefully as if there was no lag


lag

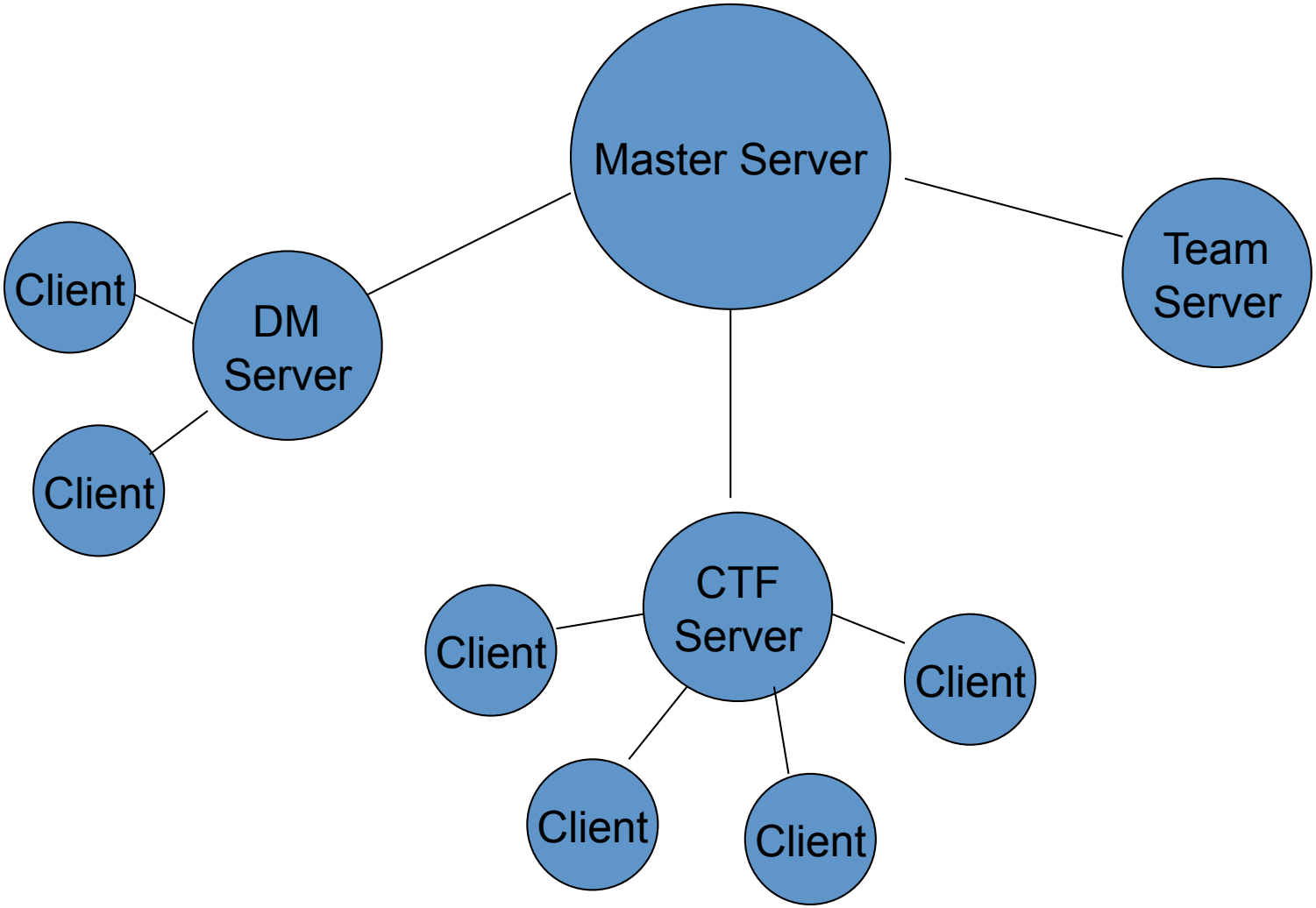
Scalability

- Basic client server model
  - Is reasonable for small numbers of players
- Second Life
  - 15 million registered accounts
  - Average 10000 players at any one time?
- World of Warcraft
  - 11 million paying subscribers

