International Journal of Research In Science & Engineering e-ISSN: 2394-8299
Volume: 3 Issue: 6 Nov-Dec 2017 p-ISSN: 2394-8280

PERFORMANCE EVULATION OF TOPOLOGY CONTROL IN MANET WITH COOPERATIVE COMMUNICATION

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ABSTRACT

Cooperative communication has received tremendous interest for wireless networks. 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. 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.
Keywords: MANET, topology control, cooperative communication, NS2 .

INTRODUCTION

Contrary to the case of wired networks, the network topology in wireless networks is not fixed and can be changed by varying the nodes' transmitting range. So, further energy can be saved if the network topology used to route/broadcast messages is energy efficient itself. The goal of topology control is to dynamically change the nodes transmitting range in order to maintain some properties of the communication graph (e.g., connectivity), while reducing the energy consumption by node transceivers (which is strictly related to the transmitting range).Since transceivers are one of the major sources of energy consumption in the wireless unit, especially in Wireless Ad hoc Networks, topology control mechanisms are fundamental to achieving good network energy efficiency. Besides reducing energy consumption, topology control has the positive effect of reducing contention when accessing the wireless channel. In general, when the nodes' transmitting ranges are relatively short, many nodes can transmit simultaneously without interfering with each other, and the network capacity is increased. Ideally, the nodes' transmitting range should be set to the minimum value such that the graph that represents the communication links between units is connected. A MANET topology can depend on uncontrollable factors such as node mobility, weather, interference, noise as well as controllable factors such as transmission power, directional antennas and multi-channel communications as described. A bad topology can impact negatively on the network capacity by limiting spatial reuse capability of the communication channel and also can greatly undermine the robustness of the network where the medium access (MAC) layer, the physical layer of the network. So the network should neither be too dense nor too sparse for efficient communication amongst nodes to take place. Topology control is therefore paramount in providing stability over network resources with the ultimate aim of ensuring cohesive network communication as already mentioned above.

LITERATURE REVIEW

Heena, Deepak Goyal [5] et al performed a work "TOPOLOGY CONTROL USING ENHANCE AODV (EAODV) ROUTING MECHANISM IN MANET" The
Proposed system modifies the existing AODV algorithm by using Topology control phenomena. In this system, the nod waits for the acknowledgment for the threshold period of time. If the acknowledgment not

received within threshold period then the node broadcast again to select an alternate path. This paper discusses the Topology control using EAODV. Here we analyze the performance of proposed system which is better than the existing system by using various performance parameters on a different number of nodes namely packet delivery ratio, an end to end delay, packet loss ratio.

Mr. A. Chandra, Ms. T. Kavitha [8] et al performed a work "Adaptive Virtual Queue with Choke Packets for Topology Control in MANETs" In this paper, we made an effort to present a queue management approach. However, the approach has outperformed existing queue management techniques RED and REM. Here choke packet mechanism is used to send the feedback to the sender. It involves additional overhead to the traffic. Maintenance of virtual queue consumes additional buffer space.

Rushdi A. Hamamreh, Mohammed J. Bawatna [9] et al performed a work "Protocol for Dynamic Avoiding End-to- End Topology in MANETs" This paper presents current research on solving TCP Topology problems over MANET by presenting most used TCP variants that preserve end to end semantic and their analysis to increase the performance of TCP over MANET. As in the case of mobile networks, the performance of TCP degrades because of its inability to handle efficiently packet losses due to Topology. We have placed special emphasis on TCP-WELCOME, because it is the most successful TCP variant over MANET, due to its ability to differentiate between types of packet losses in MANET. This article proposed a new dynamic mechanism to replace traditional Topology algorithm of TCP-NewReno used in TCP-WELCOME with dynamic minimum Topology path selection through cross-layer analysis. With reference to data analysis and the experimental results, it shows that TCP- DCM handles packet losses problem due to Topology in more efficient way than TCP-WELCOME does. Hence it improves overall throughput and increases TCP performance over MANET.

Md. Manowarul Islam, Md. Abdur Razzaque, Md. Ashraf Uddin, A.K.M Kamrul Islam [10] et al performed a work "MCCM: Multilevel Topology Avoidance and Control Mechanism for Mobile Ad Hoc Networks" In MANETs, Topology frequently leads to packets loss or delay in packets transmission. Our proposed. The MCCM mechanism capable of developing an energy efficient path that ensures maximum use of network resources. The multilevel Topology detection and control mechanism of MCCM improves network performance significantly. The selective data delivery mechanism provides an effective way to mitigate Topology and ensures high data delivery rate, lower end-to-end delay and normalized routing overhead. Thus, MCCM outperforms the state-of-the-art protocols and provide high throughput.

