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

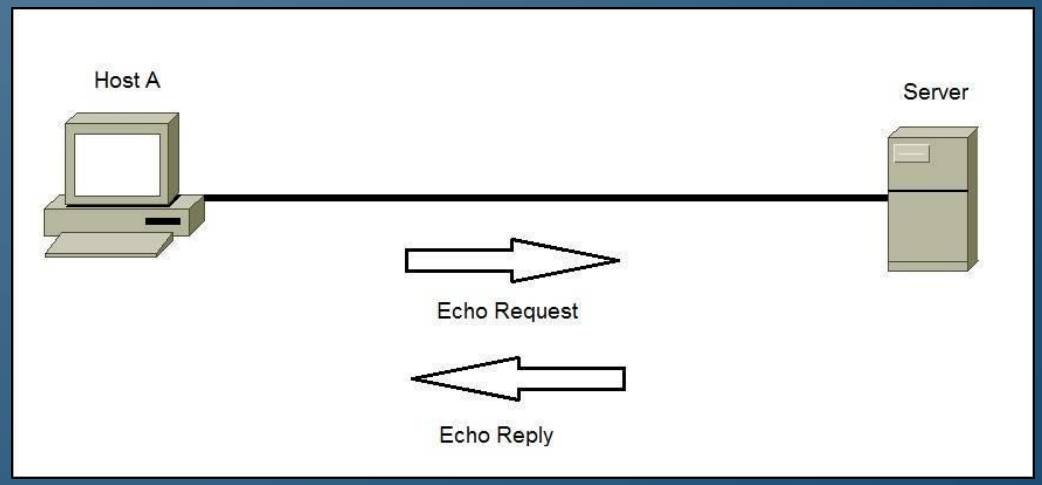
PROTOCOLS

PROTOCOLS

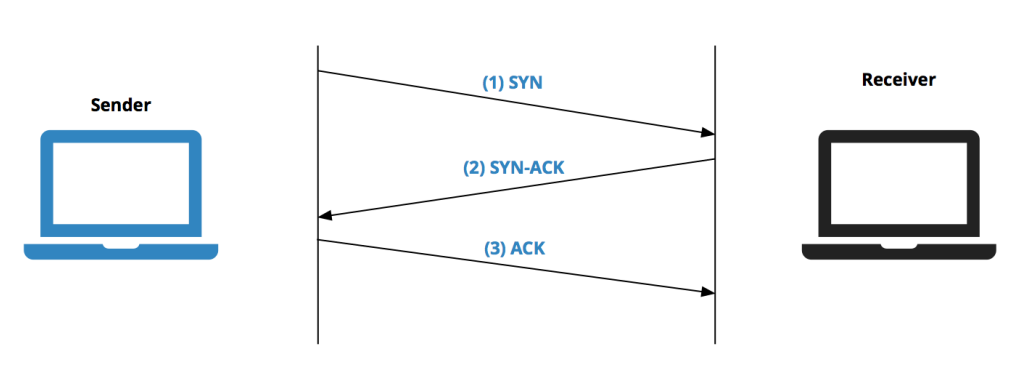
- Information sent over the internet (or network) is like sending a virtual letter. So it knows:
  - Who sent it
  - Where is it going
  - Time it is sent
  - Contents (data)
- This is called a **packet**
  - The logistical information is its **header**
  - The data is its **payload**
- The rules defining 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