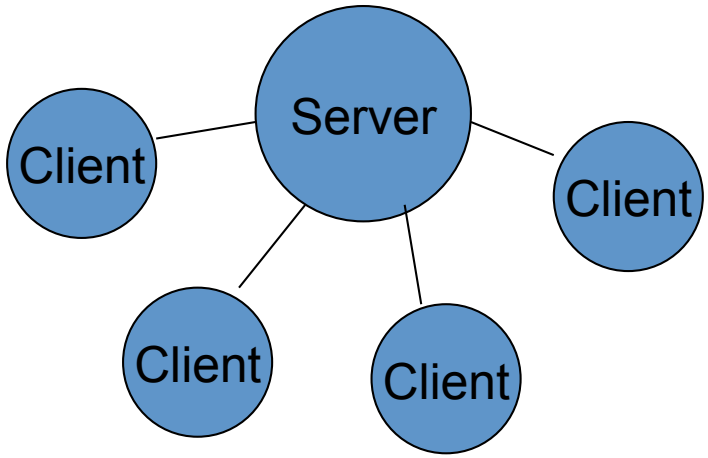
Scalability

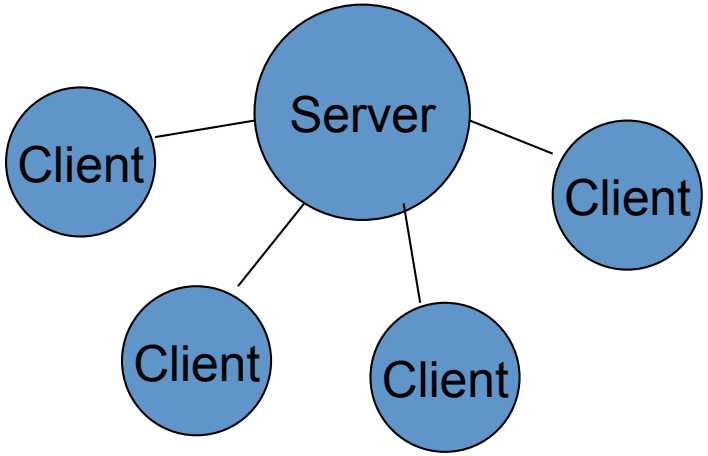
- Moderated Awareness
  - Server(s) maintains the complete model for all players
  - Client receives only a subset of the model relevant to the player
  - Where the player is and what is nearby
- Lobbies
  - A master server maintains a browse-able list of all active servers that a player can join
- Instances
  - Multiple identical instances of the server model
  - Each player inhabits only one
  - Create new instances as required
- …can make the game bigger by adding more server hardware, does not affect the clients

