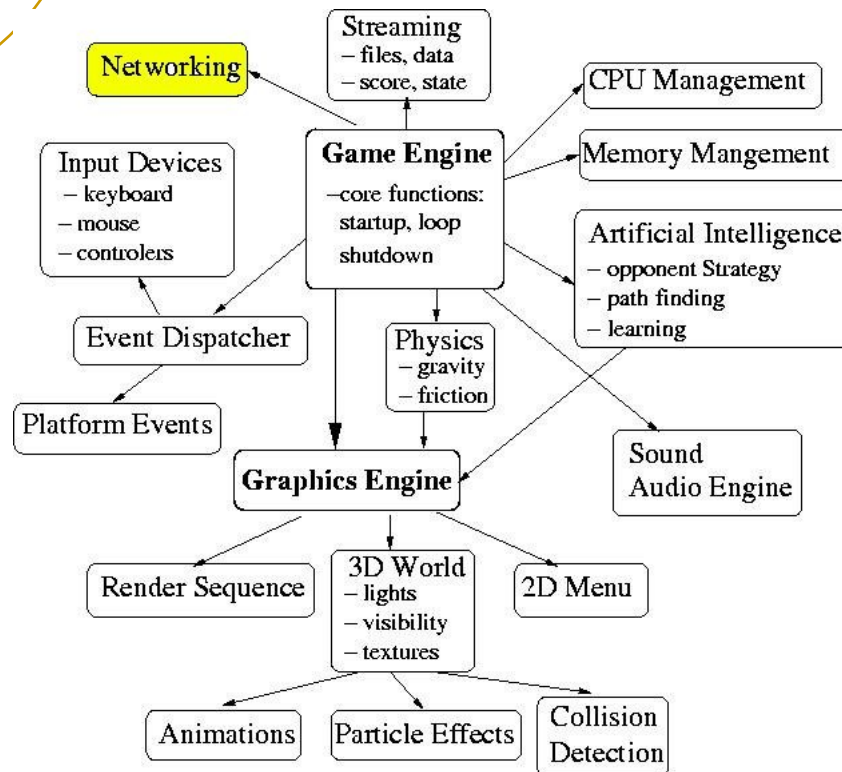


Networking

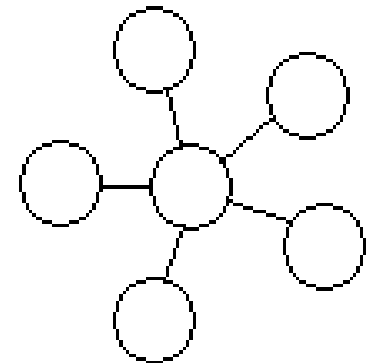


Game Networking



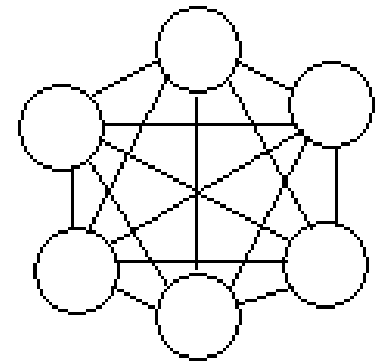
Game Networking Topology

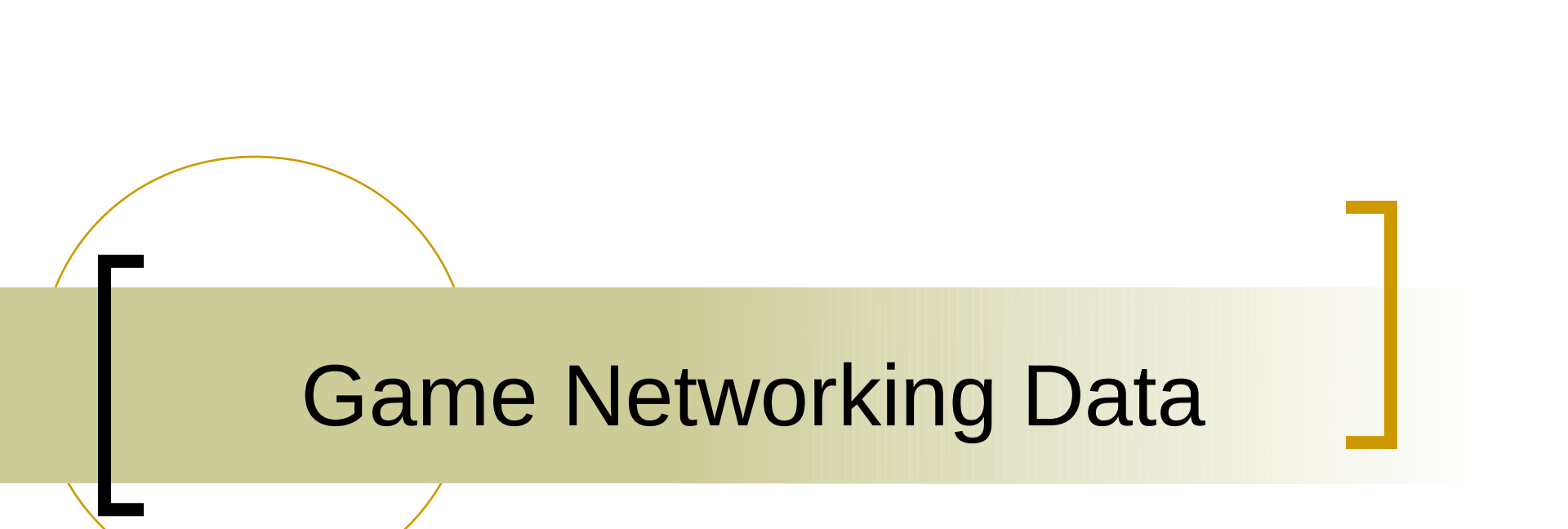
- Star (client/server) Topology
 - All devices are connected to a central hub (server)
 - Nodes communicate across the network by passing data through the hub



Game Networking Topology

- Mesh (peer to peer) Topology
 - every node has a connection to every other node in the network.
 - provides faster communication
 - burden on clients to enforce application rules
 - minimize size of messages





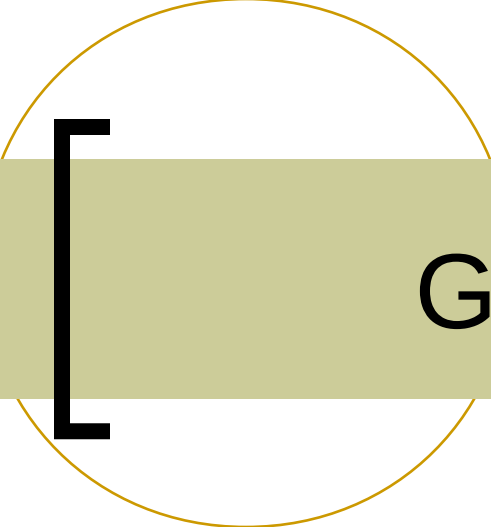
Game Networking Data

- What is communicated across networks?
 - player locations
 - player states
 - player orientation
 - voice communications
- Note: send the minimum amount of data necessary
 - minimize data type sizes (bytes are nice)



