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To Enhance the Network Capacity in MANET using COCO Topology Control Protocol

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Abstract

In Mobile Ad-hoc Network (MANET) is a Self-configuring network of mobile routers (and associated hosts) connected by wireless links. This MANET forms a random topology and routers move randomly free. Topology changes rapidly and unpredictably .Nowadays we are using so many protocols for maximizing the network bandwidth but, we can not attain the best throughout using protocols in MANET .Here narrate so many protocols and their con's which are not providing the maximum throughput, maximizing performance then overcome this issues. 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. Through simulations, we show that physical layer cooperative communications have significant impacts on the network capacity, and the proposed topology control scheme can substantially improve the network capacity in MANETs with cooperative communications. Suitable for emergency situations like natural or human-induced disasters, military conflicts, emergency medical situations, etc.

Keywords

COCO topology control, MANETs, Cooperative communications

I. Introduction

In this considering both upper layer network capacity and physical layer cooperative communications, the topology control issues in MANETs with cooperative communications. We propose a Capacity-Optimized Co-operative (COCO) topology control scheme to improve the network capacity in MANETs by jointly optimizing transmission mode selection, relay node selection, and interference control in MANETs with cooperative communications. Through simulations, we show that physical layer cooperative communications have significant impacts on the network capacity, and the proposed topology control scheme can substantially improve the network capacity in MANETs with cooperative communications. The remainder of the article is structured as follows. We introduce cooperative communications and the

topology control problem in MANETs. Network capacity and the proposed COCO topology control scheme are presented.

II. COMMUNICATION PROTOCOLS

Communications protocol is a system of digital rules for message exchange within or between computers. Communicating systems use well-defined formats for exchanging messages. Each message has an exact meaning intended to provoke a particular response of the receiver. Thus, a protocol must define the syntax, semantics, and synchronization of communication; the specified behaviour is typically independent of how it is to be implemented. A protocol can therefore be implemented as hardware, software, or both. Communications protocols have to be agreed upon by the parties involved. To reach agreement a protocol may be developed into a technical standard.

III. MOBILE ADHOC NETWORKS(MANET)

A mobile ad hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Ad hoc is Latin and means "for this purpose. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet.MANETs are a kind of Wireless ad hoc network that usually has a routable networking environment on top of a Link Layer ad hoc network.

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IV.ROUTING PROTOCOLS FOR MANETS

A routing protocol specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network. A routing protocol shares this information first among immediate neighbours, and then throughout the network. This way, routers gain knowledge of the topology of the network.

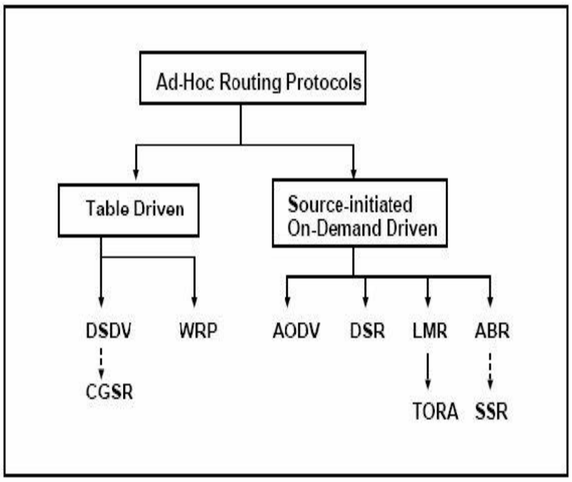

Fig.1 routing protocols for manets

A. Table-Driven Routing Protocols

1) Destination-Sequenced Distance-Vector Routing (DSDV)

Table-driven algorithm based on the classical Bellman-Ford routing mechanism Improvements – freedom of loops in routing tables routing is achieved by using routing tables maintained by each node The main complexity in DSDV is in generating and maintaining these routing tables.

2) Cluster head Gateway Switch Routing (CGSR)

Uses DSDV as an underlying protocol and Least Cluster Change (LCC) clustering algorithm. A cluster head is able to control a group of ad-hoc hosts. Each node maintains 2 tables: A cluster member table, containing the cluster head for each destination node. A DV-routing table, containing the next hop to the destination. The routing principle: Lookup of the cluster head of the destination node, Lookup of next hop, Packet send to destination, Destination cluster head delivers packet.