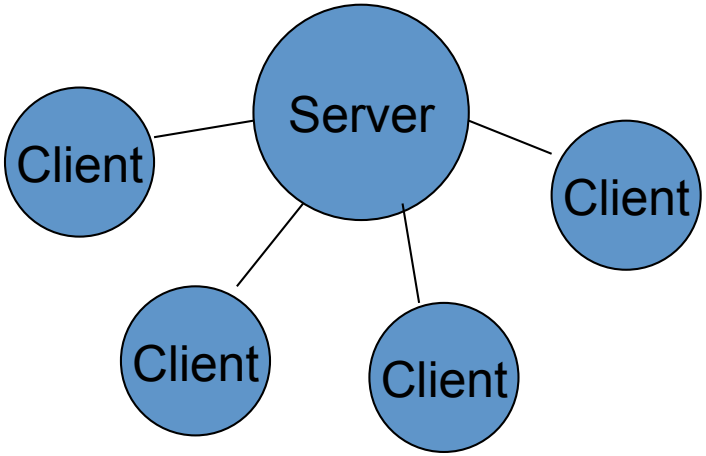
Lobby

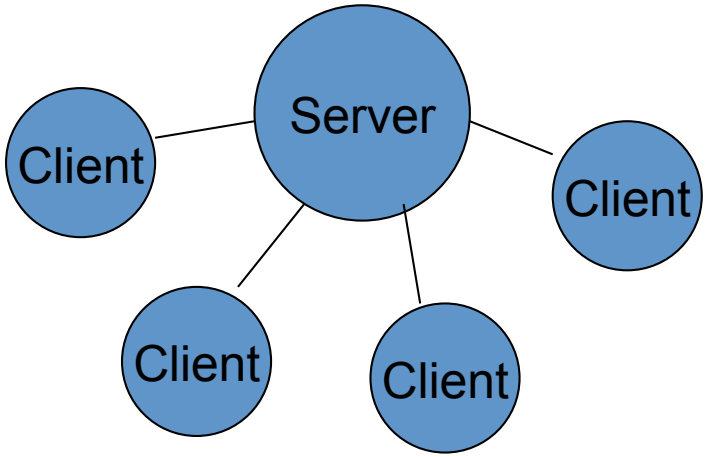

Master Server
Team Server
Client
DM Server
Client
CTF Server
Client
Client
Client
Client

