

Aspects of Networking in Multiplayer Computer Games

This paper was published in volume 2 of the Electronic Library journal back in 2000. The main objective is to provide an overview on the four factors that affect distributed real-time multiplayer computer games from a networking perspective. The motivation behind this paper, as stated by the authors, is that multiplayer computer games with their increasing popularity are in the vanguard of utilizing the networking possibilities but received few attentions in terms of research and studies. The four aspects discussed in this paper are: networking resources, architectures, scalability, and security.

The introduction of the paper provided an extensive background in regard to multiplayer computer games. It started by first introducing the classification of shared-space technologies. While this concept provided a high level perspective on multiplayer computer games, the description and graph provided no useful insight to the networking perspective of MCGs and are largely irrelevant to the objective of this paper. The authors also argued the lack of scientific literature discussing the problem of MCGs, however, considering the fact that most households still used dial-up and the small number of multiplayer online games available back in 2000, it is understandable as there simply wasn't an immediate need for research.

The discussion of the effect of networking resources in MCGs provided a very high level perspective on bandwidth, latency, and computational power. In fact, much of the information can be applied to networking applications in general but not just to MCGs. When discussing multicast as part of the transmission techniques, the authors failed to mention any of its related issues including reliability and congestion control. The paper simply stated multicast as a maturing technique in distributed systems, given out the illusion that it is a better alternative to unicast in distributed system. In addition, no mentioning of anycast was seen in this section, simply left out an important transmission technique that has proven to be beneficial to large content distribution according to Z. Al Qudah, et al. in their "Anycast-Aware Transport for Content Delivery Networks".

When discussing the data and control architectures, the authors categorized the relay from local node to the network into two-way relay and short-circuit relay. While the idea of two-way relay is straightforward, the explanation of short-circuit relay was confusing without any example. The authors claimed that short-circuit relay provided high responsiveness because a local control message will appear in the local data. However, from the perspective of an MCG that requires high responsiveness, the lack of actual responses from the network would still cause jitters and other undesired results such as teleporting or sudden death when the local host is out of sync with the rest of the players. It seems like while short-circuit relay can provide high responsiveness by replicating the local control messages, quick response is still required from the network to provide best gaming experience.

In the scalability section, the authors mentioned serial and parallel execution as one of the factors that would affect system's ability to adapt to varying amount of players. The authors estimated the maximum number of serial client connections using IPv6 in a 10Mbps Ethernet with a transmission frequency of 5 packets per second. I found it interesting that the authors used IPv6 rather than IPv4, considering the lack of IPv6 adoption back in 2000 or even today. IPv6's larger frame size along with the increase in Ethernet bandwidth from 10Mbps to 100Mbps or even 1Gbps today would increase the maximum client connection in serial, which implies that the hardware is capable of supporting such scalability but the dilemma lies in the support from applications and the underlying architectures.

The final aspect that affects networking in MCGs is the issue of security and cheating. Contrast to what most people would consider when talking about security and cheating in MCGs, the authors discussed them from the perspective that is outside the game world. The authors discussed the possibility of encrypting the command packets to prevent control protocols from breaking. However, the use of encryption would cause a significant amount of overhead both in bandwidth and computation, such overhead would create latency and therefore decrease the responsiveness of game play.

Overall, this paper is very similar to the MPEG paper by D. Le Gall in terms of purpose and contents. Both papers provide overviews on an emerging technology rather than rising questions or providing novel solutions. The objective of this paper is to understand the different aspects of networking in Multiplayer Computer Games. It did so efficiently by categorizing issues related to networking in a high-level perspective. The categorization established a foundation for future researches. In addition, the graphs throughout the paper provide intuitive messages that not only require little explanation, but instead, many of the graphs help clarify the content of the paper. The paper overall is very well written and easy to understand even for people without prior knowledge or related background.