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Leveraging the Tail Time for Saving Energy in Cellular Networks

Abstract:

In cellular networks, inactivity timers are used to control the release of radio resources. However, during the timeout period of inactivity timers, known as the tail time, a large proportion of energy in user devices and a considerable amount of radio resources are wasted. In this paper, we propose TailTheft, a scheme that leverages the tail time for batching and prefetching to reduce energy consumption. For network requests from a number of applications that can be deferred or prefetched, TailTheft provides a customized application programming interface to distinguish requests and then schedules delay-tolerant and prefetchable requests in the tail time to save energy. TailTheft employs a virtual tail time mechanism to determine the amount of tail time that can be used and a dual queue schedulingalgorithm to schedule transmissions. We implement TailTheft in the Network Simulator with a model for calculating energy consumption that is based on parameters measured from mobile phones. We evaluate TailTheft using real application traces, and the experimental results show that TailTheft can achieve significant savings on battery energy (up to 65%) and dedicated radio resources (up to 56%), compared to the default policy.