Instances

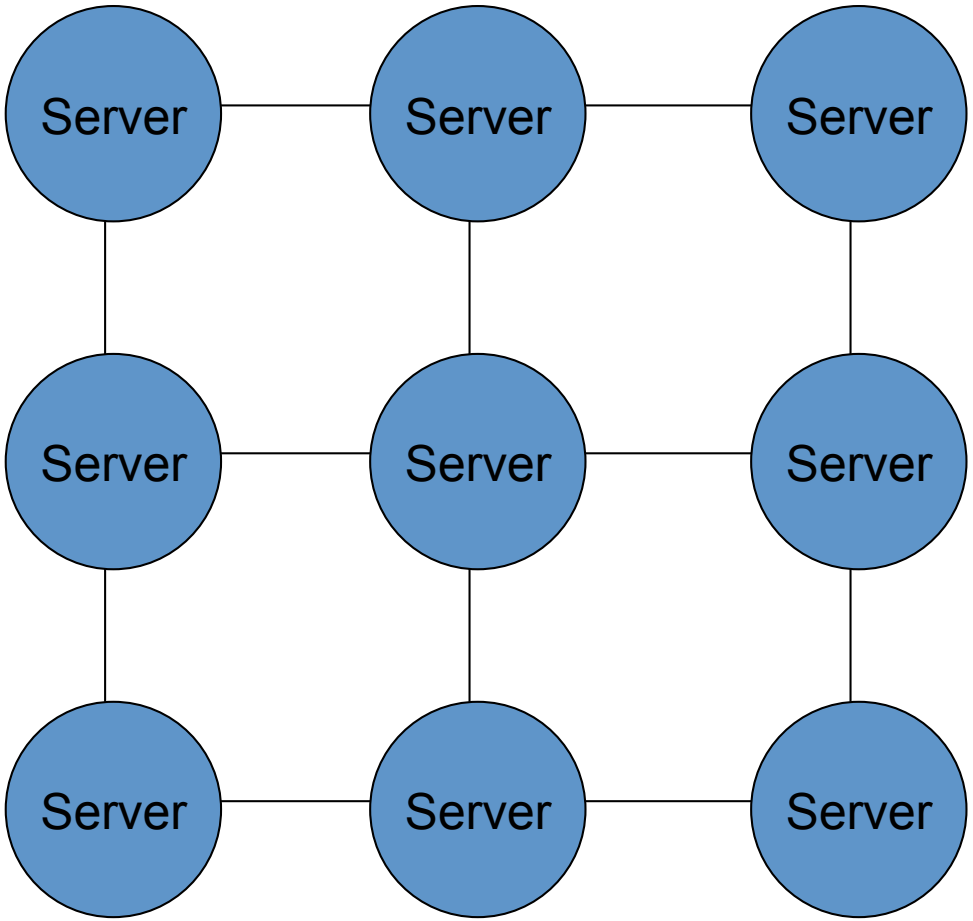

Server
Client
Client
Client
Client

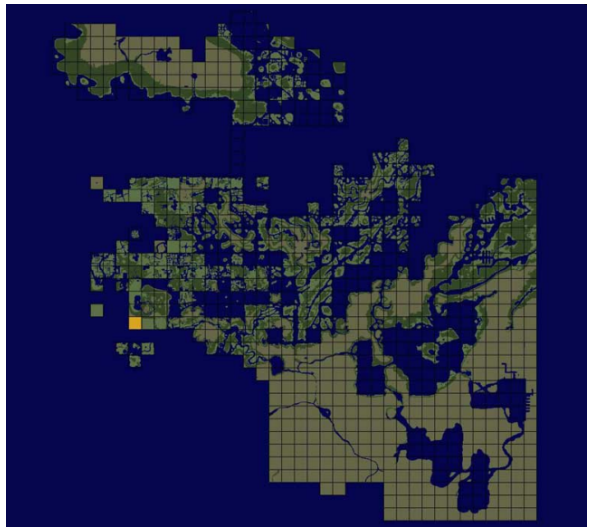

Server
Client
Client
Client
Client


Server
Client
Client
Client
Client


Server
Client
Client
Client
Client

Second Life Grid





Social Challenges

Different Attitudes to the Game

- Degree of lusory attitude
  - Taking pleasure in playing the game
  - Accepting that rules lead to limitations
  - Accepting the rules as play is an end in itself
- Relationship to the rules
  - How much the player adheres to the rules
    - Operational – the formal rules
    - Implicit – the social rules
  - Acknowledges the authority of the rules
    - Can/should they be broken?
- Interest in winning
  - How much the player wants to win

Types of Players

- Standard Player
  - Possesses lusory attitude
  - Acknowledges authority of the rules
  - Typical interest in winning
- Dedicated Player
- Unsportsmanlike Player
- Cheat
- Spoil-Sport

Types of Players

- Standard Player
- Dedicated Player
  - Extra-zealous lusory attitude
  - Special interest in understanding and mastering the rules
  - Intense interest in winning
- Unsportsmanlike Player
- Cheat
- Spoil-Sport

Types of Players

- Standard Player
- Dedicated Player
- Unsportsmanlike Player
  - Sometimes dedicated, sometimes a cheat
  - Adheres to operational rules, violates implicit rules
  - Intense interest in winning
- Cheat
- Spoil-Sport

