IMPROVING SCALABILITY IN MMOGS
- A NEW ARCHITECTURE -

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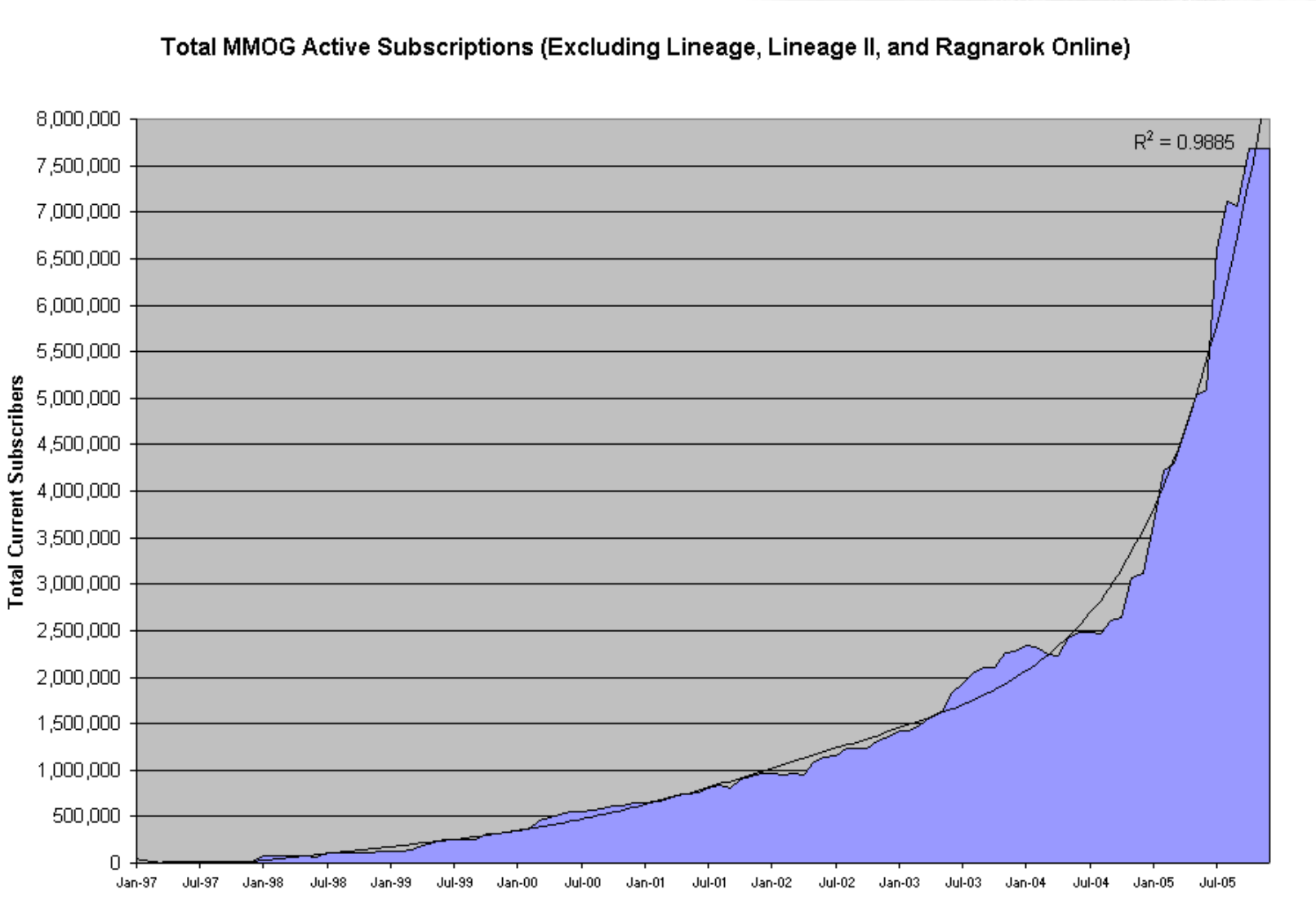
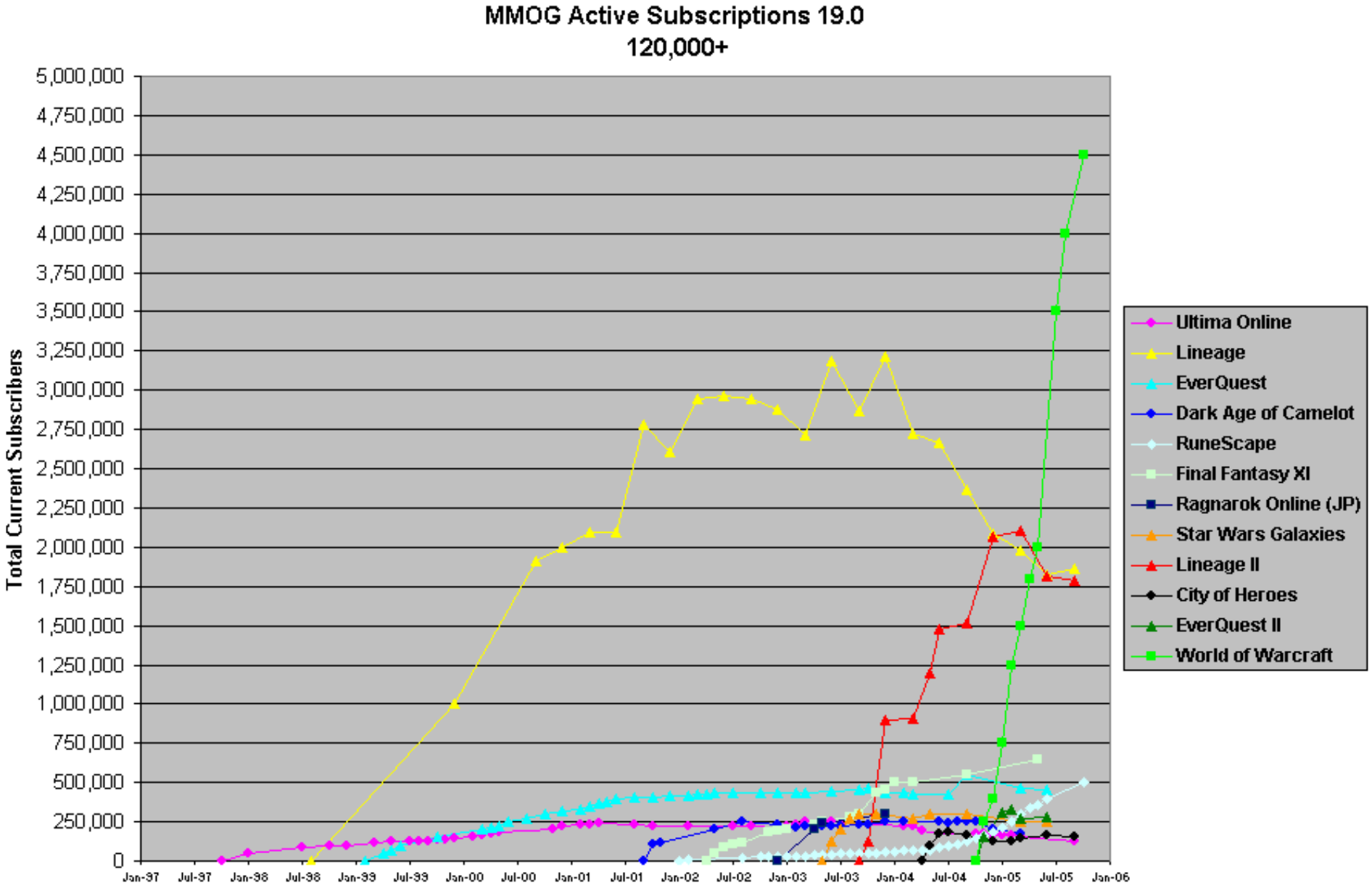
Outline

