# Performance Evaluation of Improving Network Capacity with Optimized Cooperative (COCO) Topology Control Scheme in MANETS

K. Sasikala[1], R. Reka[2] and M. A. Prasath[3]

[1]K.Sasikala, AP/IT, VMKVEC, SALEM, Tamilnadu, India.
[1]sasikalaresearch@gmail.com
[2]R.Reka, AP/CSE, VMKVEC, SALEM, Tamilnadu, India.
[1]rekaresearch@gmail.com
[3]M.A.Prasath, Research Scholar, VMU, SALEM, Tamilnadu, India.
[3]maprasath@gmail.com

## ABSTRACT

Supportive message has received wonderful interest for wireless networks. To get better the system capability of MANETs with helpful infrastructure, we a Capacity- Optimized Cooperative topology manage system that considers both higher layer system capacity in addition to corporeal layer relay assortment in cooperative infrastructure. Simulation consequences have exposed that physical coating helpful infrastructure techniques have important impacts on the system capacity, and the planned topology manage scheme can considerably improve the network capability in MANETs with supportive transportation. To believe dynamic transfer patterns in the planned scheme to add improve the arrangement of MANETs through accommodating road and handrail set of connections. Consequently, the impacts of accommodating connections on network-level greater layer issues, such as topology control, direction-finding and system ability, are largely overlooked. A Capacity-Optimized Cooperative (COCO) topology is manage system to get better the system ability in MANETs through together bearing in mind together upper coating system capability and corporeal layer supportive infrastructure. From side to side simulations, we show that physical layer supportive infrastructure have important impacts on the scheme capacity, and the planned topology organize system can considerably get better the system ability in MANETs by means of supportive infrastructure.

**Keywords** — COCO, Topology Control, Network Capacity, MIMO, AODV, Simulation, MANET, Proactive and Reactive Routing Protocols, Relay Node. Cooperative Communication.

## 1. INTRODUCTION

A mobile ad-hoc network (MANET) is a group of mobile wireless nodes working together to form a network. Such networks can exist without a fixed infrastructure working in an autonomous manner and every mobile device has a maximum transmission power which determines the maximum transmission range of the device. As nodes are mobile, the link connection between two devices can break depending on the spatial orientation of nodes. Mobile ad-hoc networks have numerous applications in mobile networks, disaster relief systems and military operations. Some of the network constraints in mobile ad-hoc networks are limited bandwidth, low battery power of nodes, and frequent link unreliability due to mobility Cooperative communication has received tremendous interest for wireless networks.

A significant confronts to allow real-time application for MANETs is incorporate support for excellence of service (QoS), such as holdup and bandwidth constraint. To provide excellence of service, extension can be additional to the AODV direction-finding protocol at the same time as finding the direction. In this document, we recommend an on require and bandwidth based quality of service (QoS) direction-finding protocol (AODV) to make sure that do not go above a greatest value and the bare minimum obtainable bandwidth is necessary to propel the packets. Moreover, our proposed direction-finding code of behavior will go behind the concept of direction-finding protocol to get well the lost links professionally while mounting network reliability, growing utilization, minimizing the figure of control post and shortening the mend. The procedure is implemented and replicated by means of Ns-2 simulator.

The reproduction studies were approved out for AODV with dissimilar input parameter figure of Nodes, Node Mobility Speed; in the production parameter of packet delivery relative quantity, end-to-end holdup and route life occasion was measured for the above protocols. Most existing works on cooperative communications are focused on link-level physical layer issues. Consequently, the impacts of cooperative communications on network-level upper layer issues, such as topology control, routing and network capacity, are largely ignored. In this article, we propose a Capacity-Optimized Cooperative (COCO) topology control scheme to improve the network capacity in MANETs by jointly considering both upper layer network capacity and physical layer cooperative communications.

