SMART: A secure multi-layer credit based incentive scheme for delay-tolerant networks

Abstract

Delay-tolerant networks (DTNs) provide a promising solution to support wide-ranging applications in the regions where end-to-end network connectivity is not available. In DTNs, the intermediate nodes on a communication path are expected to store, carry, and forward the in-transit messages (or bundles) in an opportunistic way, which is called opportunistic data forwarding. Such a forwarding method depends on the hypothesis that each individual node is ready to forward packets for others. This assumption, however, might easily be violated due to the existence of selfish or even malicious nodes, which may be unwilling to waste their precious wireless resources to serve as bundle relays. To address this problem, we propose a secure multilayer credit-based incentive scheme to stimulate bundle forwarding cooperation among DTN nodes. The proposed scheme can be implemented in a fully distributed manner to thwart various attacks without relying on any tamperproof hardware. In addition, we introduce several efficiency optimization techniques to improve the overall efficiency by exploiting the unique characteristics of DTNs. Extensive simulations demonstrate the efficacy and efficiency of the proposed scheme.