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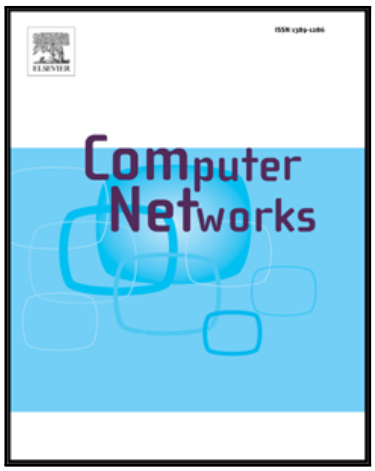

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Failure Recovery in Wireless Content Distribution Networks with Device-to-Device Cooperation

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Abstract

Device-to-device cooperation has emerged as a prominent solution to a wide range of challenges in large-scale wireless networks. However, the ad hoc nature of cooperative networks and their proneness to failure are a major obstacle towards their real world deployment and wide adoption. In this work, we focus on failure recovery and scalability in wireless content distribution networks with device-to-device cooperation, where a number of mobile devices in a given geographical area are interested in downloading a common content from an application service provider. We present low complexity effective algorithms based on clustering and tree construction methods in order to address three different types of dynamic node behavior, namely new devices joining the network, existing devices leaving the network, and existing devices moving locally within the network. Moreover, we propose a constrained version of the minimum spanning tree algorithm with bounds on the height of the tree and the maximum degree per node, in order to capture practical operational constraints for device-to-device cooperation in wireless networks. We present results for various network scenarios using simulations and experimental test bed to demonstrate the effectiveness of the proposed algorithms in terms of performance efficiency, computational complexity, and practical implementation feasibility.

Index Terms

Cooperative networks, mobile-to-mobile data sharing, traffic offloading, clustering algorithms

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