Packet loss recovery in internet telephony

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ABSTRACT

Internet telephony is promising for long-distance calls because of its low service charge and value-added functions. Packet loss is a challenge to Internet telephony as it affects voice quality. Some packet loss recovery schemes have been proposed in the literature to combat packet loss and enhance voice quality. Their main idea is that the sender transmits redundancy so that the receiver can make use of this redundancy to possibly recover the lost packets.

In this thesis, we consider an Internet telephony system in which the service provider operates a telephone gateway in each servicing city to serve the general public. We propose a more powerful packet loss recovery scheme, called lightweight piggybacking, for this Internet telephony system. The source telephone gateway produces very small redundancy via two stages of erasure coding and fragmentation on the low bit-rate version of original voice streams, such that the small redundancy can be shared by multiple voice streams to a large extent for more powerful packet loss recovery at the destination telephone gateway. We further enhance the lightweight piggybacking scheme in a multipath environment provided by a large Internet telephony system, such that the resulting scheme can recover bursty loss even more powerfully.

We conducted simulation experiments to evaluate the performance of lightweight piggybacking. Compared with the conventional piggybacking scheme, the lightweight piggybacking scheme can effectively: (i) increase the probability of recovering the lost packets using the same or smaller amount of redundancy, and (ii) recover the loss of multiple and consecutive packets. When the telephone gateways of a large Internet telephony system form a multipath transmission environment, lightweight piggybacking is even more powerful for packet loss recovery.

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