1. MMOGs: tremendous growth
2. Traditional MMOGs architecture and its flaws
3. Related work
4. Our solution
5. Implementation
6. Results
7. Work in progress

MMOG market: rapid growth



MMOG market: rapid growth



The MMOG challenge

- 20,000 players on a same map. They all move at the same time
- They all want updates of the world with a latency < 200ms
- Manage game state consistency for all these players

Traditional MMOGs architecture and its flaws

- Server cluster hosted by the game editor
- Secure
- Gives the server host a total control over the network

but ...

- Centralized
- CPU and bandwidth intensive for the server with constant updates
- Non-resilient to a crash of the server
- Lots of variation in the popularity the game implies **scalability issues**

Related work

Full P2P solution:
Peer-to-Peer Support for Massively Multiplayer Games, B. Knutsson, H. Lu,W. Xu, B. Hopkins

Separate world in zones:
A Distributed Event Delivery Method with Load Balancing for MMORPGs, Shinya Yamamoto, Yoshihiro Murata, Keiichi Yasumoto and Minoru Ito

Issues:
Security and Latency
Gamestate consistency

The idea...

Important observations on MMOGs

- Huge map
- Players in one region of the map don't interact with the players in another region
- Players are rarely scattered uniformly on the map; they usually gather in groups
- Most players stay connected for at least an hour, and some of them are connected much more than that

