International Journal of Research
Available at https://edupediapublications.org/journals
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 03 Issue 14
October2016

Optimal Configuration of Intercommunicate Coding in Adhoc Network

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Abstract—Network coding has recently emerged as an effectivesolution for multicast and broadcast communications in ad hocnetworks. We focus on broadcast traffic and design a networkcoding-based scheme that we compare against simpler solutions,by using the network simulator ns-2. Indeed, while often thebenefits of network coding have been shown via theoreticalanalysis or in simplified simulation scenarios, our aim is to assessthe performance of network coding in ad hoc networks when arealistic MAC protocol is considered. Our results show that theperformance of network coding for traffic broadcasting stronglydepends on the network node density and on the generation size.In particular, network coding leads to significant gains in termsof end-to-end packet loss probability and protocol overhead only
When the average number of neighbors per node is higher than.

Index Terms—Ad hoc networks, traffic broadcasting, networkcoding

1. INTRODUCTION

Recent results on the advantages of network coding inwired networks have stimulated a lot of interest in thesubject and in particular, in the application of networkcoding to wireless ad hoc networks. Network codingrefers to the basic notion of performing coding operationson the contents of packets throughout a network,and is is generally attributed to Ahlswede et al. [1], whoshowed the utility of the network coding for multicastin wired networks. The work of Ahlswede et al. wasfollowed by other work by Koetter and Medard [5]who showed that codes with a simple, linear structurewere sufficient to achieve the capacity of multicastconnections in lossless, wireline networks. This resultwas augmented by Ho et al. [3], who showed that, infact, a random construction of the linear codes wassufficient. The utility of such random linear codes forreliable communication over lossypacket networks such as wireless ad hoc networks was soon realized[7]. In [8], a prescription for the efficient operation of adhoc networks is given, which proposes using the randomlinear coding scheme of [7] coupled with optimizationmethods for selecting the times and locations for injectingcoded packets into the network.In ad hoc networks, broadcasting is used for data disseminationwith several different aims such as finding a route to a particularnode, sending a warning signal or performing servicediscovery. The simplest method to implement broadcastingis flooding, where every node in the network retransmits amessage to its neighbors upon receiving it for the first time.Flooding, however, can lead to undesired effects such as thewell-known broadcast storm problem: redundant packet retransmissionsresulting in repeated contention, collisions, andextra-power consumption. Two typical ways to alleviate thebroadcast storm effects consist in reducing possible redundanttransmissions and differentiating the timing of retransmissions,as extensively discussed in [1].

2. RELATED WORK

Existing System

The probability that the random linear NC was valid for a multicast connection problem on an arbitrary network with independent sources was at least $(1 - d/q)\eta$, where η was the number of links with associated random coefficients, d was the number of receivers, and q was the size of Galois field Fq. It was obvious that a large q was required to guarantee that the system with RLNC was valid. When considering the given two factors, the traditional definition of throughput in ad hoc networks is no longer appropriate since it does not consider the bits of NC coefficients and the linearly correlated packets that do not carry any valuable data. Instead, the good put and the delay/good put tradeoff are investigated in this paper, which only take into account the successfully decoded data. Moreover, if we treat the data size of each packet, the generation size (the number of packets that are combined by NC as a group), and the NC coefficient Galois field as the configuration of NC, it is necessary to find the scaling laws of the optimal configuration for a given network model and transmission scheme.

Disadvantages

- Throughput loss.
- The decoding loss.
- Time delay.

Proposed System:

Proposed system with the basic idea of NC and the scaling laws of throughput loss and decoding loss. Furthermore, some useful concepts and parameters are listed. Finally, we give the definitions of some network performance metrics. Physical layer Network Coding designed based on the channel state information (CSI) and network topology. The PNC is appropriate for the static networks since the CSI and network topology are preknown in the static case.There are G nodes in one cell, and node i ($i = 1, 2, \ldots, G$) holds packet xi. All of the G packets are independent, and they belong to the same unicast session. The packets are transmitted to a node i'in the next cell simultaneously. $gii'$is a complex number that represents the CSI between i and i'in the frequency domain.

Advantages:

- ✓ System minimizes data loss.
- ✓ System reduces time delay.

3. IMPLEMENTATION

Network Coding-based Broadcasting

Our network coding-based broadcasting is implemented ontop of the network layer running over an IEEE 802.11 MACprotocol. This choice allows us to avoid encoding routingaddress information carried in IP headers.As suggested in [10], we embed the coding vector in thepacket header, thus dispensing with the need for centralizedknowledge of the graph topology or decoding functions. Inparticular, the encoding header follows the IP header as thefirst piece of data in the IP payload.The network coding header contains information about theencoded packet, such as: the generation size and identifier,the number of encoded packets along with their size, and thecoding vector.We now detail the different operations performed by thesource node, the intermediate nodes, and the receiver nodes.It is worth remarking that, in broadcasting, intermediate nodesare also receiver nodes; however, for the sake of clarity, wedistinguish the two operations. Also, note that each node(except for the source) needs to collect s (recall that s isthe generation size) independent packets for further encoding/decoding,therefore some buffer space is needed at thereceiver. In the following, we will call this buffer NC buffer.

