

# Sequences for Channel Access in Mobile Ad Hoc Networks

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## Abstract

The medium access control (MAC) protocol determines when a network node has permission to access a shared channel, and is therefore central in improving throughput and minimizing delay. In wireless networks, collisions arise when two or more nodes within transmission range (neighbours) access the channel simultaneously; then the transmissions are ineffective. Nodes farther apart than transmission range can access the channel without collision, permitting ‘spatial reuse’. MAC protocols strive to provide frequent access to the channel, but not so frequent that collisions make the accesses ineffective. In mobile ad hoc networks, neighbours change over time, and the demands of each node also change, sometimes quite rapidly. Some MAC protocols operate by partitioning time into short slots, assigning a sequence to each node to determine in which slots it is permitted to transmit. While the principal goal is usually to maximize throughput, other performance metrics are also important, such as (maximum and average) delay, jitter, drop rate, and fairness. Topology-aware protocols compute sequences for cases in which each node has neighbourhood information; topology-transparent protocols compute sequences when the neighbours are not known.

In this talk, the main combinatorial approaches to topology-transparent scheduling are introduced, using orthogonal arrays, Steiner systems, and codes - and their generalization to cover-free families. Phrasing the known approaches in this way leads to a strong connection with cross-correlation of the sequences involved, and underlies some challenging open problems in sequence design.