Types of Players

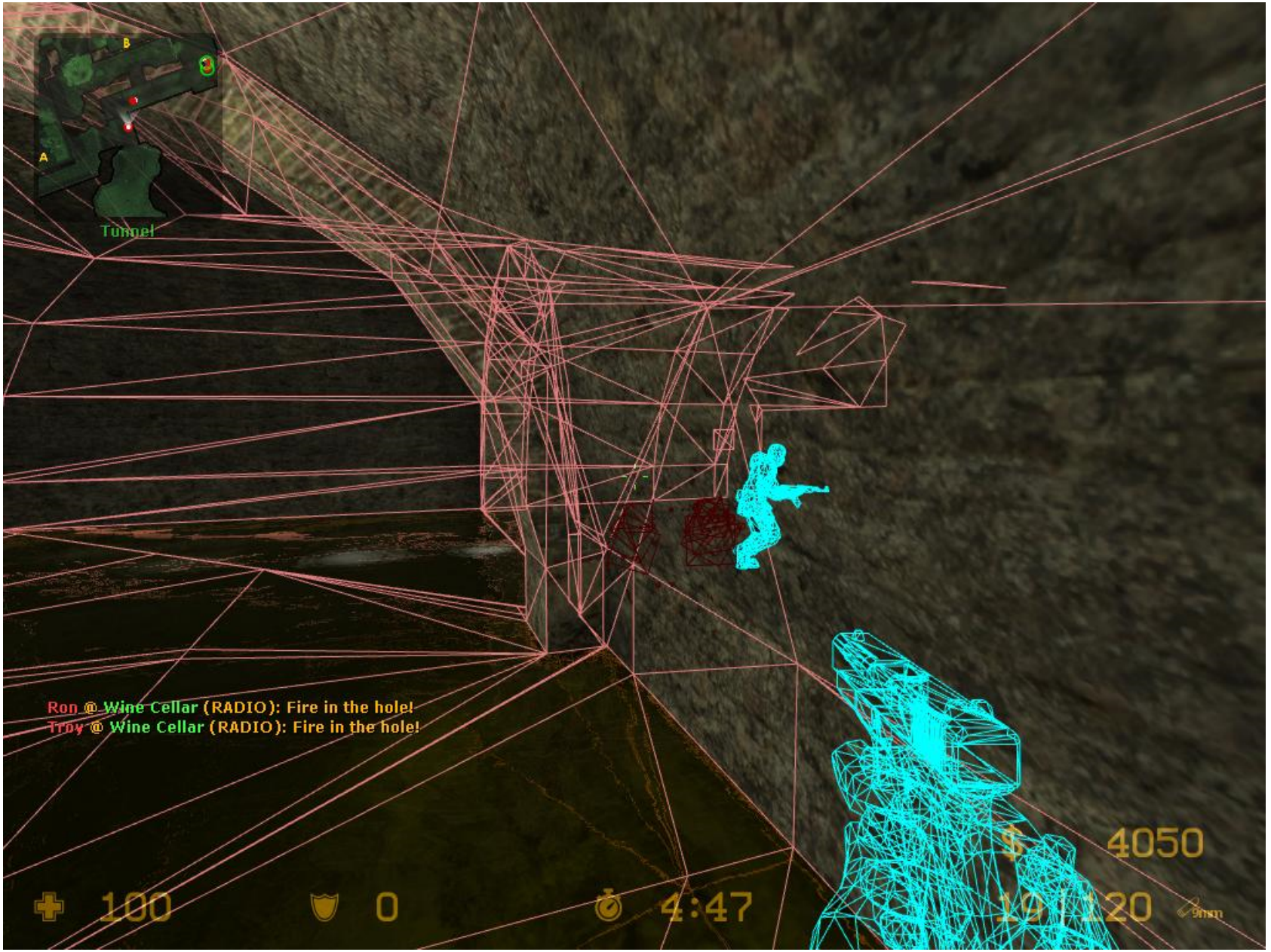
- Standard Player
- Dedicated Player
- Unsportsmanlike Player
- Cheat
  - Pretends to possess lusory attitude
  - Violates operational rules in secret
  - Intense interest in winning
- Spoil-Sport

