Multiplayer Game Networking

“Aspects of Networking in Multiplayer Computer Games ” was published by Jouni Smed, Timo Kaukoranta, Harri Hakonen in The Electronic Library, vol. 20, num. 2, 2002. The paper provides an overview of the four aspects of networking in multiplayer gaming: networking resources, distribution, scalability, and security .

The paper's introduction opens with describing “shared-space technologies” and how it relates to online multiplayer gaming. It goes over the different classifications of “shared-space technologies” and then focused on Virtual Reality. Research that pertains to Virtual Reality Shared-Space can be split into three categories: Military Simulations, Virtual Reality, and Computer Supported Collaborative Work. Online multiplayer gaming falls under the Virtual Reality Shared-Space, but does not fit into the three areas of research.

The first body paragraph goes over Networking Resources, focusing mainly on Bandwidth, Latency, and Network Processing Power. Bandwidth is explained with a simple comparison of Unicast, Multicast, and Broadcast with a figure (Figure 2) to compliment. Latency is explained as the length of time for a packet to get from one node to another. The paper vaguely explains that the handling network traffic adds additional strain to the system.

Next the paper goes into distribution concepts, focusing on communication, data, and control. Figure 3 shows different communication architectures that are commonly used in online gaming. It quickly explains that peer-to-peer is good for smaller online games or when playing over a LAN, a client-server architecture scales better but puts a lot of network strain on the server, and the server-network supports the best scalability at the cost of network complexity. Data and Control architectures must take into account consistency and responsiveness. A fully centralized data architecture allows for a stable consistency, but the responsiveness of the system goes down. Distributed or Replicated data architectures allow for more responsiveness at the cost of consistency, which usually is better for online gaming. To reduce resource requirements further on a system, compensation techniques are used. These include message compression and aggregation, area's of interest, and position estimation. Figures 6, 7, and 8 show different methods of compensation in online gaming.

The distribution concepts section was very vague throughout. It does not include any specific examples or data supporting its conclusions about selected techniques related to online gaming.

The next section is scalability, the ability of a system to adapt to resource changes. First speedup though parallelization is explained, with an equations 1 and 2 showing the ability of a system to speedup though parallelization of the non-serial parts. Figure 9 shows the different event execution in online gaming. The paper then goes over the communication capacity of different architectures.

The paper attempts to calculates the maximum number of clients a server can provide serializable. This is apparently done by randomly selecting values for the number of bits in a

message and transmission frequency. It would have been better to cite an external source that figured out the average maximum clients a server can handle in an online gaming system.

Finally, the paper goes into security and cheating in online gaming. At the time of the papers writing, no academic research has looked into security in online gaming. Packet and traffic tampering can be used by a user to cheat the system. First Person Shooters, for example, can modify outgoing packets to signal that they hit an enemy even though they had not. The server and other clients then will use this illegal packet unknowing that it was not genuine. A simple solution to basic forms of packet and traffic tampering can be achieved through checksum. A second method of cheating is to modify the game engine to allow the display of information not readily available to the user. This can be seen in First Person Shooters where a modify game engine can allow walls to be transparent, giving the player a battlefield advantage.

These exploited are widespread though games at the time of writing. It would have been better to include some real world examples of these types of exploits. For example, at the time of writing, Counter Strike was very popular at the time and the exploits were widespread.

The paper provided a good overview of the different topics of networking topics that online multiplayer gaming provides. It does not go into any specifics, but was not intending to from the start. This paper explains were future research can take place.