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

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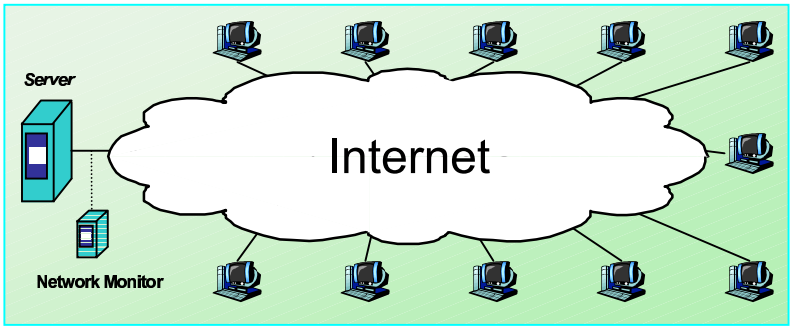
The Story:

A Week in the life of a loaded Counter-Strike Server

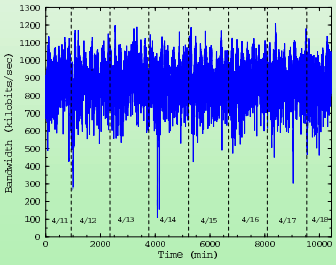
•**Internet Video Games follow a simple client-server model:** Multiple transient clients connect to a pre-existing stationary game server



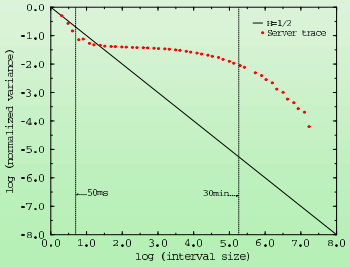
Counter-Strike Screenshot

A simplified view of the network topology

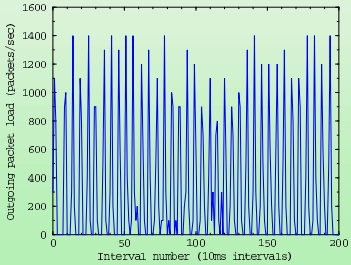
Bandwidth usage is nearly constant: It is composed by a number of low-bandwidth non-responsive UDP flows



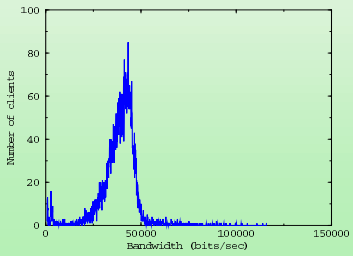
Network usage is unlike traditional Internet applications: Bandwidth is not self-similar, and aggregates well



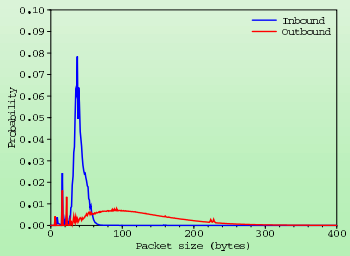
Which is not to say that it's smooth on all scales: Bandwidth is characterized by highly periodic broadcasts at the millisecond level



Client bandwidth is designed to saturate the narrowest last-mile link (56K modems): The game must provide uniform & fair user experience



Network use is primarily composed of large bursts of small packets: This is due to low-latency requirements of game mechanics



Which can be disastrous if the server's network cannot switch at a high enough speed:

•Routers must be able to handle a large bursts of small packets

•Experiments with commercial NAT devices show a high packet loss rate, due to under-provisioned hardware

•But buffering is not the solution! Buffers introduce latency – which is detrimental to client performance

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