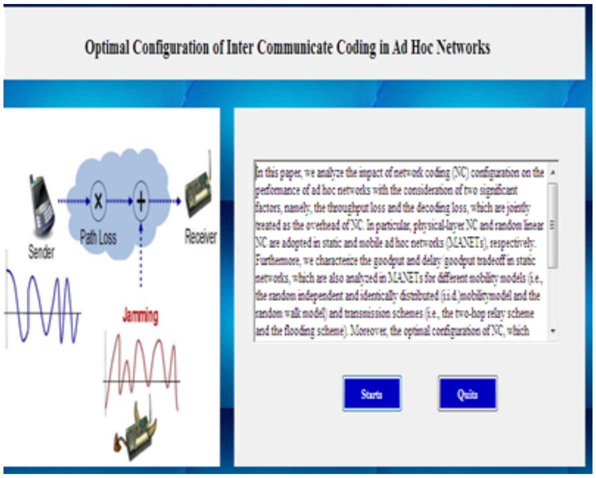
Simple Flooding

The simple flooding scheme we use as term of comparisonis based on the IEEE 802.11 standard. When a node sendsa broadcast packet, all its one-hop neighbors will receive it.Since all the neighbors need to rebroadcast the packet in theirturn, their transmissions may occur at almost the same time,thus likely resulting in collisions.To reduce the collision probability, we introduced a simplelink-layer modification to the standard: after receiving thebroadcast packet, we let the receiving node defer the retransmissionby a small time, randomly chosen in the range.

Deferred Broadcast

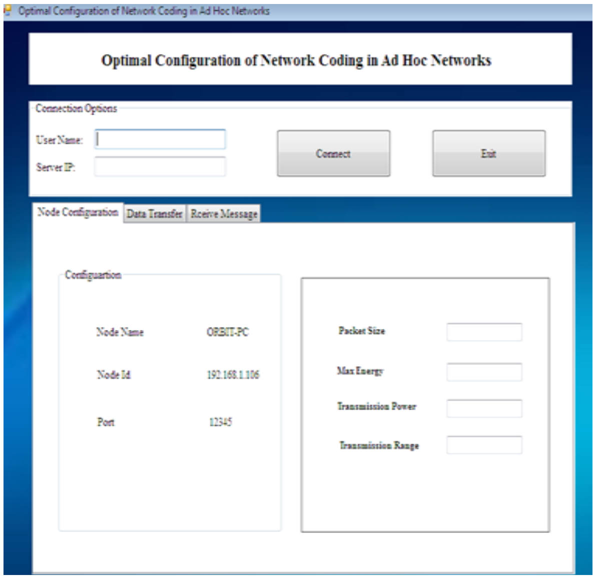
The deferred broadcast scheme we consider includes themechanism proposed in [5], which, for the sake of clarity, webriefly recall.Upon receiving a broadcast packet, nodes store the informationabout the predecessor node1 and, before taking a decisionwhether to rebroadcast it or not, they wait for a hold-off timeTho, during which they listen to possible retransmissions of the same packet by other nodes. In particular, for each packet,the node counts the number of rebroadcast events from othernodes with different predecessors. If this counter exceeds agiven threshold, the packet is dropped. We set this thresholdto 2, since simulation results show that a greater value doesnot lead to any improvement. This choice is supported by thefindings in [1], where it is stated that if a node rebroadcastsa packet heard more than twice, the extra area it can cover isonly about 9%.

4. EXPERIMENTAL RESULTS



In this paper, we analyze the impact of network coding (NC) configuration on the peformance of ad hoc networks with the consideration of two significant factors, namely, the throughput loss and the decoding loss, which are jointly treated as the overhead of NC. In particular, physical-layer NC and random linear NC are adopted in static and mobile ad hoc networks (MANETs), respectively. Furthermore, we charactenize the goodput and delay/goodput tradeoff in static networks, which are also analyzed in MANETs for different mobility models (i.e., the random independent and identically distributed (i.i.d.)mobilitymodel and the random walk model) and transmission schemes (i.e., the two-hop relay scheme and the flooding scheme). Moreover, the optimal configuration of NC, which

Fig:-1 Base Station

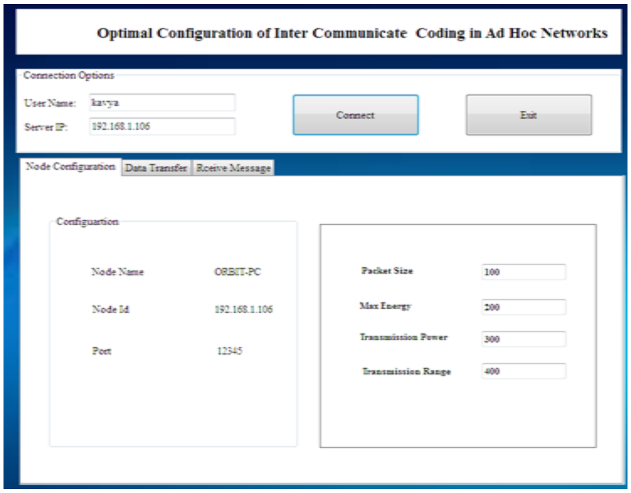


User Name:
Server IP:

Node Name ORBIT-PC
Node Id 192.168.1.106
Port 12345

Packet Size
Max Energy
Transmission Power
Transmission Range

Fig:-2 Node Station

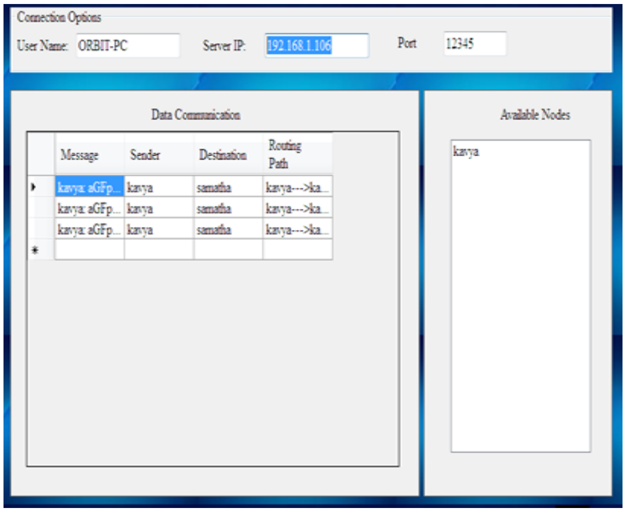


User Name: kavya
Server IP: 192.168.1.106

Node Name ORBIT-PC
Node Id 192.168.1.106
Port 12345

Packet Size 100
Max Energy 200
Transmission Power 300
Transmission Range 400

Fig:-4 Data Connection

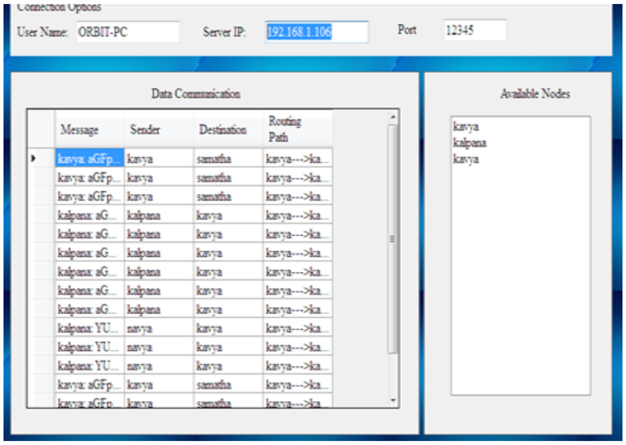


User Name: ORBIT-PC
Server IP: 192.168.1.106
Port 12345

Message	Sender	Destination	Routing Path
kavya: aGFp...	kavya	samatha	kavya--->ka...
kavya: aGFp...	kavya	samatha	kavya--->ka...
kavya: aGFp...	kavya	samatha	kavya--->ka...

kavya

Fig:-5 Senders path



User Name: ORBIT-PC
Server IP: 192.168.1.106
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Message	Sender	Destination	Routing Path
kavya: aGFp...	kavya	samatha	kavya--->ka...
kavya: aGFp...	kavya	samatha	kavya--->ka...
kavya: aGFp...	kavya	samatha	kavya--->ka...
kalpana: aG...	kalpana	kavya	kavya--->ka...
kalpana: aG...	kalpana	kavya	kavya--->ka...
kalpana: aG...	kalpana	kavya	kavya--->ka...
kalpana: aG...	kalpana	kavya	kavya--->ka...
kalpana: aG...	kalpana	kavya	kavya--->ka...
kalpana: aG...	kalpana	kavya	kavya--->ka...
kalpana: YU...	navya	kavya	kavya--->ka...
kalpana: YU...	navya	kavya	kavya--->ka...
kalpana: YU...	navya	kavya	kavya--->ka...
kavya: aGFp...	kavya	samatha	kavya--->ka...
kavya: aGFp...	kavya	samatha	kavya--->ka...

kavya
kalpana
kavya

Fig:-6 Reviser End

5. CONCLUSIONS

In this paper, we discussed the problem of identifying the maximum throughput that a multicast connection with or without network coding can achieve in an unreliable static ad hoc network. We presented mathematical programming formulations for the problem that include wireless medium contention constraints, which are crucial to the problem, and, through numerical analysis using the formulations, we show that network coding achieves 65% higher throughput than conventionalmulticast in a typical setting. In addition, we showed through simulation that network coding allowed very robust communications with significantly less overhead than conventional multicast.

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