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Jincheng Huang, Huihui Xiang, and YahengZhang
[11] et al performed a work "Stable AODV Routing Protocol with Energy-aware in Mobile Ad Hoc Network" This paper introduces an improved AODV to establish a stable routing, which is based on hop AODV, node mobile speed and node communication status. The results show that the proposed program through pre-alarming significantly improves the transmission rate of the data packet and reduces the control overhead and delay caused by unpredictable link interruption. Compared with LAER, it also reduces the variance of the node energy and increases the time of network partition. In the high-speed dynamic network, it exhibits superior performance. When the mobility is low, compared with the method LAER, the delay of

the proposed method is slightly high. The proposed AODV is superior to the traditional AODV and AODV based on VON on the aspects of end-to- end delay, routing load and spend. In order to avoid passing the Topology and fast nodes, the number of the control packets in the routing discovery process is minimized. In the future, in a different node density, traffic and mobility model, the proposed protocol will be the important part of the research.

Vishnu Kumar Sharma and Dr. Sarita Singh Bhadauria [7] et al performed a work “MOBILE AGENT BASED TOPOLOGY CONTROL USING AODV ROUTING PROTOCOL TECHNIQUE FOR MOBILE AD- HOC NETWORK” So this paper includes routing protocol we emphasize on more stable path rather than shortest path all the time and as the protocol reduces the probability of link breakage the rate of broadcasting of ROUTE REQUEST, ROUTE REPLY, HELLO, ERROR messages are also reduce. The protocol reduces the topological changes, on the other hand, it will also minimize the overhead of broadcasting messages. This protocol can be very efficient at the time of sending the large data where continuous connection among the source and destination is more preferable. If we consider the two graphs in the previous section then we can see that both the Line Graph and Bar Graph values of Mobility Aware Routing Protocol (MARP) lie below the Line Graph and Bar Graph values of Non-Mobility Aware Routing Protocol (NMARP). So from the above comparative studies which have done for different no of nodes, it can be easily concluded that the Mobility Aware Routing Protocol (MARP) which we have proposed, always gives the stable path and selects comparatively static path than the other protocols.

Ashraf Abu-Ein, Jihad Nader [13] et al performed a work “An enhanced AODV routing protocol for MANETs” In this paper, a PH-AODV routing protocol is proposed, it is a modified version of AODV. The proposed protocol combines the power coefficient and the hop-count parameter to improve the performance of AODV. And it is compared with AODV in terms of throughput, an end to end delay and a number of drop packets. It is observed that the new protocol is much better than original AODV.

RESEARCH METHODOLOGY

In this paper we describe MAODV protocol proposed that try to improve performance of original AODV protocol.

MAODV

Multicast protocol is a key technique to the group team application, which benefits in the significant reduction of network loads when packets need to be transmitted to a group of nodes. Multicast protocol must guarantee the performance requirements: adaptable to the dynamic change of network topology, timeliness, minimizing routing overhead and efficiency etc. Multicast is a mmunication approach for groups on information source using the single source address to send data to hosts with same group address. MAODV topology is based on multicast tree adopting broadcast routing discovery mechanism to search multicast routing, which sends data packets to each group nodes from data source.

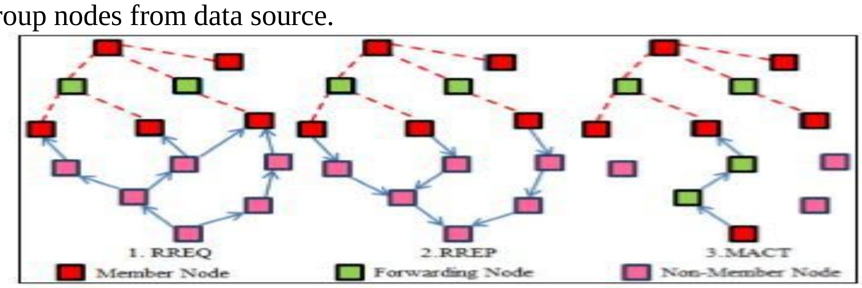

Figure: MAODV Protocol

International Journal of Research In Science & Engineering
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ROUTE DISCOVERY

When a source node needs a route to a destination node and there is not the valid route in the routing table, the source node broadcasts a route request packet (RREQ) to the destination node. When each node receives the RREQ, it creates or updates a reverse route to the source node in the routing table. If it does not have a valid route to the destination node in the routing table, it rebroadcasts the RREQ. When the RREQ flooding from the source node arrives at the destination node, the destination node creates or updates the reverse route. And it unicasts a route reply packet (RREP) which has an incremented the sequence number to the reverse route.

