A Selective Retransmission Protocol for Multimedia on the Internet

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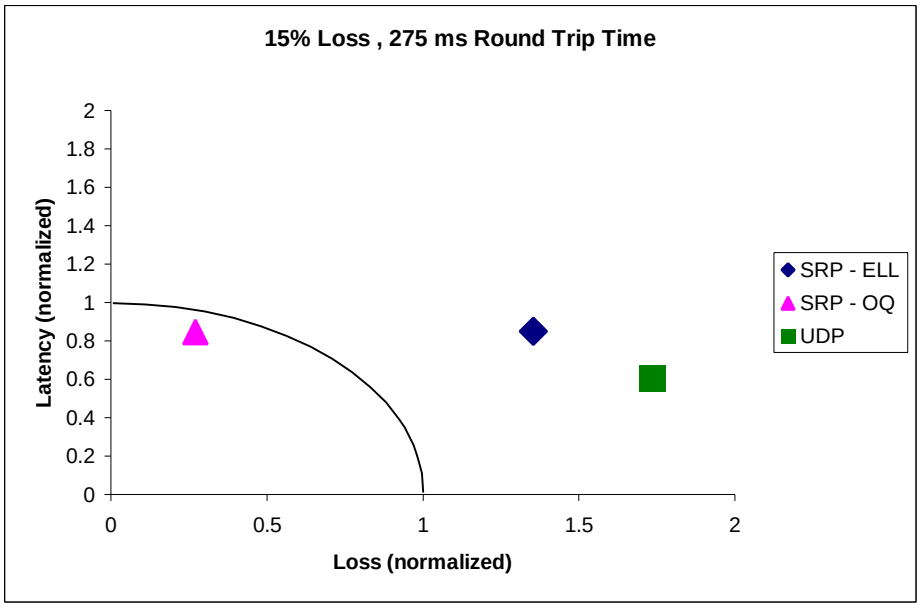
Internet multimedia applications have different requirements than text-based applications. Audio and video both require that data is received in a timely fashion and is more forgiving of lost data. Small losses in the playback stream can be replaced with substitute data or concealed so that the listener does not notice. TCP is ineffective for multimedia due to the overhead of retransmission and ignorance of timing factors. While it provides a service with no loss of data, it does not support any time constraints. Data can arrive at a receiver with unbounded delay. UDP, conversely, provides a "best effort" service with minimal delay. It does not, however, offer any guarantees on data loss. With UDP, potentially all data sent can be lost. Our Selective Retransmission Protocol (SRP) provides a balance between the delay of TCP and the loss of UDP. SRP retransmits only a percentage of the data that was lost, providing a compromise between TCP, which retransmits all lost data, and UDP, which retransmits no data. The amount that is retransmitted depends on several Quality of Service (QoS) factors including current loss and latency, round-trip time, network congestion, and is tuned to provide the best possible multimedia quality given the network conditions. We developed two algorithms for the retransmission decision and ran experiments using an isolated test bed with simulated network traffic. We found that one of these algorithms produced a better balance between loss and latency than either TCP or UDP.



The graph shows the multimedia quality for three different media sessions over a network with 15% loss and 275 ms round-trip delay. The axes are the amount of end-to-end latency and loss a session experienced, normalized by the maximum tolerable limits. The closer to the origin, the better the multimedia quality. The curve represents the region of acceptable quality, where all points inside the curve have acceptable quality and those outside the curve have unacceptable quality.