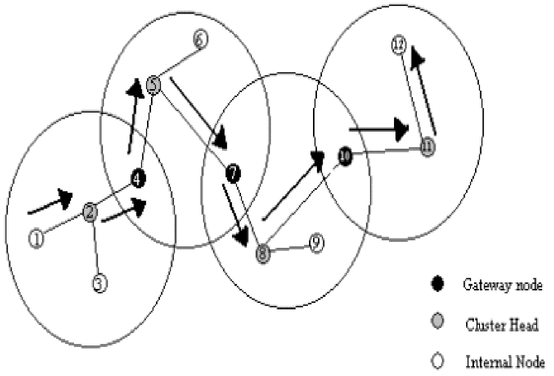

Fig. 2 Cluster head Gateway Switch Routing(CGCSR)

Drawbacks is too frequent cluster head selection can be an overhead and cluster nodes and Gateway can be a bottleneck .

3) The Wireless Routing Protocol (WRP)

Table-based protocol with the goal of maintaining routing information among all nodes in the network.Each node is responsible for four tables: Distance table, Routing table,Link-cost table, Message retransmission list (MRL) table.Link exchanges are propagated using update messages sent between neighboring nodes., Hello messages are periodically exchanged between neighbors. This protocol avoids count-to-infinity problem by forcing each node to check predecessor information. Drawbacks: 4 tables requires a large amount of memory and periodic hello message consumes power and bandwidth .

B. Source-Initiated On-Demand Routing Protocols

1) Ad-Hoc On-Demand Distance Vector Routing (AODV)

Builds on DSDV algorithm and the improvement is on minimizing the number of required broadcasts by creating routes on an on-demand basis (not maintaining a complete list of routes).Broadcast is used for route request. Advantages: uses bandwidth efficiently, is responsive to changes in topology, is scalable and ensures loop free routing. Drawbacks: nodes use the routing caches to reply to route queries. Result: "uncontrolled" replies and repetitive updates in hosts' caches yet early queries cannot stop the propagation of all query messages which are flooded all over the network.

2) *Dynamic Source Routing (DSR)*

Based on the concept of source routing. Mobile nodes are required to maintain route caches that contain the source routes of which the mobile is aware 2 major phases: Route discovery – uses route request and route reply packets Route maintenance – uses route error packets and acknowledgments .Advantages: No periodic hello message and fast recovery - cache can store multiple paths to a destination Drawbacks: the packets may be forwarded along stale cached routes. It has a

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major scalability problem due to the nature of source routing. Same as AODV, nodes use the routing caches to reply to route queries.

3) *Temporally-Ordered Routing Algorithm (TORA)*

Highly adaptive, loop-free, distributed routing algorithm based on the concept of link reversal.Proposed to operate in a highly dynamic mobile networking environment.It is source initiated and provides multiple routes for any desired source/ destination pair.This algorithm requires the need for synchronized clocks.3 basic functions: Route creation, Route maintenance, Route erasure. Advantages: provides loop free paths at all instants and multiple routes so that if one path is not available, other is readily available. It establishes routes quickly so that they may be used before the topology changes. Drawbacks: exhibits instability behavior similar to "count-to-infinity" problem in distance vector routing protocols.

4) Associativity-Based Routing (ABR)

Free from loops, deadlock, and packet duplicates, and defines a new routing metric for ad-hoc mobile networks. Each node generates periodic beacons (hello messages) to signify its existence to the neighbors. These beacons are used to update the associativity table of each node. With the temporal stability and the associativity table the nodes are able to classify each neighbor link as stable or unstable.ABR consists of 3 phases: Route Discovery ,Route Repair/Reconstruction ,Route Delete .If node A has in his Route Cache a route to the destination E, this route is immediately used. If not, the Route Discovery protocol is started.

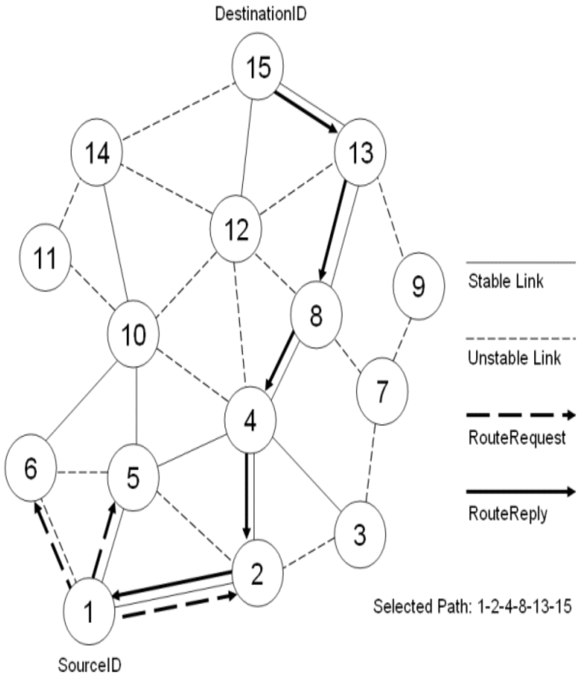

Fig.3 Associativity-Based Routing(ABR)