A movable ad hoc network (MANET) consists of a collection of communicate hosts that shape a random network topology by income of any of more than a few wireless communiqué media. MANET infrastructure stand for a diversification in message technology needed to solve the rigorous end-to-end supplies of QoS-based announcement networks. Of the numerous challenges in this complex disseminated system, the problem of direction-finding based on a predefined set of buyer preferences, grave to guarantee quality-of-service, is the meeting point of this investigate. Specifically, this document modify a cluster-based QoS direction-finding algorithm for movable ad hoc networks by means of the aim of as long as fault broadmindedness, which is a dangerous feature in as long as QoS in the link failure-prone surroundings of mobile networks. Performance of this new-fangled fault-tolerant cluster-based QoS wireless algorithm is evaluate according to breakdown recovery instance, dropped packets, throughput, and continued flow bandwidth via simulation involving node breakdown scenario the length of QoS paths. The mobility model is designed to describe the movement pattern of mobile users, and how their location, velocity and acceleration change over time. Since mobility patterns may play a significant role in determining the protocol performance, it is desirable for mobility models to emulate the movement pattern of targeted real life applications in a reasonable way. Various researchers proposed different kinds of mobility models, attempting to capture various characteristics of mobility and represent mobility in a somewhat 'realistic' fashion. Much of the current research has focused on the so-called synthetic mobility models that are not trace-driven.

A mobility model should attempt to mimic the movements of real mobile nodes. Changes in speed and direction must occur and they must occur in reasonable time slots. For example, we would not want mobile nodes to travel in straight lines at constant speeds throughout the course of the entire simulation because real mobile nodes would not travel in such a restricted manner. Mobility pattern of the Mobile Ad Hoc Network, in many previous studies, was assumed to be Random Waypoint because of its relatively simple implementation and analysis. However, in the future, MANETs are expected to be deployed in various different scenarios and applications having complex node mobility and connectivity dynamics. For example, in a MANET on a battlefield, the movement of the soldiers will be influenced by the commander. In a city-wide MANET, the node movement is restricted by obstacles or maps.

## 2. LITERATURE REVIEW

The final objective of the cognitive means of communication is to get hold of the most excellent accessible range through cognitive potential and re configurability as describe before. Since a good number of the range is already assigned, the most imperative confront is to share the approved spectrum devoid of meddlesome with the program of other approved users. The cognitive telephone system enables the usage of for the short term unused gamut, which is referred to as range hole or white space. If the bandwidth is further utilized by the an approved user and the cognitive means of communication moves to a new spectrum hole or stays in the same group, altering its broadcast power level or intonation scheme to avoid meddling. According to the network structural design, cognitive radio (CR) network can be confidential as the infrastructure-based CR system. The infrastructure-based CR system has a central system entity such as a bottom station in cellular network or an access tip in wireless local area networks (LANs) [2].

Recently, an up-to-the-minute class of techniques called accommodating communication (or cooperation diversity) has been introducing to allow on its own antenna strategy to take improvement of the remuneration of MIMO systems. Transmitting self-determining copies of the signal from dissimilar locations consequences in having the handset obtain separately faded versions of the signal, thus dropping the fading consequence through multipath proliferation. In this announcement model, each wireless node is unspecified to transmit information and to take action as a cooperative representative, relaying information from supplementary users. There are wireless set of connections applications planned in literature that bring into play the model, such as power efficient distribution and construct a connected dominating set. The techniques are secret as amplify-and-forward, decode-and-forward, and assortment relaying. In the amplify-and-forward account, nodes that receive a noise version of the indication can amplify in addition to relay this deafening version. The receiver then combines the in sequence sent by the dispatcher and relay nodes. In decode-and-forward method, a relay node must first decipher the signal and then retransmits the detected data [3].