When each node receives the RREP, it creates or updates a forward route to the destination node and

it forwards the RREP to the reverse route. When the RREP arrives at the source node along with the reverse rout , it creates or updates the forward route, and starts communications. For example, Figure 1 shows the process of the route discovery, which the source node S broadcasts the RREQ and the destination node D unicasts the RREP .If each node has the valid route to the destination node in the routing table when it receives the RREQ, it unicasts the RREP to the source node instead of the destination node. For example, Figure 1-II shows such a process, which the node B unicasts the RREP instead of the node D. During the route discovery, when each node receives the RREQ that it has already processed, it discards the RREQ, so the loop is avoided and the overhead becomes low.

Simulation and Result:

Packet Delivery Ratio

This is the fraction of the data packets created by the CBR sources to those successively delivered to the destination. This evaluates the ability of the protocol to discover the routes. Figure shows the Packet Delivery ratio under various mobility networks with AODV routing protocol.

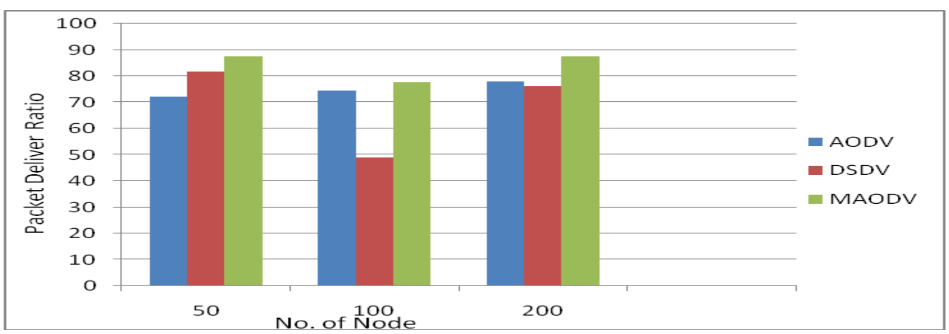

Fig: PDR

Table 7.1 PDR

No. of nodes	AODV	DSDV	MAODV
50	72.08	81.65	87.66
100	74.51	48.92	77.82
200	77.98	76.11	87.4

Throughput

The average rate at which the data packet is delivered successfully from one node to another over a communication network is known as throughput. The throughput is usually measured in bits per second (bits/sec). A throughput with a higher value is more often an absolute choice in every network. Figure shows the Throughput under various mobility networks with AODV routing

Protocol

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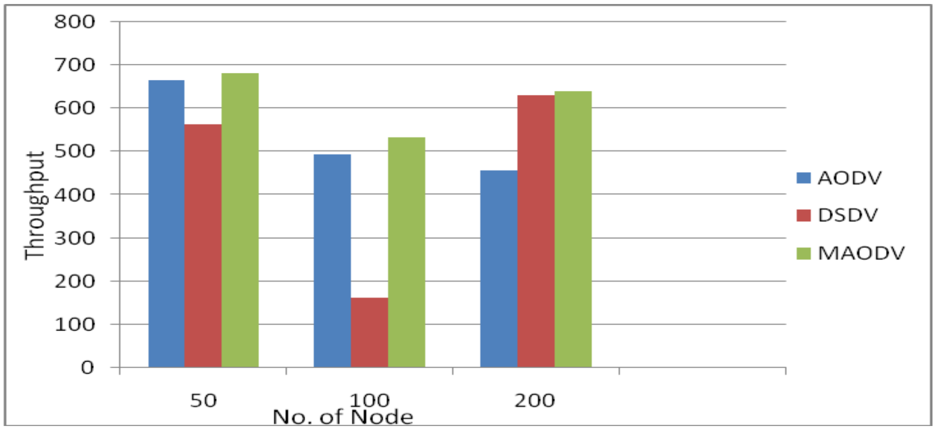

Figure: Throughput

Table: Throughput

No of Node	AODV	DSDV	MAODV
50	665.8	564.05	682.77
100	494.18	162.42	533.67
200	457.37	630.8	639.96

End to end Delay

End-to-End delay is the time required to traverse from the source node to the destination node located in a network. The end-to-end delay is measured in second. The delay assesses the ability of the routing protocols in terms of use- efficiency of the network resources. Figure 7.3 shows the End-to-End Delay various mobility networks network with AODV routing protocol.