Advantages: free from duplicate packets. Drawbacks: Short beaconing interval to reflect association degree precisely

5) Signal Stability Routing (SSR)

It is a descendent of ABR and ABR predates SSR it selects routes based on signal strength between nodes and on a node's location stability thus offers little novelty.SSR route selection criteria has effect of choosing routes that have 'stronger' connectivity and it can be divided into: Dynamic Routing Protocol (DRP) or Static Routing Protocol (SRP).DRP is responsible for maintenance of signal stability table and routing table .SRP processes packets by passing the packets up the stack if it is the intended receiver and forwarding the packet if it is not Advantages: to select strong connection leads to fewer route reconstruction. Drawbacks: long delay since intermediate nodes can't answer the path (unlike AODV, DSR).

IV. CAPACITY-OPTIMIZED COOPERATIVE (COCO)

A Capacity-Optimized Cooperative (COCO) topology control scheme to improve the network capacity in MANETs by jointly optimizing transmission mode selection, relay node selection, and interference control in MANETs with cooperative communications. Through simulations, we show that physical layer cooperative communications have significant impacts on the network capacity, and the proposed topology control scheme can substantially improve the network capacity in MANETs with cooperative communications.

1)Existing System

Most existing works are focused on link-level physical layer issues, such as outage probability and outage capacity. Consequently, the impacts of cooperative communications on network-level upper layer issues, such as topology control, routing and network capacity, are largely ignored. Indeed, most of current works on wireless networks attempt to create, adapt, and manage a network on a maze of point-to-point non-cooperative wireless links. Such architectures can be seen as complex networks of simple links.

Disadvantages:

1. Low Network Capacity.
2. Communications are focused on physical layer issues, such as decreasing outage probability and increasing outage capacity, which are only link-wide metrics.

2)Proposed System

We propose a Capacity-Optimized Cooperative (COCO) topology control scheme to improve the network capacity in MANETs by jointly considering both upper layer

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network capacity and physical layer cooperative communications. Through simulations, we show that physical layer cooperative communications have significant impacts on the network capacity, and the proposed topology control scheme can substantially improve the network capacity in MANETs with cooperative communications.

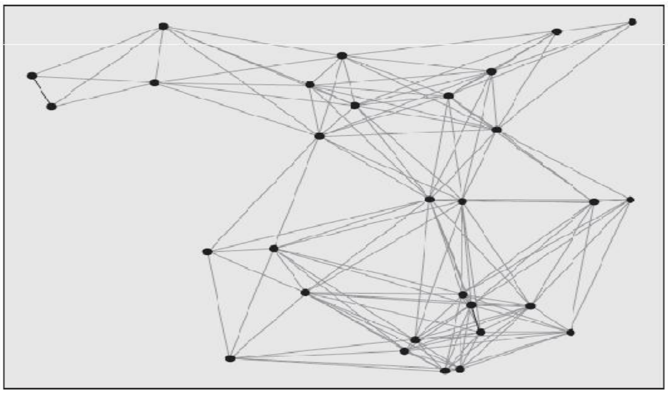

Fig 4. Different nodes in MANET

Advantages:

1. Improve the network capacity in MANETs.
2. Dynamic traffic pattern and dynamic network without a fixed infrastructure.
3. There are a source, a destination and several relay nodes.
4. Cooperation can benefit not only the physical layer, but the whole network in many different aspects.

V.MODULES

1. Transmission in MANETs:

With physical layer cooperative communications, there are three transmission manners in MANETs: direct transmissions, multi-hop transmissions and cooperative transmissions. Direct transmissions and multi-hop transmissions can be regarded as special types of cooperative transmissions. A direct transmission utilizes no relays while a multi-hop transmission does not combine signals at the destination. In the cooperative channel is a virtual multiple-input single-output (MISO) channel, where spatially distributed nodes are coordinated to form a virtual antenna to emulate multi antenna transceivers.