The position of nodes and announcement links connecting nodes. Then the topology of a MANET depends on in cooperation uncontainable factors such as mobility, terrain, vanishing, and the convenient factors such as put on the air power, antenna course, processing gain, etc. Topology control is the alteration of node parameter to get the preferred topology, and preserve it in face of changes due to the unmanageable factors. Topology manage has been a subject matter of much investigate recently. To the most excellent of our information however, none of the obtainable algorithms obtain notice of the information that the limitation modification is a division of a manage loop, involving a dynamical organization. We show in this note that breakdown to do so may lead to unbalanced behavior of the resultant system. For the difficulty in question, we determination also demonstrate a way to fix the difficulty by scheming a feedback control organization that takes into explanation the hesitation in the dynamics of the topology manage loop [4].

To realize the double network objectives of influence and spectrum optimization, the CRs carry out two sequential, disseminated criticism loop algorithms. The primary algorithm is for authority control, anywhere CRs effort to minimize their broadcast authority level at the same time as maintain network connectivity. The output of this algorithm is a power-efficient topology, which is fed into the canal control algorithm. Here, CRs choose orthogonal channels to avoid meddling at adjacent receivers. Both algorithms can be envision as organism part of a cognitive cycle: the CRs decide on (and possibly revise) their most advantageous settings based on the supposed topology state; these revised decisions encourage a change in topology configuration, moreover in the connectivity or in the waterway occupancy profile; the made to order topology affects the presentation of person CRs, which in turn bring up to date their authority or conduit settings, and the series starts all over once more [5].

The algorithm guarantees with the intention of the greatest connected set of nodes for the set of connections will until the end of time be found. Second, our algorithm is computationally less difficult, and we carry out not need to spell out a deployment region, which is an imperative thought for the case at what time nodes frequently change operation region. Third, our algorithm does not need precise location in order but only directional in order. This can be a feature when cost of nodes is a deliberation. Forth, our algorithm is not attached with any radio broadcast model. Due to the large power of ecological factor on means of communication occurrence transportation radio propagation model can be disreputably imprecise. Finally, fifth our algorithm is talented to give a worst-case analysis for both, the smallest amount power routes and the highest node degree in the network. The rest of our paper is controlled as follows. We describe our system model and the assumption we create about the surroundings [7].

### 2.1. Heterogeneity of Broadcasting Frequencies

  

The varying corporeal propagation characteristic of the electromagnetic influence over different band bands is another apprehension for CRNs. A low occurrence signal knows how to journey beyond, penetrate ramparts and other obstacle but its in sequence capacity is subordinate and the correctness in formative direction of entrance is poorer. However, a superior frequency indication can only journey a shorter coldness, but will be able to obtain more in order in adding up to will show enhanced directionality. The variety in range bands and their policy for access them entail that the CR nodes have got to become familiar their bandwidth, carrier, power and cadence technique as well. This category of heterogeneity does not happen in the customary multi-channel ad-hoc networks, anywhere the permissible channels are usually from one range band with comparable corporeal individuality. The ad-hoc network based on range band operates on channels, although effectively channels are orthogonal and can be used for simultaneous broadcast without excessive meddling. These channels possess similar spread characteristics in terms of coverage, power organization, intonation etc. The legacy means of communication nodes are statically configured to function over these channels with fixed spread characteristics and cannot function on any extra channel with dissimilar corporeal individuality [9].

In both protocol in instead of selecting logical neighbors from the normal hop neighbor set, each node collects the location information of nodes within a small search region to conserve control message overhead. The radius of the search region is iteratively enlarged until logical neighbors in the search region can cover the entire normal op neighborhood. That is, each position outside of the search region can be reached via a k-hop path through a selected logical neighbor and the k-hop path is more energy-efficient than direct transmission. If the search region is the entire hop neighborhood, algorithm is equivalent to constructing a local shortest path tree and considering only neighbors of the root in the SPT as logical neighbors [11].