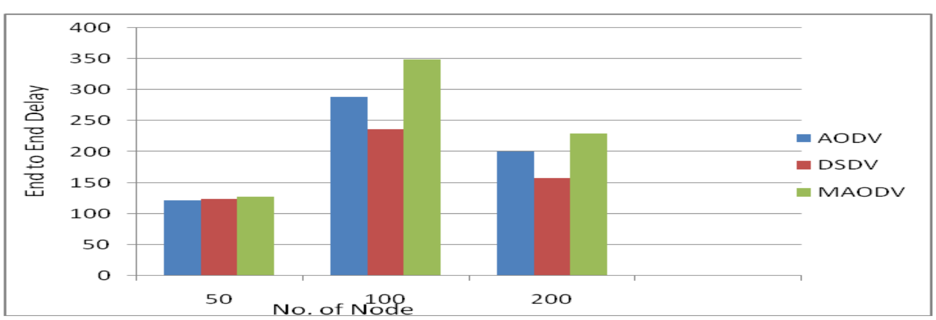

Figure: End-to-End Delay

Table: End-to-End Delay

NO. OF NODES	AODV	DSDV	MAODV
50	122.232	123.832	127.167
100	288.704	236.539	349.41
200	200.038	157.878	229.656

Residual Energy

Total amount of energy used by the Nodes during the Communication or simulation for example node having 100 percent energy and after complete simulation 40 percent energy remaining so we can say that the Residual energy of the node is 60 percent. Figure shows the Residual Energy various mobility networks network with AODV routing protocol.

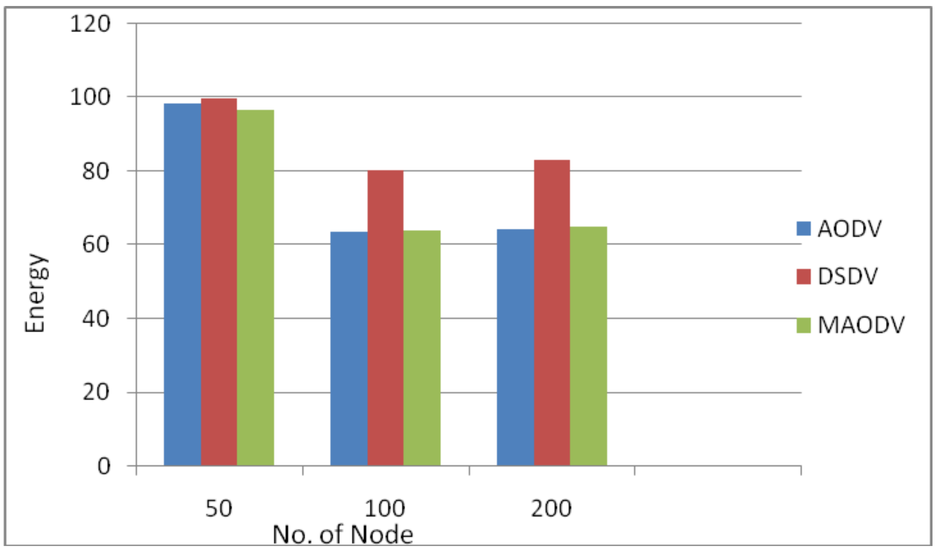

Figure: Residual Energy

Table: Residual Energy

no.of nodes	AODV	DSDV	MAODV
50	98.524681	99.897318	96.788376
100	63.758674	80.513234	63.978753
200	64.427889	83.292627	64.947923

CONCLUSION

Conserving energy in MANET is challenging due to its mobility, changing topology, and mainly due to trade- off between keeping nodes in power-save mode and maintain efficient & effective communication. The key issue treated in this master's thesis project has been the improvement of parameters in Mobile Ad-Hoc Networks using the Network Simulator. This project aim is the first to apply the idea of a trust model established in subjective logic in the security solutions of MANETs. The trust and trust relationship among the respective nodes can be established, calculated and combined using an item opinion. In our MAODV routing protocol, nodes can work together to obtain an objective opinion about another node's trustworthiness. They can also perform trusted routing behaviors according to the trust relationship among them. This improves overall energy consumption as well as other network parameters. By the results and their analysis, it can be concluded that with the topology control the network performances are improved greatly as compared to network without topology control. The algorithm preserves capacity and connectivity of network, decreases latency, and also provides significant energy conservation.

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