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A Network Traffic and Player Movement Model to Improve Networking for Competitive Online Games

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***Abstract*— The popularity of computer games and e-sports is enormously high and still growing every year. Despite the popularity computer games often rely on old technologies, especially in the field of networking. Research in networking for games is challenging due to the low availability of up-to-date datasets and network traces. In order to achieve a high user satisfaction while keeping the network activity as low as possible, modern networking solutions of computer games take players' activities as well as closeness of players in the game world into account. In this paper, we analyze the Battle Royale game mode of the online multiplayer game *Fortnite*, where 100 players challenge each other in a king-of-the-hill like game within a constantly contracting game world, as an example for a popular online game with demanding technical requirements. We extrapolate player movement patterns by finding player positions automatically from videos, uploaded by Fortnite players on popular streaming platforms and show, how they influence network traffic from the client to the server and vice versa. This extended abstract features the highlights of [1], which has been accepted at the NetGames 2018 event.**

Regarding networking aspects, most games rely on decade old techniques. They still transmit their time critical information, such as player positions and game world updates, via UDP, and use TCP for matchmaking and information presented in context of the game itself. Neither of these protocols was designed for online games. That is noticeable at every big game launch, where game servers crash under the load of hundreds of thousands of players and network nodes struggle to keep up.

Novel information-centric networking (ICN) architectures may be better suited for multiplayer online gaming as ICN approaches have a strong focus on the information itself. In current research, the characteristics of Named Data Networking (NDN) [2], which is one implementation of an ICN, are used beneficially in order to reduce redundancy and network latency. However, the lack of extensive data sets and proprietary software makes research on alternative networking architectures for online games challenging.

The goal of our work is to provide means to test new networking approaches in the context of online gaming. We focus on the popular game *Fortnite* and analyze it regarding its network traffic, game mechanics that influence networking, i.e. player encounters and players' positions in the game world, and the average player behavior. Based on our observations we extrapolate game network traffic in combination with simulated user behavior that can be used to simulate the progress of a game round and the network traffic generated.

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Fig. 1. Heat map from player movements in Fortnite Battle Royale generated automatically from more than 36 hours of game streams.

We first obtained more than 36 hours of streamed in-game video footage from YouTube and utilized OpenCV's template matching algorithms to track player positions on the game map. Based on the players' movement patterns, we obtained a heat map of hot spots, where players moved frequently throughout the analyzed games, as shown in Fig. 1. We then analyzed the basic structure of a game round, which is very well defined for the Battle Royale game genre, and modeled random player movements and encounters throughout the game world. In combination with network traces obtained by playing the game, we modeled network traffic for each client and inferred the network traffic on the server. The resulting tools to simulate game rounds are provided as open source software and are available with sample simulation output for further research on GitHub: `https://github.com/phylib/FortniteTraces`.

References

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