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An Information Theoretic Framework for Predictive Channel Reservation in GPRS Push-to-Talk Service*

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Abstract. The wireless telecommunication industry is now slowly shifting the paradigm from circuit-switched voice-alone network to an integrated packet switched architecture. This will facilitate variety of new multimedia applications, in the same infrastructure, in a cost-efficient way. However, it is important to use the legacy $2.5G$ access systems as much as possible, to make the transition smooth. The recent industry-wide trend for *push-to-talk* services in GPRS networks is a direct consequence of this emerging packet-switch services. In this paper, we propose such a packet-switched based architectural framework for efficient push-to-talk and data services in GPRS using low-bit-rate coding. The prime novelty and advantage of the framework lies in proposing new intelligent, advanced channel reservation techniques to reduce the voice packet delay. Subsequent use of packet-classification and packet assembly scheme aids in reducing the overhead associated with the media packet transfer. Our proposed framework results in more than 50% capacity gain over current GSM system using a silent detection mechanism.

1 Introduction

Rapid rise in wireless data services has already resulted in service migration from traditional circuit-switched telecommunication networks to packet-switched networks. This will provide vast opportunities for new, cost-effective real-time services. Recent statistics reveal that almost two-third of today's mobile phones are of GSM (Global System for Mobile communications) standards. In order to support the wireless Internet services new GPRS (General Packet Radio Services) standards [5, 6], with data rates upto 128+ Kbps, has been proposed. However, the benefit of packet switched based networks can not be fully harnessed without successful integration of voice services under the same networks. The recent offering of *push-to-talk* services in GPRS is first attempt to migrate voice service to GPRS.

In this paper first we have proposed a packet-switched architecture based on the subsystems proposed in UMTS specification by $3GPP$ [1]. These subsystems are designed for voice and data services. It leverages the use of relevant, existing features of GPRS architecture and proposes new, intelligent, advanced channel reservation schemes to ensure voice packet QoS in push-to-talk services. In order to get an optimal trade-off between voice packet delay and Internet protocol overhead, we have used packet classification, low-bit-rate AMR (Adaptive Multi-Rate) coding and packet bundling mechanisms in the

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