

A Hybrid Error Control Scheme for MANET Reliable Multicast

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ABSTRACT

The development of pervasive computing and proliferation of portable computing devices have raised the research on mobile ad hoc networks (MANETs). In this paper, we focus on MANET reliable multicast, which is crucial for military and disaster rescue scenarios. Usually, in these scenarios any data loss can be fatal to the success of the entire operation. In the previous literature, mainly two approaches, the automatic repeat request (ARQ) and the anonymous gossip (AG), were suggested as packet recovery mechanisms to counteract packet loss and error in MANETs. However, these two approaches have long data transmission latency, and are not suitable for delay sensitive applications.

Different from previous work, in this paper we introduce a new hybrid error control scheme that integrates interleaving, forward error correction (FEC), and threshold based ARQ to mitigate the error and loss effects encountered in MANETs. In particular, the threshold based ARQ is studied carefully to shorten the transmission delay in reliable multicast. In order to work compatibly with a variety of MANET multicast routing protocols, this new scheme is based on Client/Server architecture, and resides on the top of UDP layer. Moreover, we use specification and description language (SDL) to formally depict this hybrid error control scheme from a broad overview down to detailed design levels. Although SDL is not intended to be an implementation language, automatic translation of SDL information to a programming language is available.

To evaluate the performance of this scheme, firstly the experimental results from a real MANET testbed are demonstrated in this paper. After this, mathematical analysis is conducted carefully to support and extend these experimental results. Both experimental and mathematical results show that this new hybrid error control scheme has shorter data transmission delay and less packet loss rate than the MANET multicast algorithms only employing ARQ or AG.

THREE SUBJECT AREAS IN ORDER OF PREFERENCE

(1) Mobile & Pervasive Computing, (2) Communications & Wireless Systems, (3) Computer Networks & Systems

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