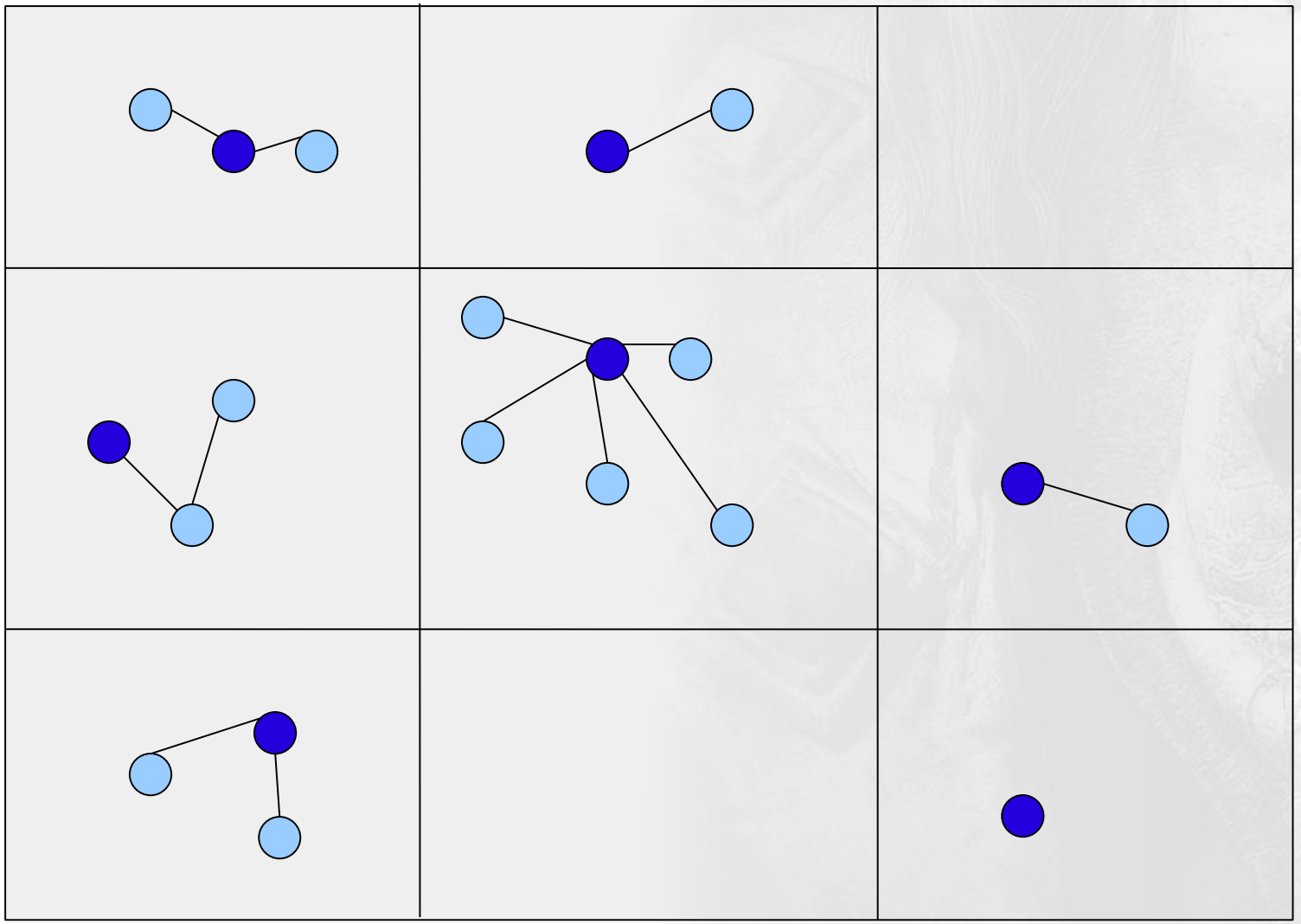
Our solution to improve scalability

- Dynamically divide the world into independent zones
- Delegate the workload to several super peers per zone
- Smooth transition from zone to zone
- Keep a main server to control the whole network

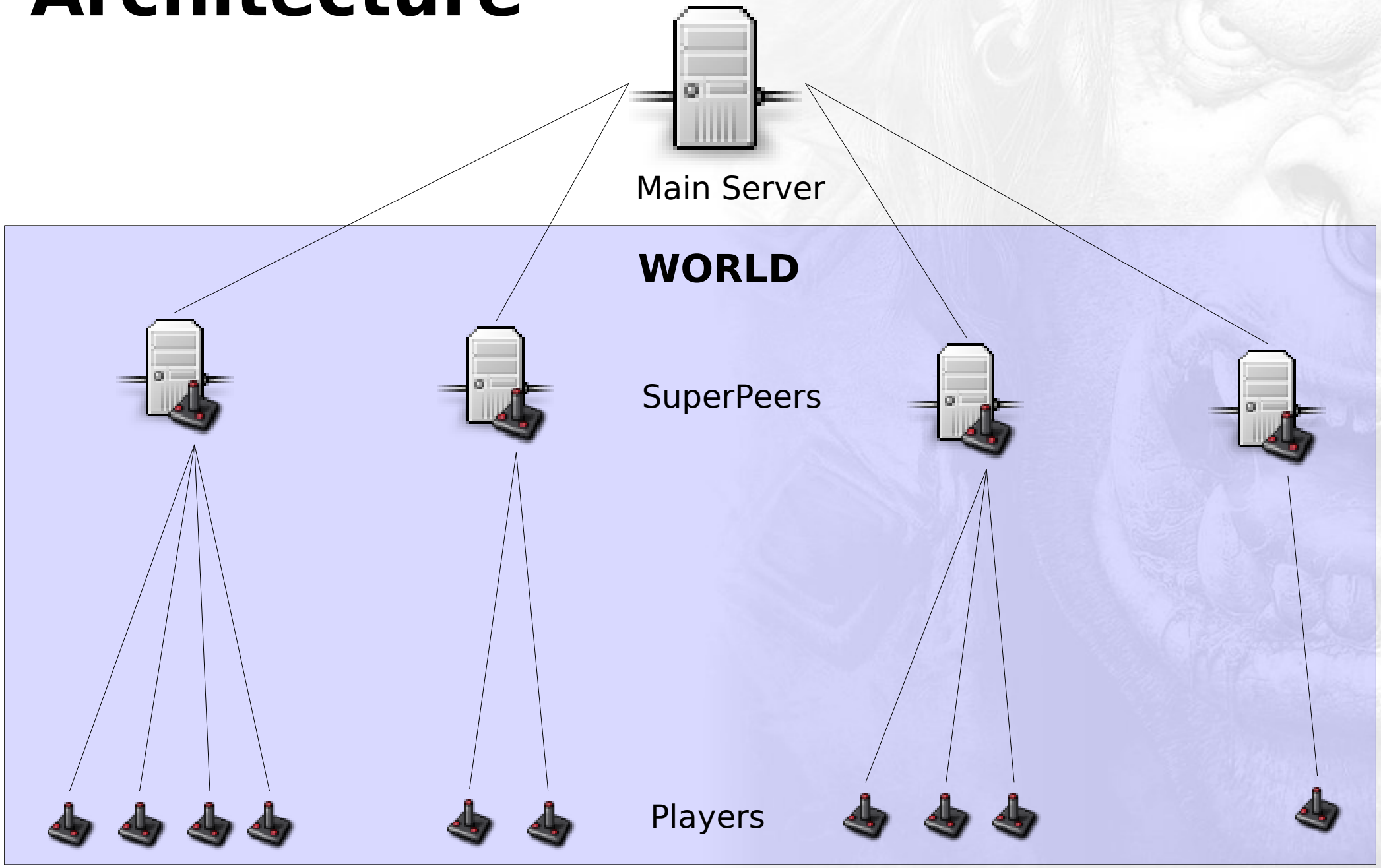
3 level hierarchy

- **Main Server**
  - Hosted by the game editor/publisher
- **Super Peers**
  - Manage a zone and reports to Main Server
- **Simple peers**
  - Connected to the Super Peer of its zone

