GPAT – CHAPTER 12
NETWORKED GAMES
INTRODUCTION

• Networked games allow multiple players to connect over the internet and play together
• Provides a unique player experience to interact cooperatively, competitively, and social with other players
PROTOCOLS

Information sent over the internet (or network) is like sending a virtual letter. So it knows:

- Who sent it
- Where it is going
- Time it is sent
- Contents (data)

This is called a **packet**

- The logistical information is its **header**
- The data is its **payload**

The rules defining how a packet is laid out and what happens when it is sent is called a **protocol**

**Internet protocol**, IP, is the base protocol that must be followed to send any data over the internet. More complex schemes are built on top of it.
INTERNET CONTROL MESSAGING PROTOCOL (ICMP)

- Not designed for large data transmission, i.e., game data
- Useful for *echoing* to determining connectivity and measure *latency* by *pinging*
- Basically used to send a timestamp back and forth
TRANSMISSION CONTROL PROTOCOL (TCP)

• One of two methods to transmit game data

• Connection-based protocol that provides for guaranteed delivery of all packets in the correct order to a specific port on a computer

• If an acknowledgement is not received in a certain amount of time (timeout) a packet is resent

• Which games features is this useful for? Why is it not great for most games?
USER DATAGRAM PROTOCOL (UDP)

• Connectionless protocol that is "unreliable", i.e., you can send data to a port without actually having a connection
• No guarantee that a packet is received, nor in any particular order
  • Implement your own ordering through sequence numbering
• Most common for use in games. Why?
NETWORK TOPOLOGY
SERVER/CLIENT MODEL

- There is a central computer (server) that all other computers (clients) connect to.
- Most common in games today.
- Server is authoritative and validates clients' actions. Often supported by a dedicated server. Why?
- Clients often employ client prediction.
- Problems?
PEER-TO-PEER MODEL

• Clients connects to all other clients
• Play is often performed in lockstep, e.g., real-time strategy games
  • Actions are cued and executed every so often
• Game is simulated on clients individually (means no randomness possible)
CHEATING
• In information cheats, one player is able to get information that players are not normally allowed to have
  • Example – being able to find a stealth character because their position data is still sent by the server
  • Example – seeing all player movement in RTS games (map hack)
• Can be stopped by limiting available information or cheating countermeasures
OTHER CHEATS

• In **game state cheats** a player modifies the state of the game, thus breaking it
  • Example – host server modifies the game

• In a **man-in-the-middle attack** you route all information through another computer that intercepts and modifies packets
  • Can be overcome through encryption of packets
FGD – CHAPTER 17
DESIGN ISSUES FOR ONLINE GAMING
ADVANTAGES AND DISADVANTAGES OF ONLINE GAMING

Advantages
• Socializing
• Human intelligence over AI
• Online play vs local multiplayer
  • Why an advantage?

Disadvantages
• Technical issues
  • Communication
  • Latency
  • Dropped/garbled packets
• Harder to suspend disbelief
• Need to produce content
• Customer services
DESIGN ISSUES
ARRIVING PLAYERS

• Need to decide when players can join
  • Rolling starts (matches)
  • Immediately (requires fast gameplay)

• Get rid of the victory condition – rather aim for achievements

• Discourage competition between experienced and inexperienced players

• Be sure competition is consensual
DISAPPEARING PLAYERS

• Players can leave at any time and so you need to handle properly to ensure minimal disruption to others
  • The vanishing player forfeits
  • Institute a penalty for disconnections
  • Award victory to whomever is ahead at disconnection
  • Record as a tie or disconnected game
  • Abandon the game
  • Use referees
REAL-TIME VS TURN-BASED GAMES

• Considerations of turn-based:
  • Limit number of players in one game
  • Set time limit on players turn
  • Determine default action if player runs out of time
  • Let players do other things while waiting
Collusion is a form of cheating in which players who are supposed to be opponents work together in violation of the rules.

To reduce consider how players might:

- Share secret knowledge
- Pass cards under the table (transfer items)
- Take a dive (lose deliberately)
ASYNCHRONOUS GAMES

• In asynchronous games, players actions are not synchronized
  • Don’t have to be logged on
  • Don’t have to wait for others
• Mostly non-competitive
• Other considerations?
TECHNICAL SECURITY

• Use a secure protocol
  • Encrypt data
  • Implement heartbeats for disconnectivity
  • Add timestamp and unique serial number to packets

• Don't store sensitive data on the players computer

• Don't send the player data they aren't supposed to have

• Don't let the client perform sensitive operations
PERSISTENT WORLDS
HOW PERSISTENT WORLDS DIFFER FROM OTHER GAMES

• Persistent worlds constitute permanent environments in which players can play, retaining the state of their avatar

• Traditional narrative is difficult to implement because of the number of players, story can unfold by quests at varying scales

• Players can fill a large number of rich and varied roles

• Without a victory condition, gameplay is different as the player decides for themselves what to do (expressive vs reactive gameplay)
TYPES OF ONLINE PLAYERS

- Model proposed in 1997 to describe various types of players in online games
- Conjectures that a healthy online community requires a certain proportion of each type
CREATING AN AVATAR

Maximize expressiveness. Considerations:

• Unique name/handle
• Physical appearance
• History/experience
• Reputation
• Autobiography
WORLD MODELS

- Classic world models
  - Scavenger model
  - Social model
  - Dungeons & Dragons model
  - Player-versus-player model
  - Builder model
AVATAR DEATH

• Some options
  • Permanent death
  • Resurrection with reduced attributes
  • Resurrection with some property missing
THE NATURE OF TIME

• Game time must proceed at a fixed rate for all players
• Different than single player, how?
• Avoid design of time-consuming activities
• Time is irreversible
ECONOMIES

• Harder to tune

• Avoid being able to create something for nothing

• Maybe avoid fixed number of resources?
SOCIAL PROBLEMS
MANAGING CHAT

Consider:

• Limiting content
• Profanity filters
• Complaint and warning systems
• Blocking other players
• Moderated chat spaces
PLAYER-KILLER (PK) PROBLEM

• Should you allow players to kill each other?
• Pros:
  • Human intelligence
  • Interesting loot
  • Social experience
• Cons:
  • Unfair
  • Annoying to many players
• Justice mechanisms
  • No automated regulation
  • Flagging criminals
  • Reputation systems
  • PvP switch
  • Safe games (no PvP)
• Factions are a good solution usually
• Bottom line: you can't please everyone
  • It’s a fantasy world
  • People pay to play