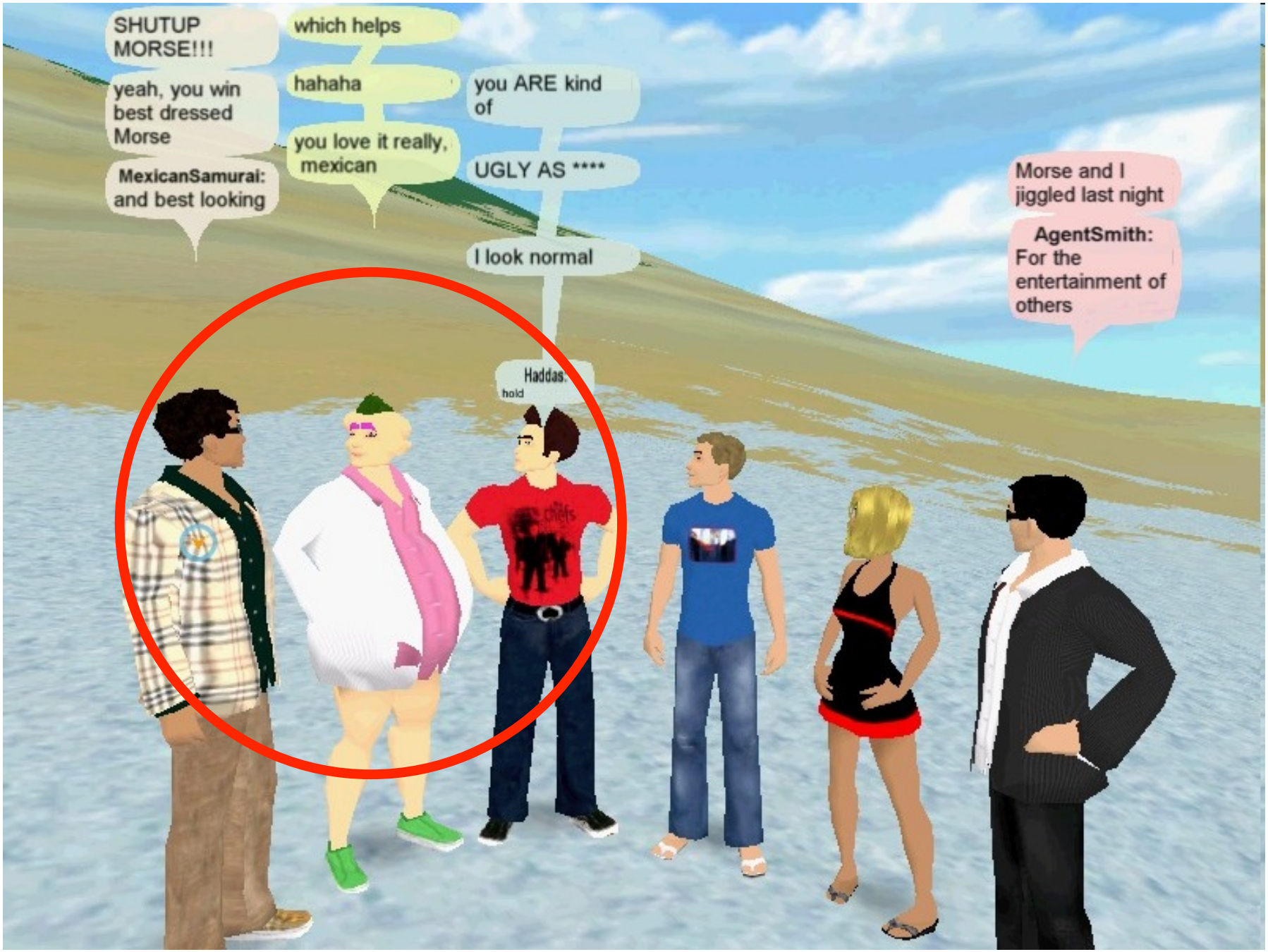
Types of Players

- Standard Player
- Dedicated Player
- Unsportsmanlike Player
- Cheat
- Spoil-Sport / Griefer
  - No pretense about lack of lusory attitude
  - No interest in adhering to any rules
  - No interest in winning

Breaking the Rules

- A big problem in online games
- Making use of dominant strategies in order to win
  - Standard player vs dedicated player
  - Trick jumping, camping, weapon imbalances, short cuts
- Breaking operational rules
  - Hacking the client
  - Using bots to automate play
- Breaking implicit rules
  - Multiple concurrent sessions
  - Killing team members / Spying for the other team
  - Subverting game economy (“gold farming”)
  - Disrupting the play of other players


B
A
Tunnel
Ron @ Wine Cellar (RADIO): Fire in the hole!
Troy @ Wine Cellar (RADIO): Fire in the hole!
100
0
4:47
$ 4050
20