## 3. COCO TOPOLOGY

In this project we recommend a Capacity-Optimized Cooperative (COCO) topology manage scheme to get better the network ability in MANETs by in cooperation bearing in mind both higher layer network ability and corporeal layer supportive infrastructure. Through simulations, we demonstrate that bodily layer helpful communications contain important impacts on the system capability, and the future topology manage scheme can considerably get better the complex capability in MANETs with supportive infrastructure. If any attack or collision occur means suddenly to choose the sing node in the network, And also we consider dynamic traffic patterns in the proposed scheme to further improve the performance of MANETs with cooperative communications.

### 3.1. Data Flow Diagram

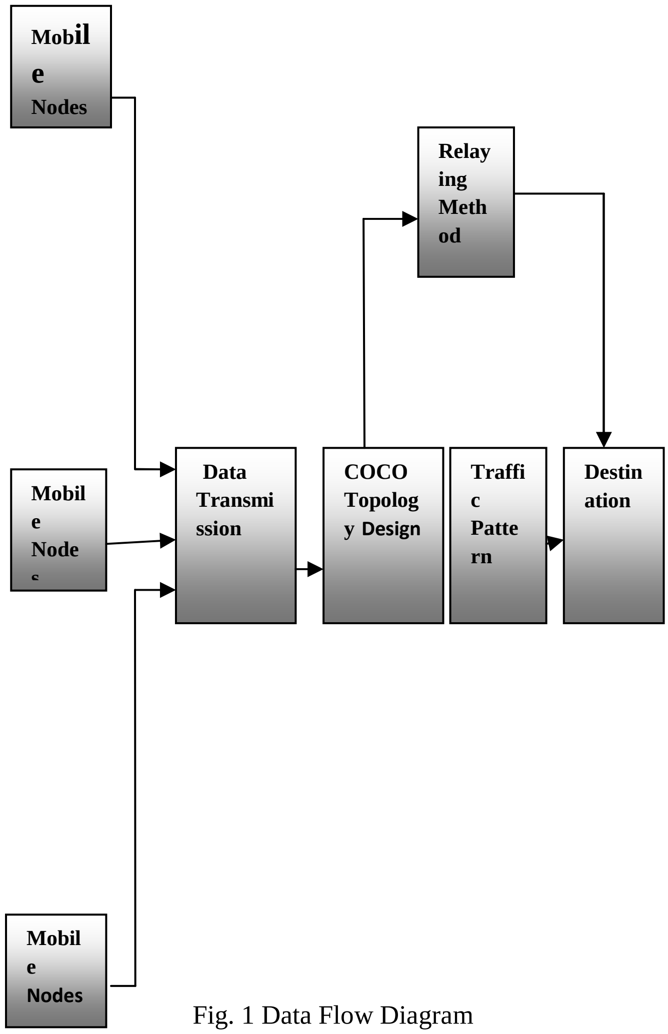


Fig. 1 Data Flow Diagram

### 3.2. Transmission in MANETS

There are three transmission manners in MANETs that are straight transmission, multi-hop transmission and helpful transmissions. Straight transmissions and multi-hop transmissions can be regard as particular types of supportive transmissions. A direct broadcast utilizes no relay while a multi-hop broadcast does not unite signals at the purpose. The supportive channel is a practical multiple-input single-output channel, where spatially circulated nodes are synchronized to appearance a practical antenna to follow multi transmitter transceivers.

### 3.3. Relaying Strategies

There are two relying strategies that are amplify-and-forward and decode-and-forward. In the communicate nodes only boost the power of the signal conventional from the dispatcher and retransmit it to the handset. In decode-and-forward, the communicate nodes will carry out physical-layer decoding and after that onward the decode result to the destinations.