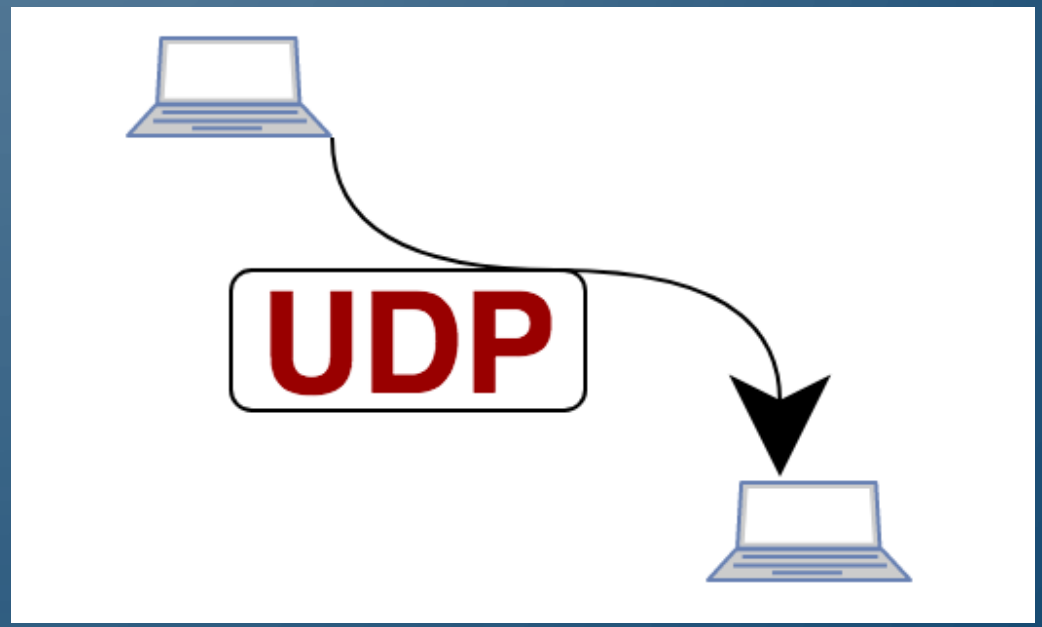
TRANSMISSION CONTROL PROTOCOL (TCP)



- 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?

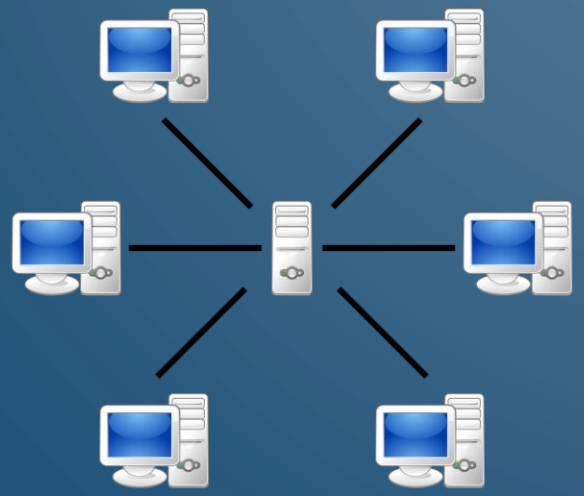
USER DATAGRAM PROTOCOL (UDP)

- 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

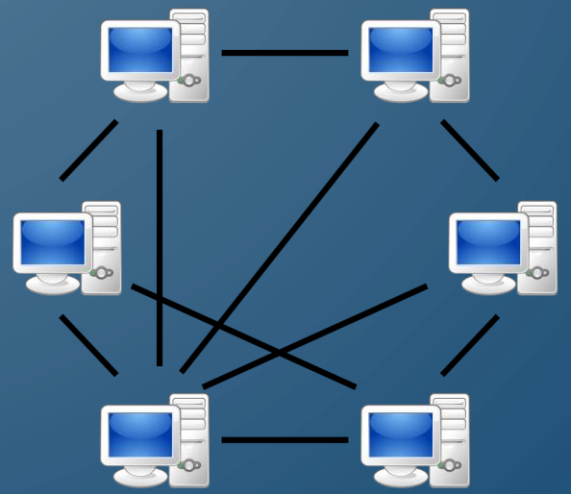
SERVER/CLIENT MODEL



- 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)