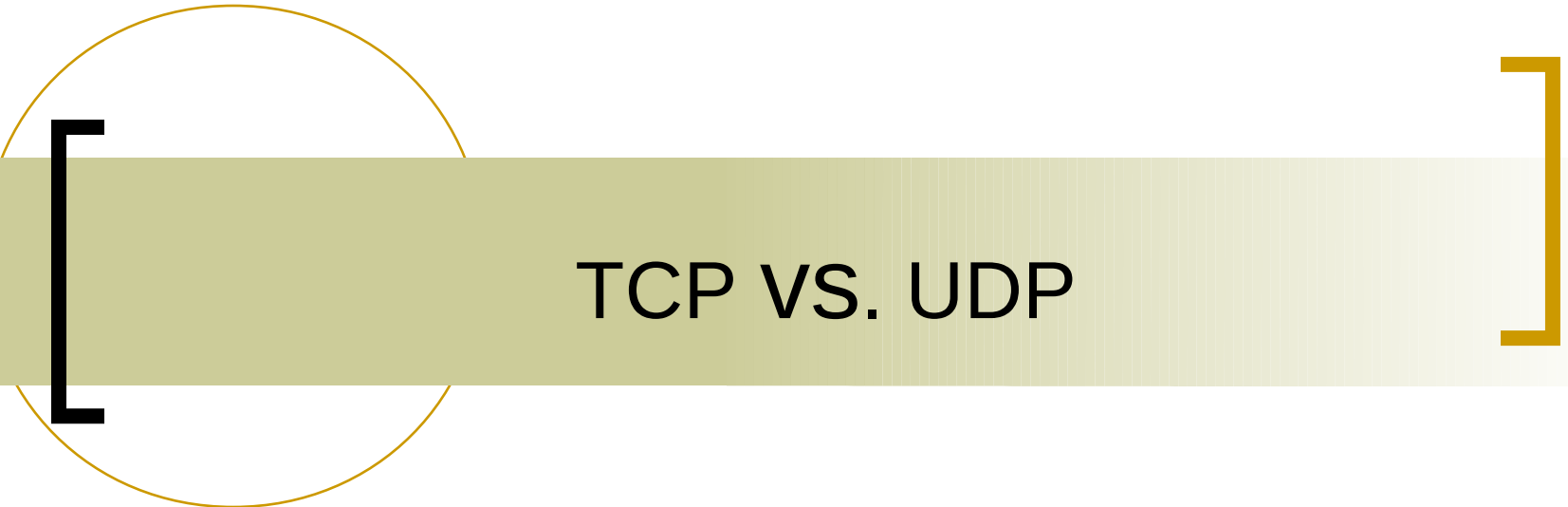
Game Networking

- Networked games must be:
 - fast
 - reliable
- Which should be used (client/server or peer-to-peer) for MMOs?
 - it depends, but mostly client/server
- Architectures in use:
 - pure client/server
 - pure peer to peer
 - hybrid client/server & peer to peer



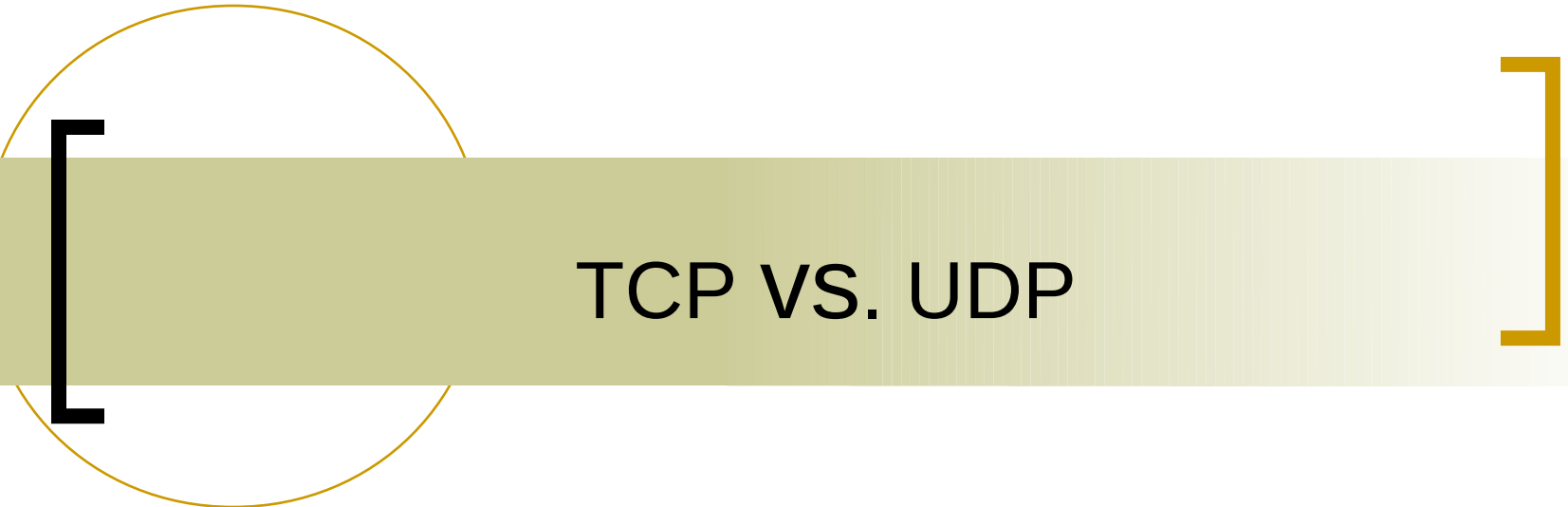
Game Networking

- Latency
 - a difficult issue in multiplayer games
 - How do you handle communication delays?
 - Where is the delay?
 - lag is commonly due to overloaded networks

A decorative graphic consisting of a thin yellow circle. A thick black left square bracket is positioned on the left side of the circle, and a thick yellow right square bracket is on the right side. A horizontal olive-green bar with a gradient is placed across the middle of the circle, containing the title text.

