EXCESSIVE DELAYS IN RANDOM-ACCESS NETWORKS

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We explore the achievable delay performance in wireless random-access networks. While relatively simple and inherently distributed in nature, suitably designed backlog-based random-access schemes provide the striking capability to match the optimal throughput performance of centralized scheduling mechanisms in a wide range of scenarios. The specific type of activation rules for which throughput optimality has been established, may however yield excessive backlogs and delays. Motivated by that issue, we examine whether the poor delay performance is inherent to the basic operation of these schemes, or caused by the specific kind of activation rules. We first establish lower bounds for the delay in the case of backlog-based activation rules and show that the type of rules for which throughput optimality has been established yield excessive delays. We further examine fixed activation rates and establish lower bounds for the delay and mixing time. The bounds indicate that the delay and mixing time can dramatically grow with the load in certain topologies.