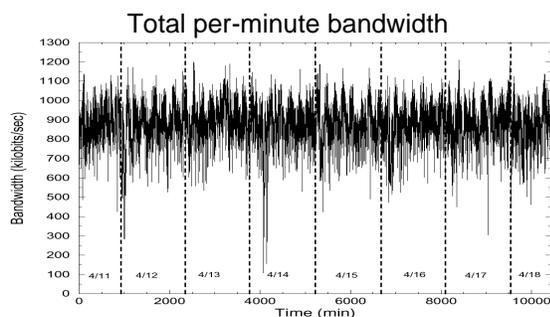


Provisioning On-line Games: A Traffic Analysis of a Busy Counter-Strike Server

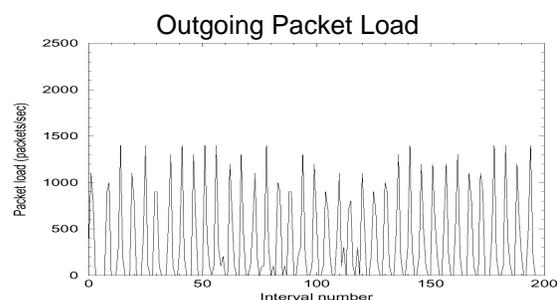
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Abstract:

This poster describes the results of a 500 million packet trace of a popular on-line, multi-player, game server. The results show that the traffic behavior of this heavily loaded game server is highly predictable and can be attributed to the fact that current game designs target the saturation of the narrowest, last-mile link (i.e. 56k modems). Specifically, in order to maximize the interactivity of the game itself and to provide relatively uniform experiences between players playing over different network speeds, on-line games typically fix their usage requirements in such a way as to saturate the network link of their lowest speed players. While the traffic observed is highly predictable, the trace also indicates that these on-line games provide significant challenges to current network infrastructure. As a result of synchronous game logic requiring an extreme amount of interactivity, a close look at the trace reveals the presence of large, highly periodic, bursts of small packets. With such stringent demands on interactivity, routers must be designed with enough capacity to quickly route such bursts without delay. As current routers are designed for bulk data transfers with larger packets, a significant, concentrated deployment of on-line game servers will have the potential for overwhelming current networking equipment.



The trace data that we observed does not conform to traditional models of network traffic. Specifically, the traffic does not exhibit self-similar, or heavy-tailed properties. The long-term behavior is characterized by a near-constant consumption of network resources. However, on smaller scales, the traffic is dominated by an extremely bursty, highly periodic pattern.



The real-time low-latency requirements of the application's logic places demands on network infrastructure which are dissimilar from more traditional Internet services. Thus, network packets are relatively small – packet data is often smaller than the link and transport layer headers. In addition, packets are broadcast on intervals much shorter than typical retransmission times, UDP is typically chosen to satisfy this archetype of networking requirements. With the global explosion of on-line multi-player gaming, it will become more important in the coming years to understand how the Internet environment will be influenced by this form of traffic.

[1] W. Feng, F. Chang, W. Feng, J. Walpole, "Provisioning On-Line Games: A Traffic Analysis of a Busy Counter-Strike Server", In Proceedings of the Internet Measurement Workshop, November 2002
<http://www.cse.ogi.edu/sysl/projects/cstrike/>

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