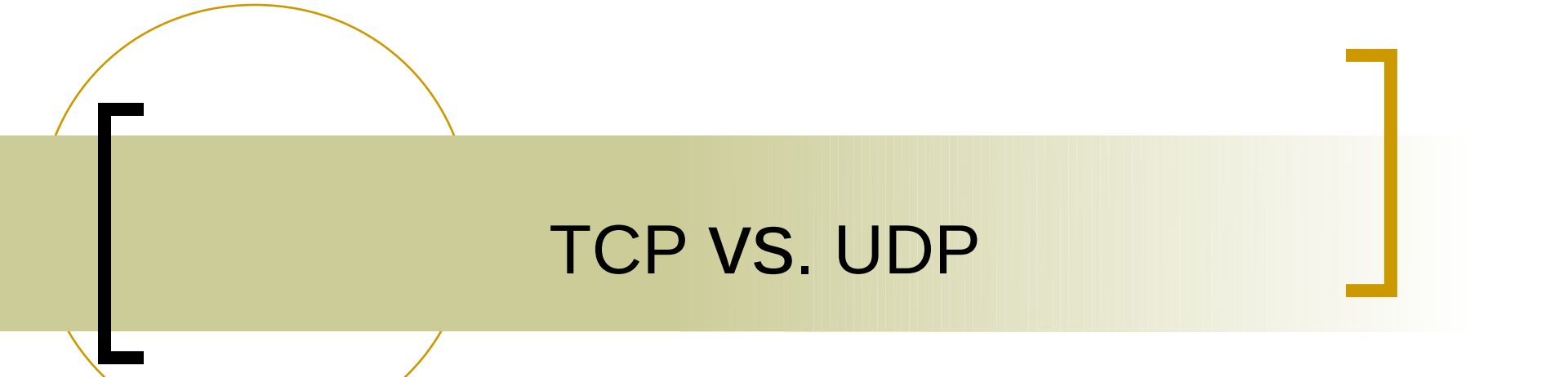
TCP VS. UDP

- What UDP (User Datagram Protocol) gives you:
 - unreliable delivery
 - no retransmission, packets not ACKnowledged, no reordering
 - no congestion control
 - speed & low overhead (good for streaming audio/video)

A decorative graphic consisting of a thin yellow circle. A thick black left square bracket is positioned on the left side of the circle, and a thick yellow right square bracket is on the right side. A horizontal olive-green bar with a gradient is placed across the middle of the circle, containing the title text.

TCP VS. UDP

- Both transport layer protocols on top of IP.
- TCP is lossless.
- What TCP (Transmission Control Protocol) gives you:
 - reliable delivery
 - retransmission and reordering
 - congestion control



TCP VS. UDP

- Some game data can be *interpolated*.
 - if packet is lost, the game can continue.
- Some game data must be guaranteed to be received.
 - some things can't and shouldn't be interpolated.
- Understand TCP is slower, but safer.
- Both are used, both have virtues, both have drawbacks.
- Programmers are always looking for UDP opportunities.
- Alternative: use a “Reliable UDP” and use for certain types of info sent.

A decorative graphic consisting of a thin gold circle. A thick black left square bracket is positioned on the left side of the circle, and a thick gold right square bracket is on the right side. A horizontal gold bar with a gradient is placed across the middle of the circle, containing the title text.

XNA Networking

1. RakNet
2. Games for Windows LIVE

XNA Networking

A list of XNA Creators Club and LIVE membership requirements for different game types on the PC and the Xbox 360 is shown in **Table 18-1**.

Table 18-1. XNA Creators Club and LIVE Membership requirements

XNA Framework and network usage	Xbox 360	PC
Run an XNA Framework game	LIVE Silver membership and Creators Club membership	No membership requirements
Use SystemLink	LIVE Silver membership and Creators Club membership	No membership requirements
Sign on to Xbox LIVE and Games for Windows LIVE servers	LIVE Silver membership and Creators Club membership	LIVE Silver membership and Creators Club membership
Use Xbox LIVE Matchmaking	LIVE Gold membership and Creators Club membership	LIVE Gold membership and Creators Club membership

Using RakNet

- Site
- Overview
- Bitstream
 - `static BitStream bs;`
 - `bs.Write(PACKET_ID_LINE);`
 - `bs.Write(mCamera->getPosition());`
- `rakconnection->Send(&bs, HIGH_PRIORITY, RELIABLE_ORDERED, 0, UNASSIGNED_SYSTEM_ADDRESS, true);`
- Raknet in XNA
- UnityCommunity