Infrastructure for Massively Multiplayer Games

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Introduction

- Massively Multiplayer Games (MMPGs) are becoming more and more popular
  - Final Fantasy XI - 500.000+ subscribers
  - Sony's Everquest - 450.000 subscribers
  - Lineage (famous Asian MMPG) claims to have 4.000.000 subscribers
- At peak times, tens of thousands of players are online
- No server can support all players simultaneously
  → Players are distributed over "shards"

Final Fantasy XI Online (Square Enix)

Lineage (NCSoft)

- Shards are different instances of the same game world ("parallel universes")
- A shard is made of a single server or a cluster of servers to which players connect as clients
- Shards support about 5000 players simultaneously
- Usually, no interaction between players on different shards is possible
- In most MMPGs players cannot even migrate between shards

Motivation

- Bringing all players together in a single game instance, allowing them to share the experience
- Providing an infrastructure that puts no limits on the number of players
  - Client/Server won't do – costs increase with growing number of players
  - Gamers tend to have powerful PCs

Everquest (Sony Online Entertainment)

Star Wars Galaxies (Sony Online Entertainment)

- **Security**
  - Protecting players' personal data (e.g. credit card numbers)
  - Disabling cheaters – cheaters are a major threat to game balance and may cause players to cancel their subscriptions
  - In C/S the server has authority over game state
    → good for detecting cheaters
- **Performance & Scalability**
  - Different types of games have different performance requirements
  - Network infrastructure must scale with number of players

Issues Involved

- **Data Dissemination**
  - Game state has to be distributed to all players
  - usually based on player's location and his perception
  - minimize bandwidth requirements
- **Synchronization**
  - Players want to have a consistent view of game state
  - network latency induces delays ("lag")
  - latency compensation techniques needed, e.g. dead reckoning
- **Availability**
  - Players pay a monthly fee and may play as much as they want
  - Server downtimes are a major annoyance to players – they prevent them from getting what they paid for
- **Persistence**
  - Most games are based on developing a virtual character ("Avatar")
  - All achievements and possessions of an avatar must be saved to persistent storage on a regular base
  - Players loosing hours or even days of "work" because of data loss will likely cancel their subscriptions

The way to go…

- Building a framework for scalable peer-to-peer MMPG infrastructures
- Imposes many challenges in a fully distributed environment, e.g.
  - Utilize clients' resources by distributing load among players
- Detecting cheaters is difficult due to lack of a central game state authority
- …
- Apply group's experience to tackle some of these challenges