Applying peer-to-peer networks to massively multiplayer games

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Computer game
Two player game
Multiplayer game
Client-Server
Hybrid
Peer-to-Peer network
Hybrid

- Server is an essential part of the network
- Example: Napster
- Server's duties:
  - Authentication
  - Administration
  - Assists in joining the network
  - Assists in connecting to other peers
  - etc.
Structured P2P network (DHT)

- Distributed Hash Tables
- A key is calculated for every piece of data put to the network
- Key is within a certain range, for example 0-2^160-1
- Each participating node is responsible for a certain range of the keyspace
- Even though nodes know only a few neighbours, search is efficient
DHT example
P2P in massively multiplayer games

- A key is generated for each dynamic object in the game (player's character, treasure chest, ...)
- Each object is administered by a random peer chosen by the DHT implementation
  - This is also an attempt to prevent cheating
- Gameplay area is divided into areas and each area is administered by a random peer
- Actions that happen within an area, are notified to the area's administrative peer
Partitioning the gameplay area
Updates within gameplay areas
Distributed game logic

- Nodes each handle the game logic
  - For example administrator of a NPC (non-player character) handles the NPC's AI
- To prevent cheating, a voting system might be implemented
  - If a node wants to do a certain action, the game area's administrator asks others if the action is permitted
- Distributed physics could also be implemented
- Allows users the possibility create their own worlds by changing the game's rules
  - Also might allow them to cheat easier
Obstacles in applying P2P to massively multiplayer games

- Joining the peer-to-peer network
- Authentication
- Firewalls
- Persistent storage of data
- Low bandwidth or slow processor
- Latency
- Information security
- Cheating
Benefits from P2P networks

- Maintenance costs are reduced significantly
  - No need for expensive server or bandwidth for it
- Players aren't dependant of the server
- In ideal case, it's much more faster than client-server architecture
- Better scalability
Current status of P2P in games

- Currently no commercial massively multiplayer game uses P2P
  - Developers of a game called Outback Online have reported that it will be using P2P
- Some research on using P2P on games has been done
  - Part of that research some small games with P2P support have been developed
About the master's thesis

- Study how well P2P networks can be applied to massively multiplayer games
- Compare different network architectures (client-server, peer-to-peer, hybrid)
- Study how to overcome the obstacles mentioned earlier
- Simulate network architectures with varying number of peers with each having varying bandwidth and different movement models
- Thesis should be complete by the end of 2007