CCIT Report No. 314

Capacity Maximization in Multichannel Slotted ALOHA with Deadlines – An Overview

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ABSTRACT

Slotted multichannel ALOHA is the access scheme of choice for sending short messages and for reserving channels to be used by longer ones in many satellite-based networks. For these applications, maximization of capacity subject to meeting a specified deadline with a specified (high) probability jointly captures true, intuitive user requirements and the desire to maximize system cost-effectiveness. This report addresses deadline-constrained capacity maximization. A key idea is to achieve a low probability of missing the deadline by permitting a large maximum resource expenditure per message, while holding the mean expenditure low in order to minimize "pollution". This is achieved through the judicious exploitation of redundancy, e.g. transmission of an increasing number of copies per round as the deadline approaches, or by the use of different working points for channels employed in different rounds. The judicious exploitation of redundancy substantially increases the delay-constrained capacity and is moreover practical and even power-efficient. This report provides a road map of our recent work on this topic, and refers the interested reader to other publications for the details.