The world: Peers & SuperPeers



Architecture

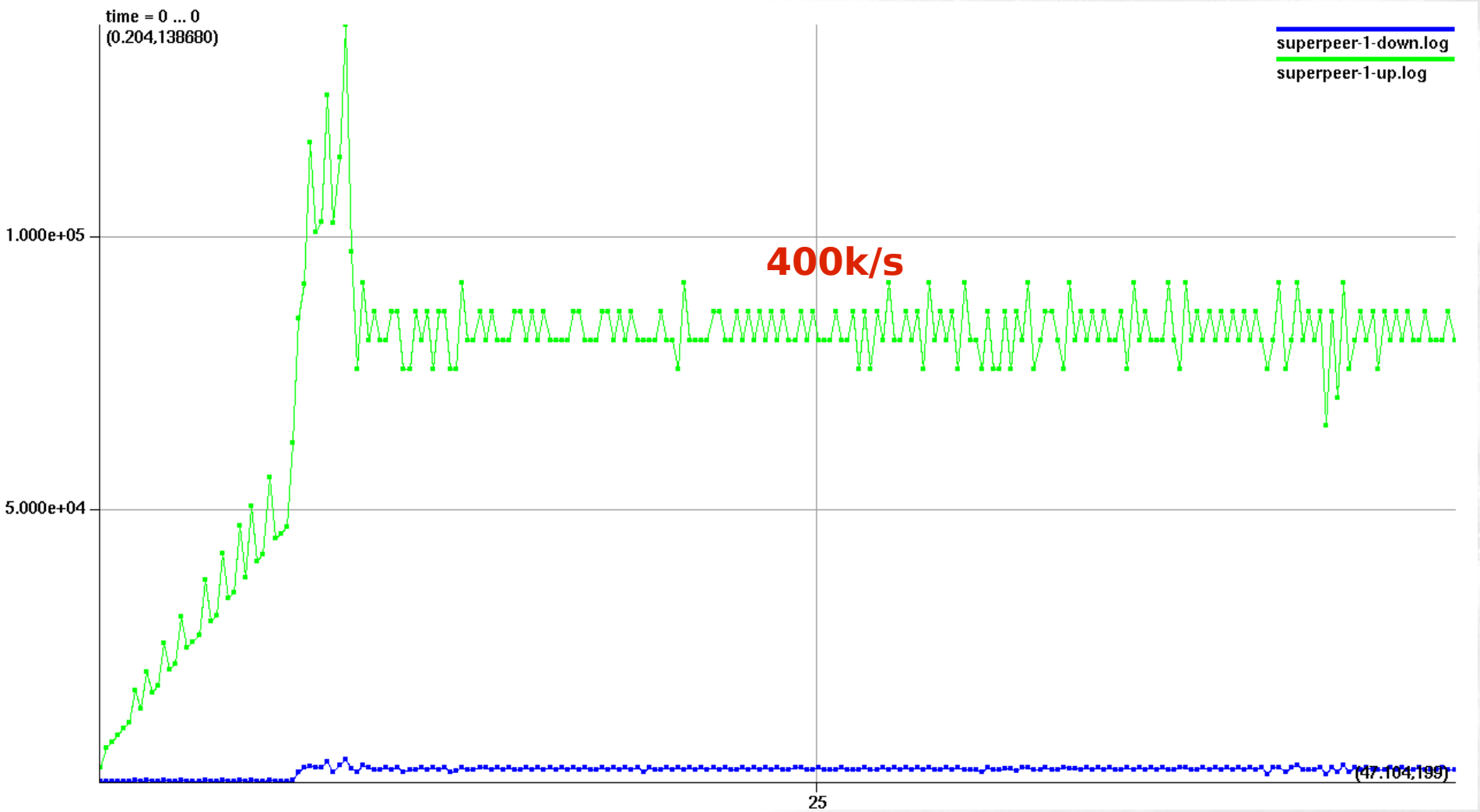


Experimental results

Server Side

Standard MMOG architecture

100 players



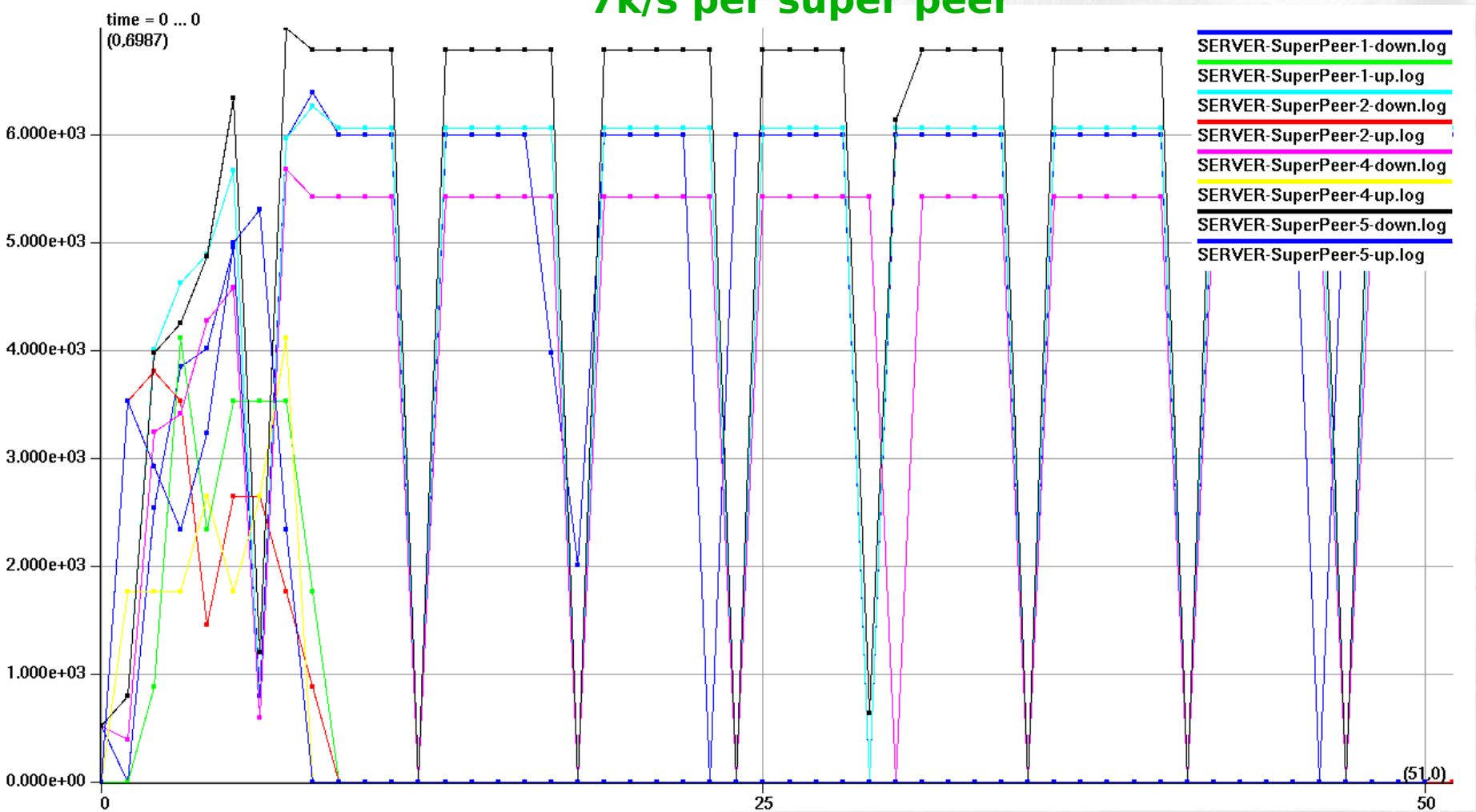
Experimental results

Server Side

Our MMOG architecture