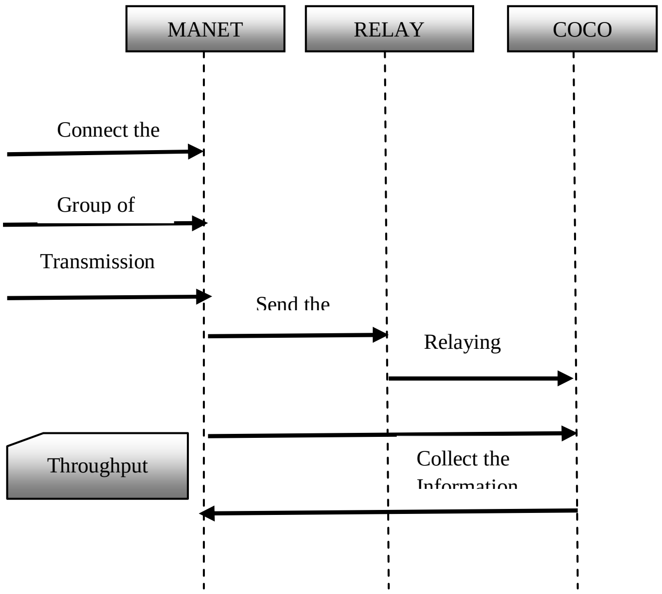


Fig.2: Sequence Diagram

### 3.4. Cooperative Communications

In this the purpose combines the two signals from the foundation and they communicate to decode that in sequence. Cooperative road and bar set of connections are due to the greater than previous to sympathetic of the reimbursement of numerous antenna system. Although multiple-input multiple-output (MIMO) systems have been widely recognized, it is not easy for a number of wireless portable devices to hold up manifold antenna due to the dimension and cost constraint. Most cooperative communication schemes involve two transmission phases. Phase 1 refers to a coordination phase. This is the phase where users exchange their own source data and control messages with each other and the destination. Phase 2 refers to a cooperation phase. This is the phase where the users cooperatively retransmit their messages to the destination.

### 3.5. Multi-Hop Communication

Multi-hop communication can be illustrated using two-hop program. When two-hop broadcast is used, two occasion slots are inspired. In the primary slot, communication is transmitting from the foundation to the relay, and the post will be forward to the purpose in the subsequent slot. The ability of this two-hop broadcast can be resulting making a payment for the outage of each leap communication.

## 4. PERFORMANCE ANALYSIS

To analyze performance of the AODV by using path connected Networks. The replication surroundings produced in NS-2, in that provide keep up for a wireless sensor networks. NS-2 was using C++ language and it has used for OTCL. It came as extension of Tool Command Language (TCL). The execution approved out using a cluster environment of 19 wireless mobile nodes rootless over a simulation area of 1200 meters x 1200 meters level gap in service for 10 seconds of simulation time. Then also used into MAC layer models. The network based data processing or most expensive and data communication level on their performance on the network. The sources create multiple packets and its sending to the destination node; each data has a steady size of 512 bytes.

### 4.1. Performance Results

The simulation scenario is calculated particularly to finding the shortest path of the network model. The path of arrangement density is deploying 0–19 nodes more than a permanent open area topology of 1200m x 1200m using 5m/s node speed and one same source-destination connections. AODV used measure of metrics used for their performance of mesh network.

#### 4.1.1. Network Performance

| Parameters | Value |
|---|---|
| Version | Ns-allinone 2.28 |
| Protocols | AODV |
| Area | 1200m x 1200m |
| Broadcast Area | 250 m |
| Transfer model | UDP,CBR |
| Data size | 512 bytes |

Table-1: Network environmental setup and parameters

## 4.2. Ratio Graph

The ratio of throughput, delivery, delay performance overall network performance improve network performance and packet delivery ratio and cut packet delay. Here throughput is defined as the total number of packets delivered over the total simulation time. Mathematically, it can be defined as: Throughput= N/1000 Where *N* is the number of bits received successfully by all destinations.