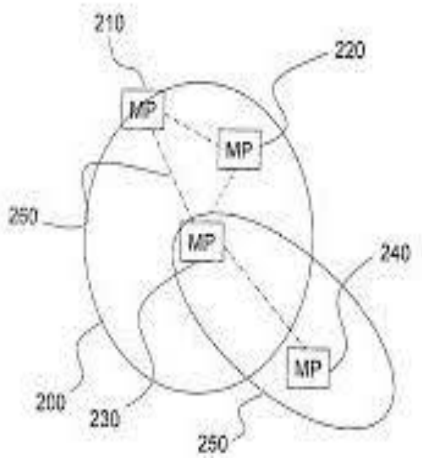

Fig.5 MANET TOPOLOGY

2. Network Constraints:

Two constraint conditions need to be taken into consideration in the proposed COCO topology control scheme. One *is network connectivity*, which is the basic requirement in topology control. The *end-to-end network connectivity* is guaranteed via a hop-by-hop manner in the objective function. Every node is in charge of the connections to all its neighbours. If all the neighbour connections are guaranteed, the end-to-end connectivity in the whole network can be preserved. The other aspect that determines network capacity is the path length. An end-to-end transmission that traverses more hops will import more data packets into the network. Although path length is mainly determined by routing, COCO limits dividing a long link into too many hops locally. The limitation is two hops due to the fact that only two-hop relaying is adopted.

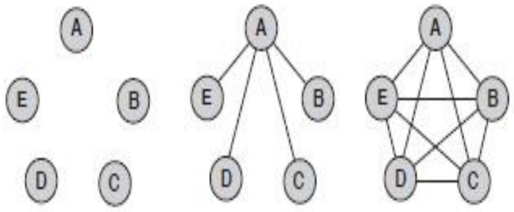

Fig.6 Network Constraints

3. Relaying Strategies:

- Amplify-and-forward
- Decode-and-forward

In amplify-and-forward, the relay nodes simply boost the energy of the signal received from the sender and retransmit it to the receiver. In decode-and forward, the relay nodes will perform physical-layer decoding and then forward the

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decoding result to the destinations. If multiple nodes are available for cooperation, their antennas can employ a space-time code in transmitting the relay signals. It is shown that cooperation at the physical layer can achieve full levels of diversity similar to a MIMO system, and hence can reduce the interference and increase the connectivity of wireless networks.

4. Cooperative Communications:

Cooperative transmissions via a cooperative diversity occupying two consecutive slots. The destination combines the two signals from the source and the relay to decode the information. Cooperative communications are due to the increased understanding of the benefits of multiple antenna systems. Although multiple-input multiple-output (MIMO) systems have been widely acknowledged, it is difficult for some wireless mobile devices to support multiple antennas due to the size and cost constraints. Recent studies show that cooperative communications allow single antenna devices to work together to exploit the spatial diversity and reap the benefits of MIMO systems such as resistance to fading, high throughput, low transmitted power, and resilient networks.

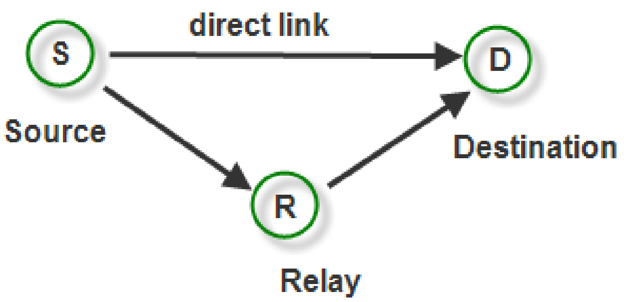

Fig. 7 Cooperative Communications

5. Multi-hop Transmission:

Multi-hop transmission can be illustrated using two-hop transmission. When two-hop transmission is used, two time slots are consumed. In the first slot, messages are transmitted from the source to the relay, and the messages will be forwarded to the destination in the second slot. The outage capacity of this two-hop transmission can be derived considering the outage of each hop transmission.

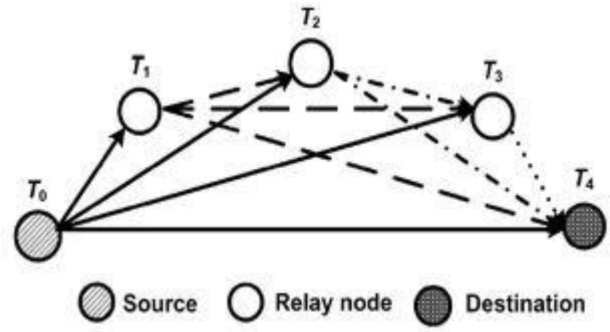

Fig 8. Multi-hop Transmission

VI.CONCLUSIONS AND FUTURE WORK

In this we have introduced physical layer cooperative communications, topology control, and network capacity in MANETs. To improve the network capacity of MANETs with cooperative communications, we have proposed a Capacity-Optimized Cooperative (COCO) topology control scheme that considers both upper layer network capacity and physical layer relay selection in cooperative communications. Simulation results have shown that physical layer cooperative communications techniques have significant impacts on the network capacity, and the proposed topology control scheme can substantially improve the network capacity in MANETs with cooperative communications. Future work is in progress to consider dynamic traffic patterns in the proposed scheme to further improve the performance of MANETs with cooperative communications.

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