7k/s per super peer

100 players
4 zones
1 update per sec

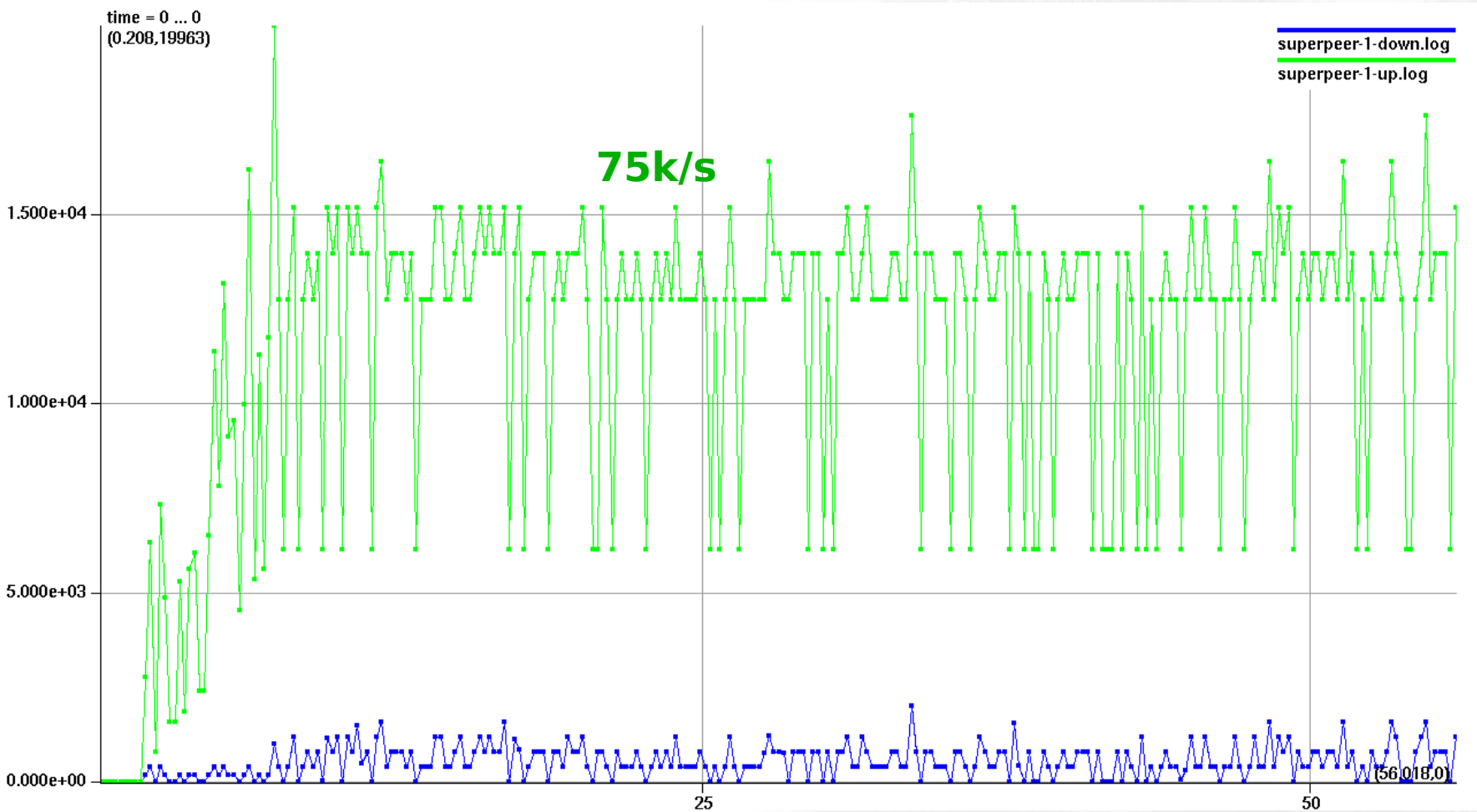


Experimental results

SuperPeer Side

Our MMOG architecture

100 players
4 zones



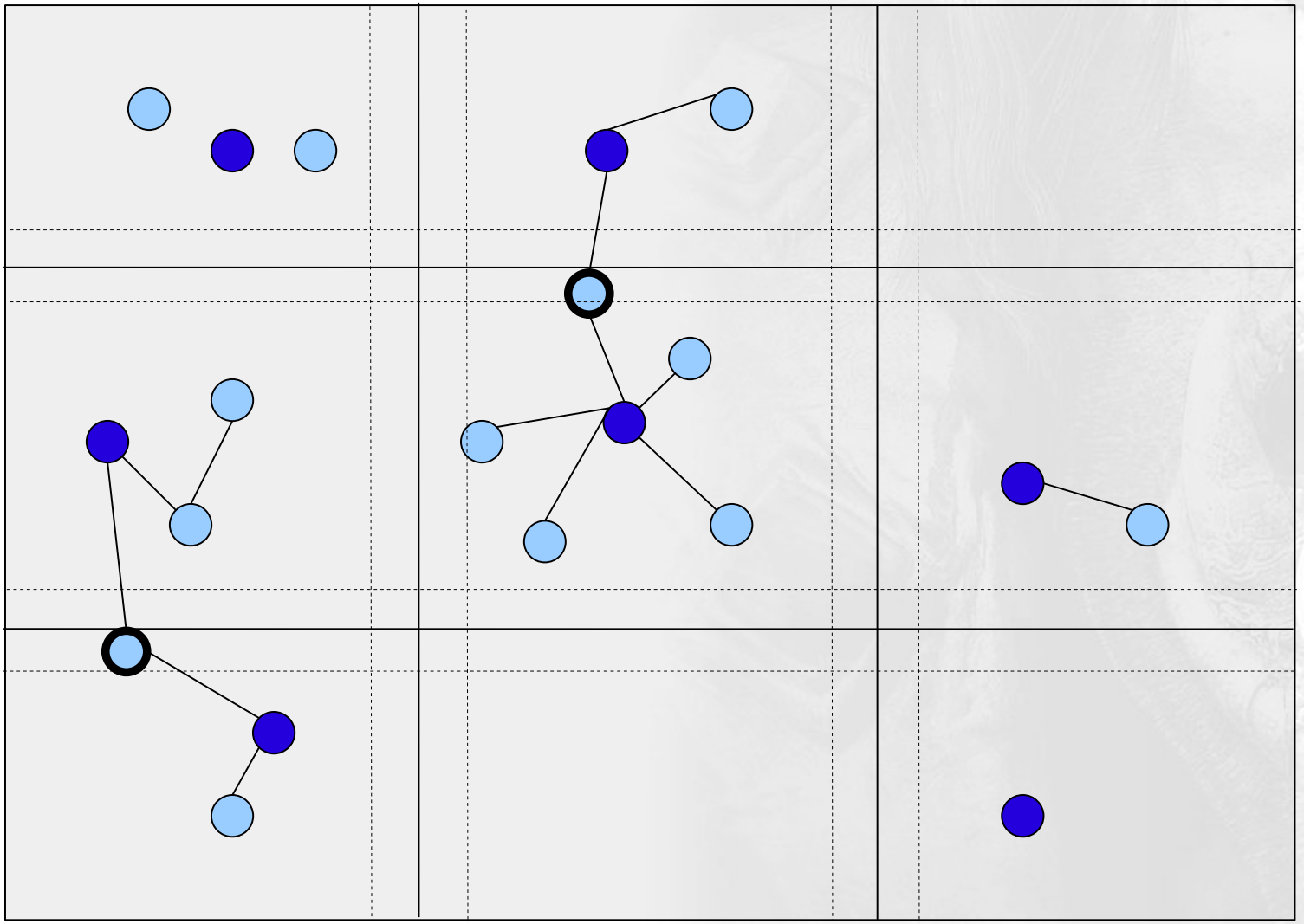
For each SuperPeer

Work in progress...

- **Smooth transition between zones**
  - *Temporarily connect a peer to 2 or more Super Peers*
- **Dynamic subdivision of the zones**
  - *When a threshold is reached, the Main Server automatically subdivides a zone into 4 zones to lower the resources needed by the SuperPeer*