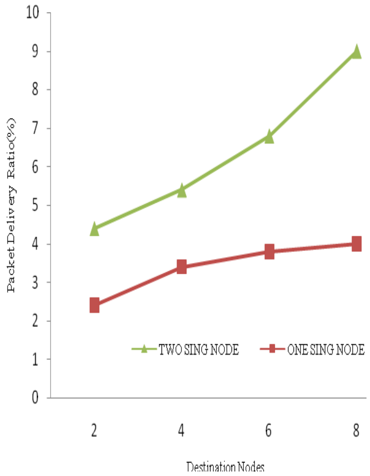


Fig.3 Comparison of existing system and proposed System throughput

## 4.3. Packet Delivery Fraction

Packet Delivery Fraction (PDF) is defined as the ratio of data packets received by the destination to those generated by the source. It is calculated by dividing the number of packets received by destination through the number of packets originated from source.

PDF = (R / S) x 100 Where R is the number of packets received by the destination and S is the number of packets sent by the source.PDF indicates the loss rate, which shows the maximum throughput that can be achieved with the network.

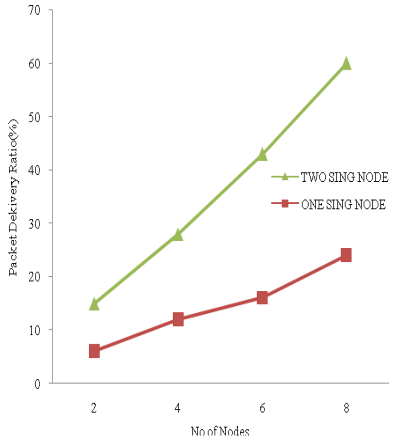


Fig 4 Performance of Packet Delivery Ratio

AODV is better among other protocols in the Packet Delivery Fraction.

## 4.4. End-To-End Delay

Average end to end delay includes all possible delay caused by buffering during route discovery latency, queuing at the interface queue, and delay at the MAC due to retransmission, propagation and transfer time. It is defined as the time taken for a data packet to be transmitted across a MANET from source to destination.

$$Delay = t_R - t_S$$

Where $t_R$ is the receiving time and $t_S$ is the sent time.

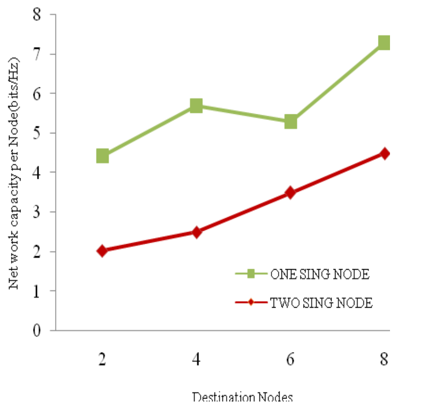


Fig.5 Average End-To-End Delay

  

The average time it takes a data packet to reach the destination. This metric is calculated by subtracting time at which first packet was transmitted by source from time at which first data packet arrived to destination.

## 5. CONCLUSION

This paper is implemented and designed for COCO topology for MANET networks is caused by dynamic and random behavior. The Multi-hop mechanism out performs TCP congestion control mechanism and thus is well suited for applications like Data Transmission in MANET. Using the two sing node minimizes packet drops caused by network congestion as compared to previous one sing node control mechanism; it still suffers from packet drops. And that our proposed technique attains high delivery ratio and throughput with reduced delay of the information delivery and end-end-delay to balances the traffic load when compared with the existing technique. COCO is the first topology control scheme for MANETs with cooperative Communications and noisy channel estimate. Improvements were recommend to modifying this algorithm for are scalability, flexibility, and customization services. Future work is under processing to consider dynamic traffic Patterns in the proposed scheme to further improve the performance of MANETs with cooperative communications. In this article, we have proposed energy efficient topology control with Cooperative Communication and selection of optimum relay node. Cooperative Communication technique helps multiple nodes to transmit similar data at the same time. This increases the transmission coverage and also saves power. The idea is also to extend this work to check security properties as well as conformance properties. Considering all these; in future the routing protocols might especially emphasize the support for multicasting in the network.

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