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Performance Enhancement Using Network Coding in Dynamic Source Routing

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Abstract

Network coding is a new technique that allows the nodes in the network to code the incoming data and transmit. Significant gains such as throughput improvement, robustness, complexity and security can be obtained by using network coding. Dynamic source routing is a reactive protocol for multi hop mobile Ad hoc networks. This paper proposes a better DSR technique using Network coding to reduce the number of transmissions in mobile ad hoc network and increasing throughput efficiency. The simulation results when compared with existing DSR protocol shows potential throughput improvement and communicates more information with fewer packet transmissions.

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Keywords: network coding; mobile Ad hoc networks; dynamic source routing; forwarder; reliability; delay.

1. INTRODUCTION

A Mobile Ad hoc network is a collection of wireless nodes with no access points or centralized administration, operates on limited battery energy consumed mostly in transmission and reception¹. The network's wireless topology may change rapidly and unpredictability. Limited bandwidth, energy constraints, high cost and security

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are some encountered problems in these types of network. The routing protocols of mobile ad hoc can be classified into three groups, table-driven, source initiated on-demand and hybrid routing protocols². Dynamic source routing protocol is a source initiated reactive protocol.

The network coding technique was introduced by Ahlswede et al.³ is a recent field in information theory that allows the intermediate nodes to create new packets by combining the packets received over the incoming edges. This technique offers several benefits such as increase in throughput, improvement in reliability and robustness of the network. Using this technique the total number of transmission is reduced and so saves power of some bottleneck nodes and increases the life time of the network. A simple example in a wireless context is a six node topology as shown in figure 1. Node N1 and Node N2 are source nodes. Node N1 transmits to N5 and N6, similarly Node N2 to N5 and N6. Instead of transmitting separately, when network coding approach is used the two packets from the source are combined by means of XOR operations at the intermediate node N3 and forwarded. The receiver can then decode this coded packet to get the required data.

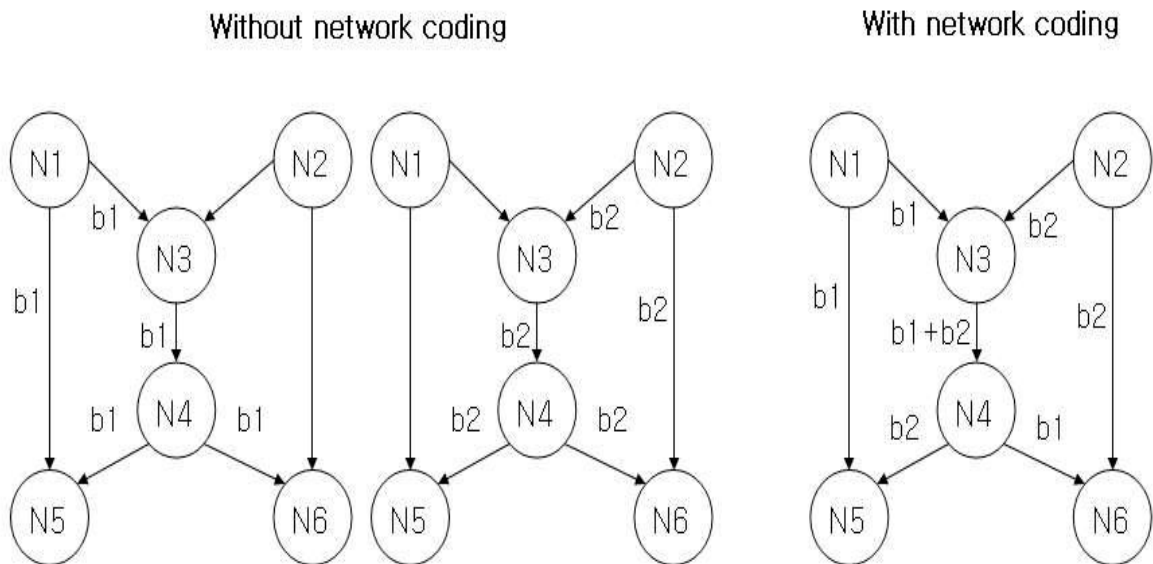


Figure 1: Simple example of network coding

Network coding was initially proposed as a distributed mechanism for achieving the multicast theoretic (max-flow, min-cut) capacity in wired networks. Coding are of two types linear network coding and random network coding. Network coding techniques can be applied to wireless network⁴ to achieve load balancing, energy saving, network monitoring, security and distributed storage. The example above shows that the network coding technique reduces the number transmissions.. It allows for a much larger degree of flexibility in the way packets can be combined. In addition to throughput benefits it is well suited for environments where only partial or uncertain information is available for decision making. Information reception does not depend on receiving specific packet content but rather on receiving a sufficient number of independent packets. This paper is organized as follows: In section 1 the introduction, section 2 we discuss the related work, section 3 description of dynamic source routing, section 4 presents the proposed network coded – dynamic source routing.. Section 5 provides the simulation results of the proposed protocol and section 6 concludes this paper.

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