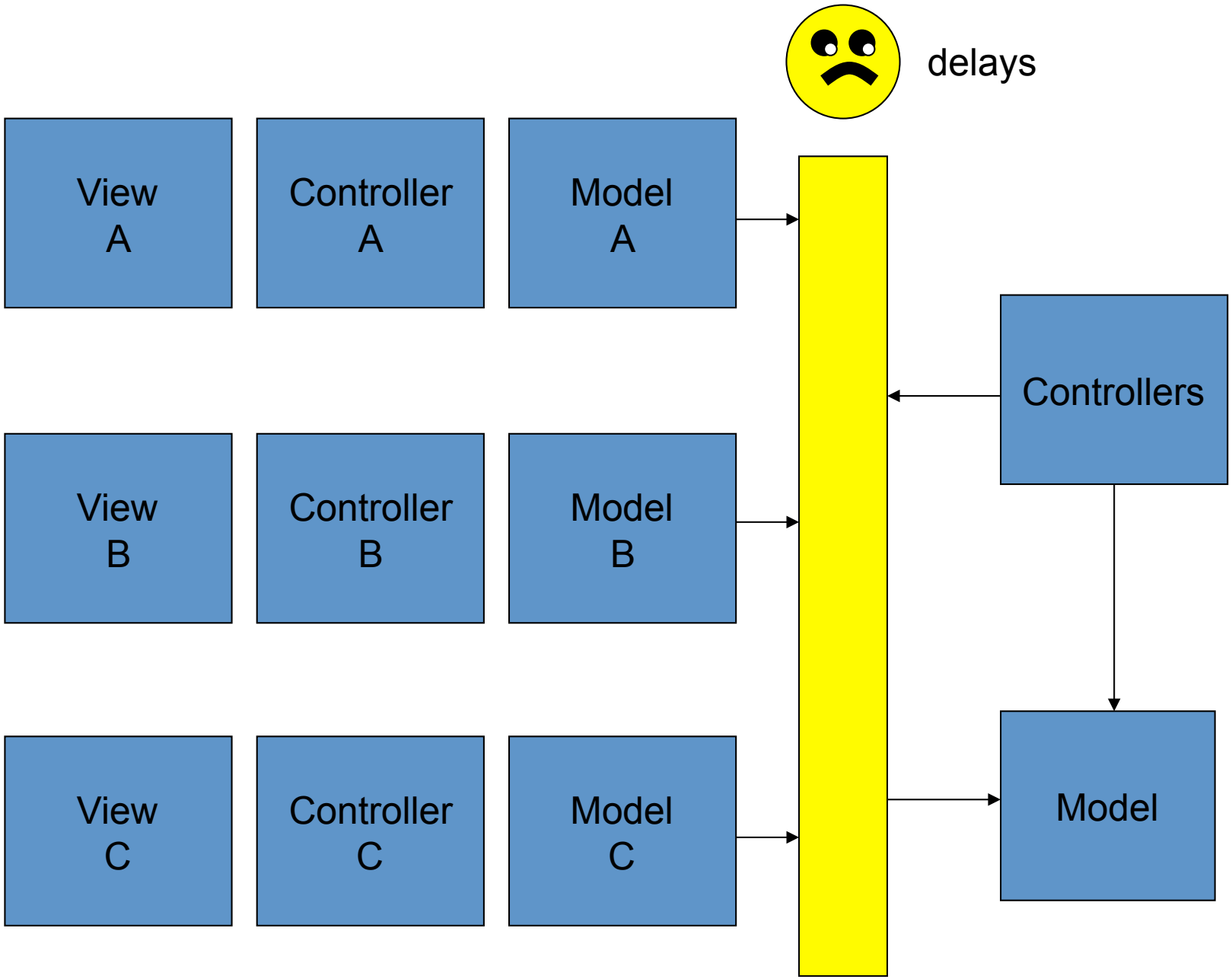

SHUTUP MORSE!!!
yeah, you win best dressed Morse
MexicanSamurai: and best looking
which helps
hahaha
you love it really, mexican
you ARE kind of
UGLY AS ****
I look normal
Haddas: hold
Morse and I jiggled last night
AgentSmith: For the entertainment of others

Reducing Rule Breaking

- Sanctioned Cheating
  - Make cheating a form of game play
  - Difficult to maintain meaningful play
- Formalise implicit rules as operational rules
  - Violations are punished within the scope of the game
  - Killing a team-mate = lose a point
  - Gold farming
    - Violates EULA (“operational rule”)
    - Account is banned

Reducing Rule Breaking

- Technical Measures
  - Never trust the client
  - Attempt to hinder the use of bots / client hacks
    - PunkBuster / The Warden / Valve Anti-Cheat System et al search the clients memory for known hacks, scripts, behaviours
    - Impossible to completely stop client hacking
    - Occasionally punishes innocent players
  - Ban offenders by email, IP address and MAC address
- Social Measures
  - Player empowerment
    - Allow players to vote out or mute offensive players
  - Employ **moderators** to police the game


delays
View A
Controller A
Model A
View B
Controller B
Model B
View C
Controller C
Model C
Controllers
Model

being racist
Johnny12eyes:
orly?
Time Out
Moderations are warnings

References

- http://developer.valvesoftware.com/wiki/Source_Multiplayer_Networking
- http://www.youtube.com/watch?v=0OiamBxxoXA