

Weinstein, C. J. and Forgie, J. W., **Experience with Speech Communication in Packet Networks**, IEEE J. Selected Areas Commun., December 1983, Vol. SAC-1, No. 6, pp. 963-980.

Abstract

The integration of digital voice with data in a common packet-switched network system offers a number of potential benefits, including reduced systems cost through sharing of switching and transmission resources, flexible internetworking among systems utilizing different transmission media, and enhanced services for users requiring access to both voice and data communications. Issues that it has been necessary to address in order to realize these benefits include reconstitution of speech from packets arriving at nonuniform intervals, maximization of packet speech multiplexing efficiency, and determination of the implementation requirements for terminals and switching in a large-scale packet voice/data system. A series of packet speech systems experiments to address these issues has been conducted under the sponsorship of the Defense Advanced Research Projects Agency (DARPA).

In the initial experiments on the ARPANET, the basic feasibility of speech communication on a store-and-forward packet network was demonstrated. Techniques were developed for reconstitution of speech from packets, and protocols were developed for call setup and for speech transport. Later speech experiments utilizing the Atlantic packet satellite network (SATNET) led to the development of techniques for efficient voice conferencing in a broadcast environment, and for internetting speech between a store-and-forward net (ARPANET) and a broadcast net (SATNET). Large-scale packet speech multiplexing experiments could not be carried out on ARPANET or SATNET where the network link capacities severely restrict the number of speech users that can be accommodated. However, experiments are currently being carried out using a wide-band satellite-based packet system designed to accommodate a sufficient number of simultaneous users to support realistic experiments in efficient statistical multiplexing. Key developments to date associated with the wide-band experiments have been (1) techniques for internetting via voice/data gateways from a variety of local access networks (packet cable, packet radio, and circuit-switched) to a long-haul broadcast satellite network and (2) compact implementations of packet voice terminals with full protocol and voice capabilities.

Basic concepts and issues associated with packet speech systems are described. Requirements and techniques for speech processing, voice protocols, packetization and reconstitution, conferencing, and multiplexing are discussed in the context of a generic packet speech system configuration. Specific experimental configurations and key packet speech results on the ARPANET, SATNET, and wide-band system are reviewed.