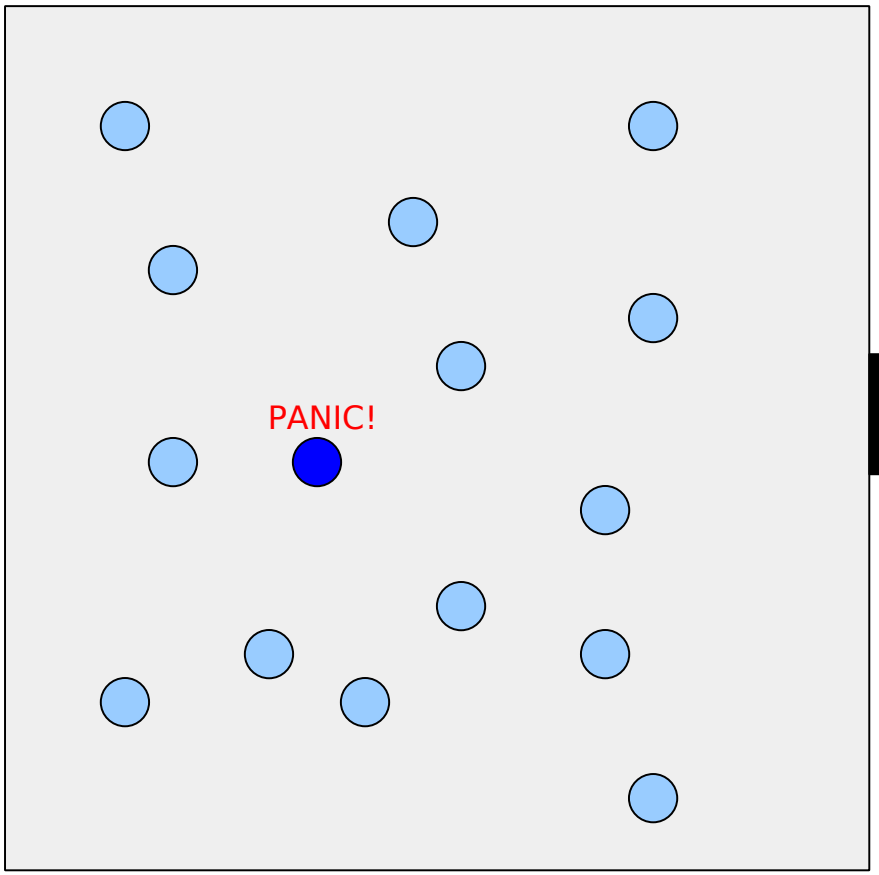
Smooth transition

Peers connected to 2 SuperPeers temporarily

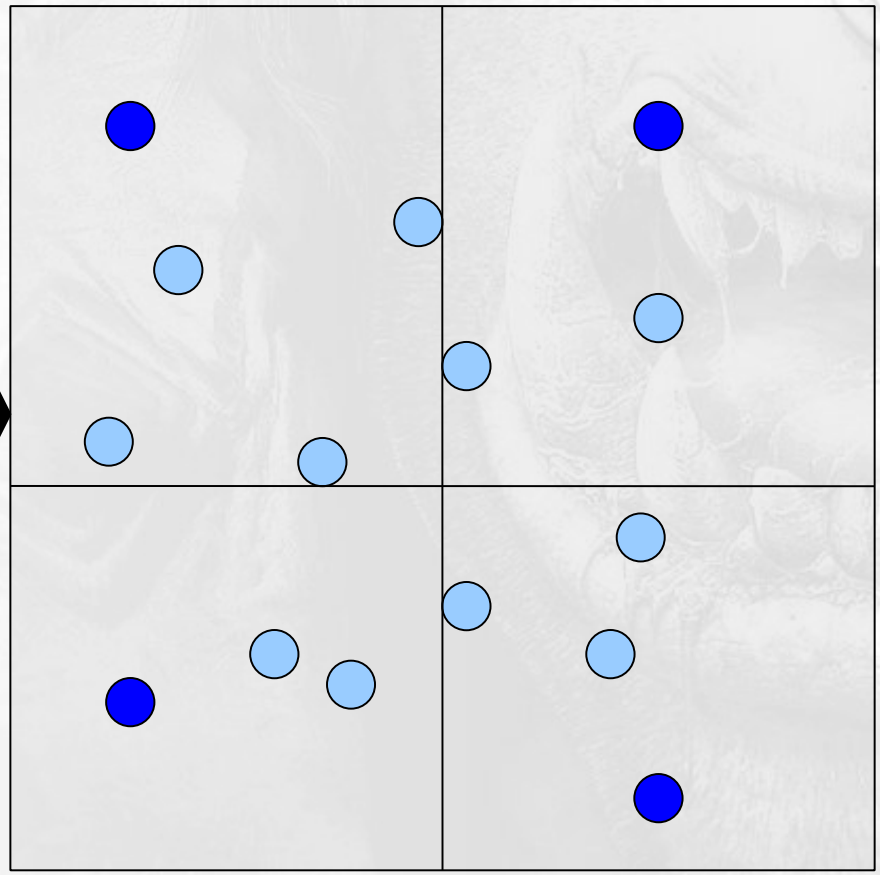


Dynamic subdivision

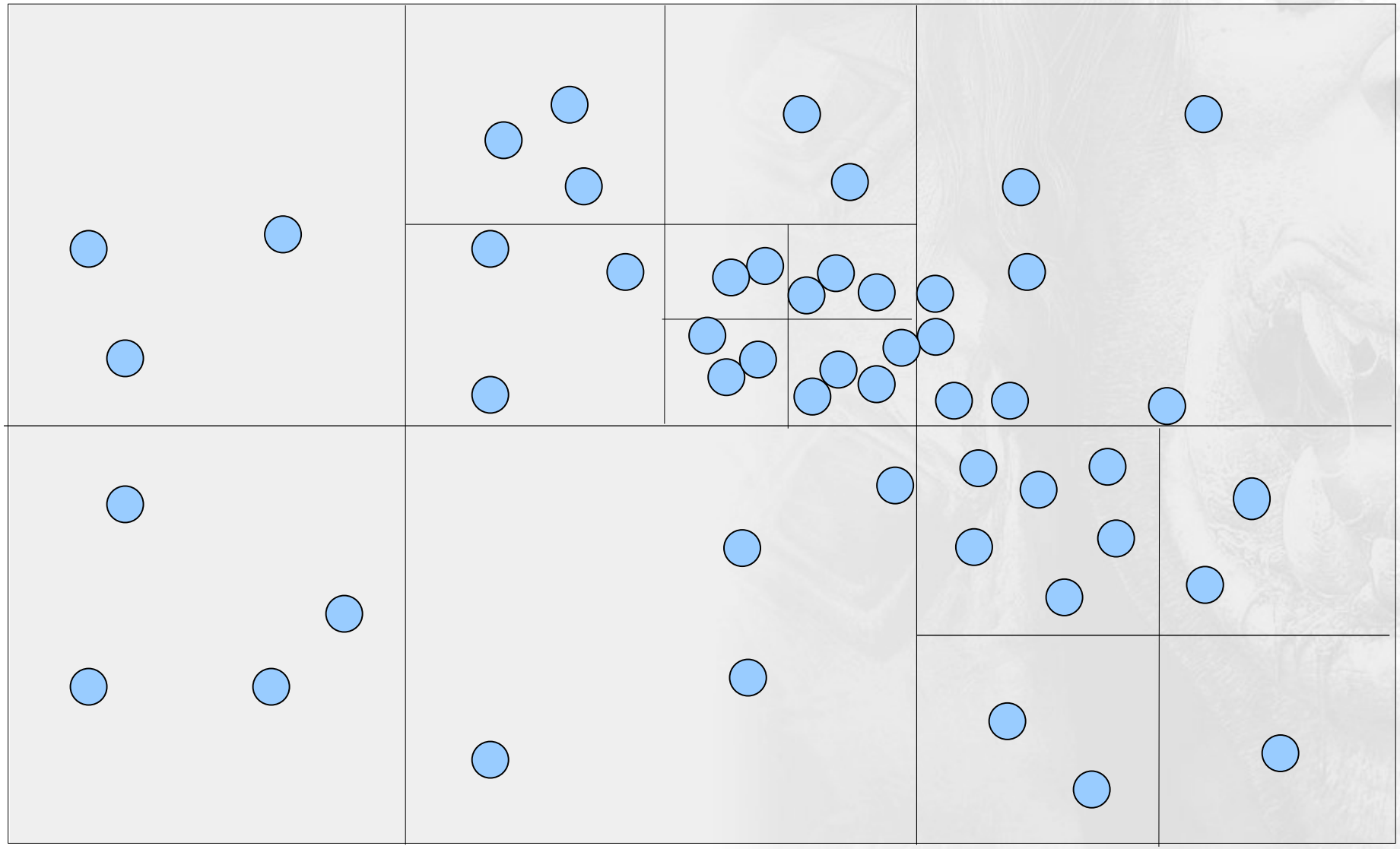
SuperPeer overwhelmed
sends Panic messages
to Main Server



