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
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**MMOG market: rapid growth**

Total MMOG Active Subscriptions (Excluding Lineage, Lineage II, and Ragnarok Online)

![Graph showing the growth in MMOG active subscriptions](image-url)
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MMOG market: rapid growth

[Graph showing active subscription growth of various MMOGs from Jan-97 to Jan-06]
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
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Architecture
Experimental results

**Server Side**
Standard MMOG architecture

100 players

400k/s
Experimental results

**Server Side**
Our MMOG architecture

*7k/s per super peer*
Experimental results

SuperPeer Side

Our MMOG architecture

For each SuperPeer

100 players
4 zones
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

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Thank you!