Peer-to-Peer Gaming Research at DVS

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Research Challenges
- Analyze and develop decentralized network architectures that can handle thousands of players
- Make use of excess peer resources and dedicated servers
- Achieve realistic evaluation

Game parameters
- Maximum avatar speed
- AOI size / vision range
- Update message frequency
- Map parameters

Bots vs. Mobility Model vs. Human Players
- Assess if simulated behavior is realistic
- What are the quality metrics for human players?

Object Management
- Degree of coupling to the spatial multicast?
- Determine a “good” object manager by using network coordinates in-game proximity other methods

Simulation Scenario
- Player session duration distribution
- Churn Model
- Player density distribution

Network: Spatial Multicast
- Dissemination of events in a spatial context
- Implementations:
  - VON
  - pSense
  - pSense3D
  - BubbleStorm-based client/server

Network: Object Management
- Persistent storage
- Concurrent modification / synchronization
- Object lookup
- Enables bases, NPCs, etc.
- Instances:
  - Colyseus
  - client/server
  - VSM

A testbed for P2P gaming mechanisms
- Game play representing a real game
- Attractive game to real players, which provide the reference behavior
- Simple enough for focusing on the important aspects
- Resource-efficient for a good simulation scalability
  - Well-defined and flexible interfaces to facilitate the replacement of network components
  - Can run in a real network as well as in a deterministic emulated network environment

Gameplay
- Planet Pi4 is a prototype of a 3D real-time massively multiplayer online game
- Competing teams
- Asteroid field sets the effective game world: parameterizable, random-generated
- Points of interest: bases, upgrade points

Bots
- Reproducible game workload generation
- Simulate human user behavior
- Implementations using finite state machines (FSM) or behavior trees (BT)

Mobility Model
- Not simulating whole gameplay
- Higher scale, faster simulation
- Random waypoint model, special movement patterns, traces (other games)

Simulation Engine
- Discrete-event simulation
- Packet level network interface (UDP)
- Custom overlay simulator
- Statistics interface, live plotting from SQLite database using gnuplot

Further reading:

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