

Improving Latency Using Codes in Mission-Critical Communication

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Abstract— Delays are crucial in mission-critical applications such as safety networks that exchange information in a short period of time to prevent impending accidents. When such applications are implemented in wireless systems, delays are inevitable, due to a defining characteristic of unstable wireless channels. Information signals sent over the air are inherently prone to distortion, thus often need to be retransmitted to ensure their successful decoding. It is crucial in mission-critical applications that the delays be short enough, although it may come with a cost in other aspects of communication, for example, reduced data rates. In this paper, we propose a novel technique that improves latency using codes. We consider the established cellular systems that are based on orthogonal frequency-division multiplexing (OFDM), and employ maximum-distance separable (MDS) codes for signals that are sent via parallel orthogonal carriers. As our main result, we show that compared to a naïve approach that applies simple repetition coding schemes, our technique can achieve both better latency and data rate. This result suggests that by employing sophisticated coding schemes, one can improve latency without making much sacrifice in data rate.

Keyword—Latency-rate trade-off, Mission-critical communication, MDS codes, OFDM systems, Packet failures



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