

PartyPeer: a P2P Massively Multiplayer Online Game *

Leslie S. Liu, Roger Zimmermann, Baoxuan Xiao and Jon Christen
Computer Science Department, University of Southern California
Los Angeles, California, USA

[lleslie,rzimmerm,bxiao,jchrist]@usc.edu

ABSTRACT

Using peer-to-Peer (P2P) architectures for large scale *interactive* applications such as Massively Multiplayer Online Games (MMOG) is very challenging because of the difficulties to maintain a consistent game world in a distributed topology and exchange game state information in the P2P network without a central sever. In this demo proposal we present the innovative design and implementation of PartyPeer, an online social game which supports a massive number of users using our P2P based streaming network called *ACTIVE+*. We also discuss some of the implementation challenges when building this real-world P2P based game.

Categories and Subject Descriptors

J.m [Computer Applications]: Miscellaneous; I.6.3 [Computing Methodologies]: SIMULATION AND MODELING—Applications

General Terms

Algorithms, Design, Performance

Keywords

Massively Online Games, Virtual Reality, Peer-to-Peer streaming

1. INTRODUCTION

Massively multiplayer online games (MMOG) have become a widely successful online business with revenue in the billions of dollars (2005). The dominant design for current MMOG games is the client-server paradigm. To the best of our knowledge, there is no truly successful implementation of an MMOG game built on a P2P-based design exists, despite the tremendous amount of research investigating P2P architectures.

In this proposal, we describe our design of PartyPeer, a P2P based game that supports a massive number of concurrent players in a social-style environment, the prototype of which is shown in Fig. 1 as a private island. We will discuss how we use our *ACTIVE+* protocol to address some of the challenges raised previously: scalability, latency and P2P connectivity.

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Figure 1: Screen shot: The Island

2. THE DESIGN

2.1 Game Overview

PartyPeer is a social game that provides a virtual space where massive number of players can gather and interact with each other. The challenges of building a scalable, playable (low-latency) and yet practical massively multiplayer game using a P2P infrastructure have led us to devise an innovative P2P based low-latency streaming platform called *ACTIVE+*. *ACTIVE+* has evolved from our previous research [2, 3, 4] with significant changes to make *ACTIVE+* a practical and suitable platform for MMOG games. We chose to implement a social game to demonstrate the feasibility of using a P2P architecture for MMOG games because a social game is a very good platform to test a massive number of players in a session. Even though the delay requirement for a social game is less than for a first-person shooter game, we hope that our pioneering efforts of implementing a playable game for many users using a P2P architecture will provide insights into many practical issues that so far have been largely ignored and inspire a new generation of P2P designs that could lead to successful P2P based MMOG games in the future.

2.2 Game Components

PartyPeer has three major components, the game engine, game world and the p2p network module. Game world is composed of the scripts describe the gaming place, 3D object models and other

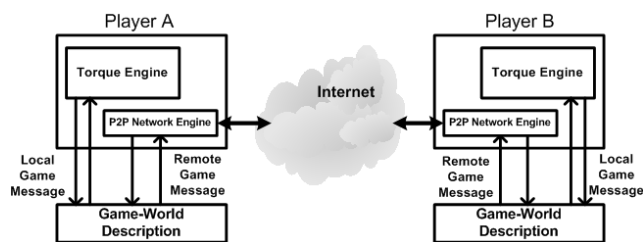


Figure 2: Game Architecture Design

gaming rules and logics. Game engine runs the game world and renders the graphic. p2p network module provides the information exchanging platform among all players.

We use Torque [1] as the game engine for PartyPeer implementation and *ACTIVE+* as the network module. Fig. 2 shows these function modules of current game design.

2.3 Features

We believe PartyPeer is an innovative project because of following features:

2.3.1 Low latency voice chatting for large group

Partypeer provides voice chatting among all participating players and dynamically maintain a low latency voice link among nearby speakers. In our *ACTIVE+* network, players are clustered based on their positions in the game world. By using our *ACTIVE+* protocol, hundreds or even thousands of people can join in the same space while minimal central resources are needed to coordinate.

2.3.2 Probability based message exchanging

PartyPeer solves the scalability problem in a P2P network by introducing probability based message forwarding mechanism. However, the system is designed so that the players virtually far from each other will have less probability of exchanging game state information as compared to nearby players. By doing so, the data rate required at each nodes is bonded by a value independent of the total number of players online. This feature makes PartyPeer a very scalable multiple-player online game.

2.3.3 NAT connectivity issue

One important practical issue that has largely been ignored by the research community when designing the P2P based game architecture is that many players connect to Internet using network address translation (NAT) devices such as home DSL modems or cable modems. These NAT devices give players machine a local IP address that is not accessible from outside world without special handling. We designed and implemented our own version of the whole punching protocol to build connections between machines behind NAT devices. We are now testing PartyPeer by players around the world, including far east and Europe and our protocol is running very well.

3. DEMO PLAN

We are planning to demo our game in a private island setting, where our guests can play paintball with players from around the world. They will be able to chat with each other as well.

We currently have already finished the modeling of the private island and the paintball game script. We have also designed two player models, one male and one female. We are continuously adding new player models to the game at this moment. Fig. 3 is a

screenshot of our prototype showing several players playing paintball game outside a beech house in the private island.



Figure 3: Screen shot: Paint Ball Game

4. CONCLUSIONS

In this proposal, we have presented a novel design of a peer-to-peer based massively multiplayer online game called PartyPeer. We used our innovative *ACTIVE+* protocol to build a scalable and low latency streaming network. Our initial results indicate that it is feasible to implement a MMOG game using P2P based architecture. We also briefly discussed the current progress of our implementation and the plan for demonstration. We are planning to complete the beta version of PartyPeer by the end of summer 2006.

5. REFERENCES

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