Main Server subdivides
the zone to reduce the workload
of the Super Peer



Dynamic subdivision

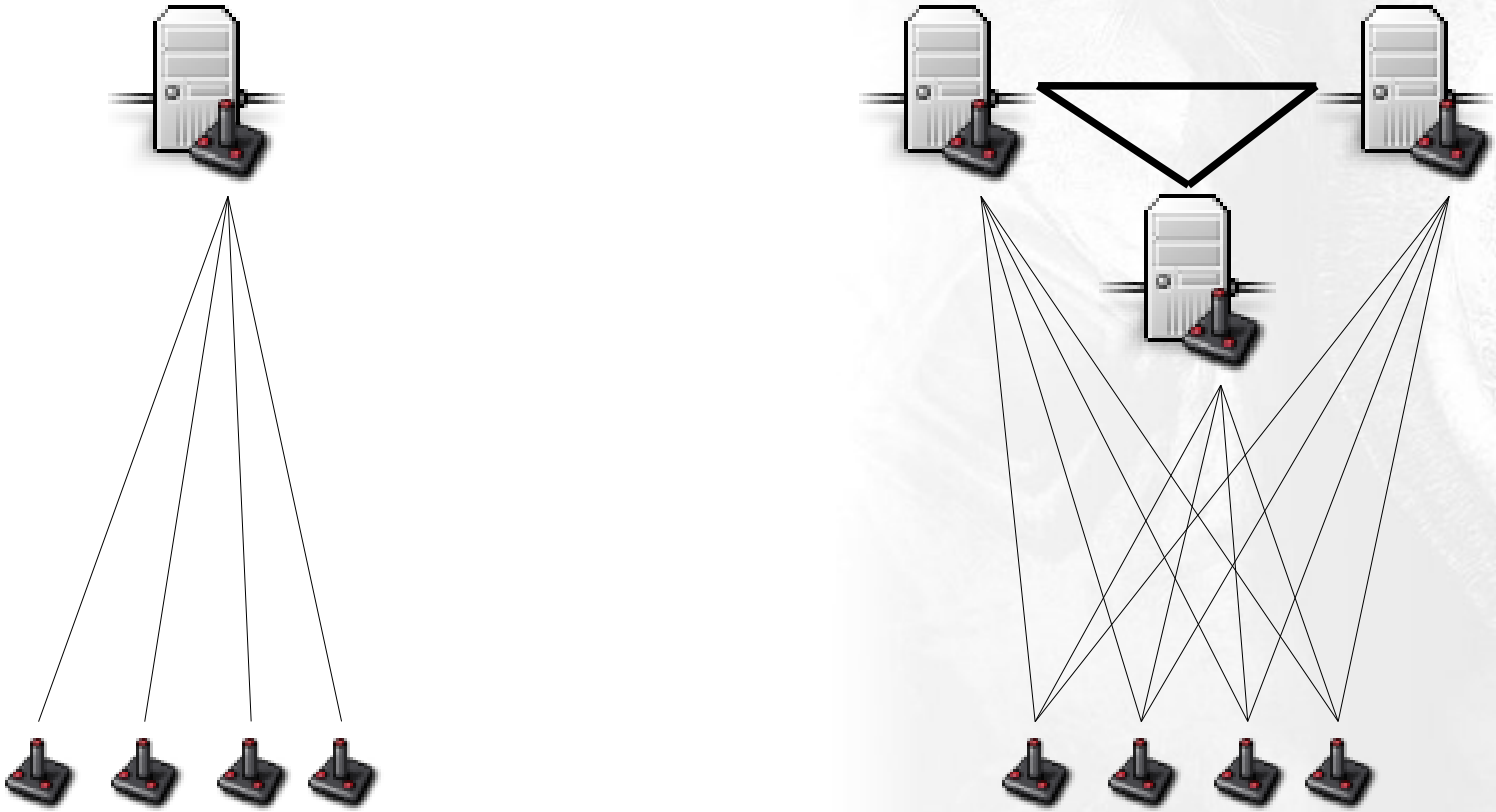


Future Work

- Observations
  - Each zone has one server, unique point of failure
  - A super peer can cheat easily
  - Players have spare upload bandwidth
  - Super peers have spare download bandwidth
- Proposed solution: Multiple super peers per zone
  - Improves cheat protection
  - Improves client experience when a super crashes or disconnect
  - Improves latency

Future Work

- Multiple super peers per zone



Questions?

Project hosted by SourceForge:
http://sourceforge.net/projects/scalamo/

- Source code freely accessible
- Join the project by sending us an email

Ariel: ariel.vardi@gatech.edu
Philippe: philippe.david@gatech.edu

Thank you!