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## Introduction

In MMORPG, such as World of Warcraft user can perform various actions in the virtual world. We study the dependencies of specific actions and generated network traffic. The results may be applied, for example, when considering a design of a version of the game for mobile devices.

## Objectives

Classify user action types and determine the relationship between a specific user action and generated network traffic.

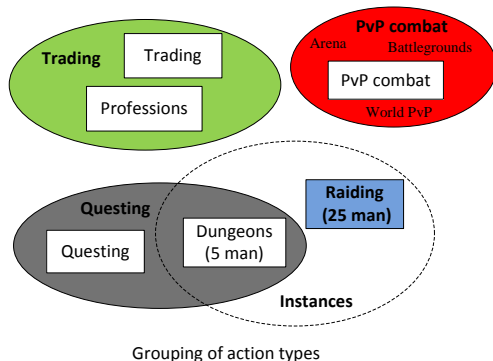
## Action types

Isolate parameters which characterize certain action types:

- Number of participating users
- Rate of player activity
- Goal of the action
- Number of active non-player characters

Classify action types based on previously defined parameters:

- Questing
- Instances (incl. 5-man dungeons and 25-man raids)
- Trading
- Professions activities
- Player versus Player (PvP) combat



## Methodology and measurements

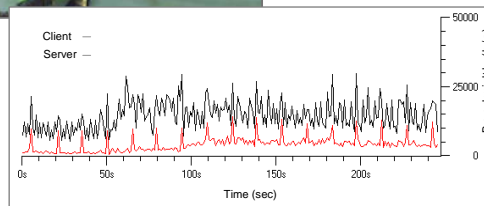
- Six players participated in a measurement/gaming session.
- Incoming/outgoing traffic was captured by using Wireshark (www.wireshark.org).
- Context specific data in terms of (type of) action performed was collected from the players.
- A total of 1.28 GB of action specific data gathered.
- We analysed bandwidth usage, payload size, number of packets per second, interarrival and interdeparture times and burstiness.



Action type:  
PvP combat

In game

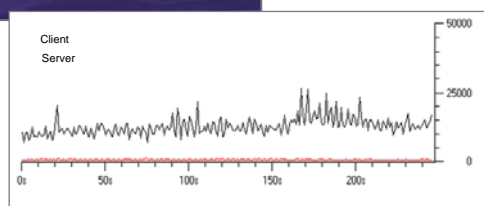
Server and client time series



Action type:  
Trading

In game

Server and client time series



## Results

Significant differences in network load were demonstrated for specific action types:

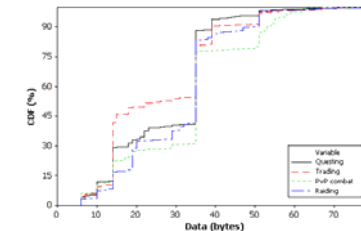


Figure 1. Empirical CDF of client's packets payload size

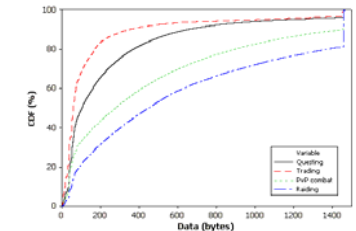


Figure 2. Empirical CDF of server's packets payload size

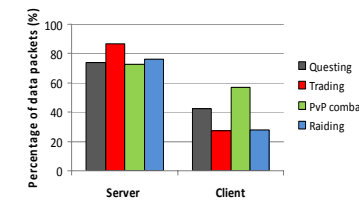


Figure 3. Packets per second

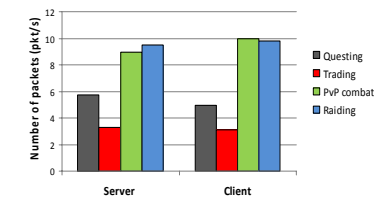


Figure 4. Percentage of sent data packets

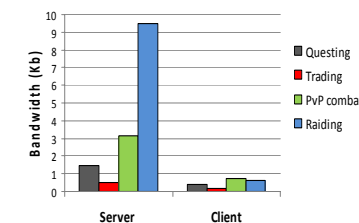


Figure 5. Bandwidth usage

Summary of results:

- Trading has lowest requirements in all categories.
- PvP combat has highest demands on uplink connection.
- Raiding has highest demands on downlink connection.
- Questing has average results in all categories, mostly due the diversity of actions in this category.

## Acknowledgements

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