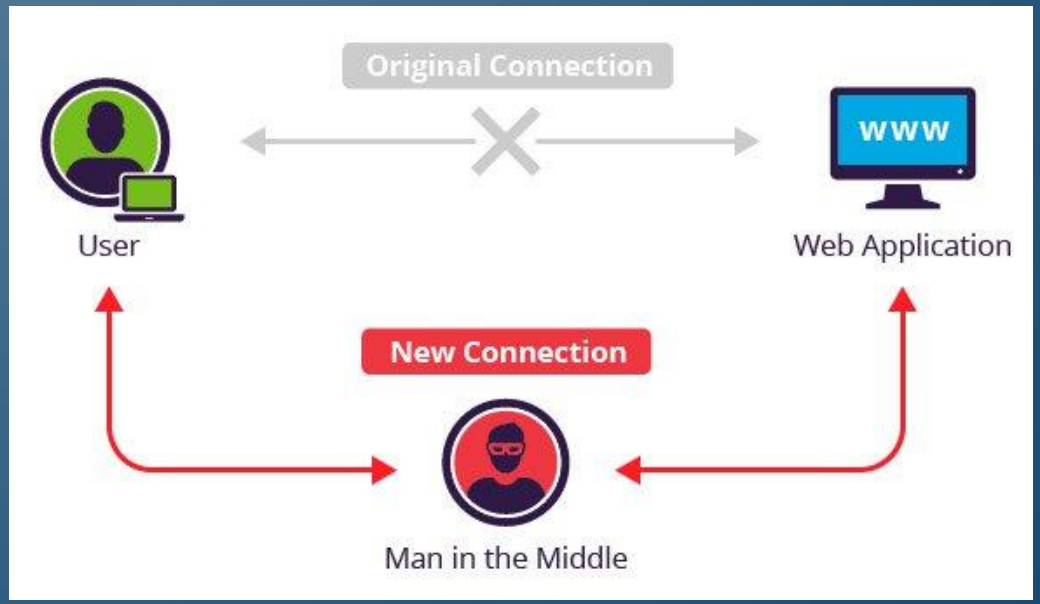
CHEATING

INFORMATION CHEATS

- 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

- **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

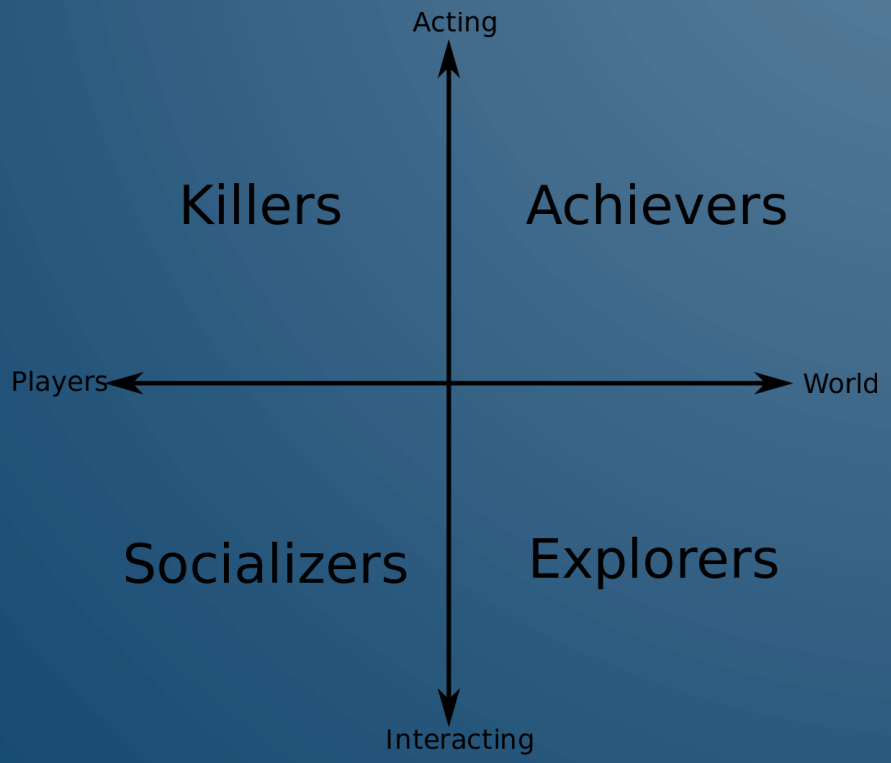
- Use a secure protocol
  - Encrypt data
  - Implement heartbeats for disconnectivity
  - Add timestamp and unique serial number to packets
- Don't store sensitive data on the players computer
- Don't send the player data they aren't supposed to have
- Don't let the client perform sensitive operations

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