

Energy Efficient Routing Technique by using TORA and BPSO



Neeraj Baiswar, Mohd. Saif Wajid, Gaurav Kumar Srivastava

Abstract: A MANET (Mobile Adhoc NETWORK) is infrastructure less self configuring a set of mobile devices, and those devices communicating via wireless. Devices in MANET can free to move anywhere and any direction. Due to nature of movable, the link between each device can frequently change; due to its dynamic nature of MANET it has some security issues than other fixed infrastructure networks. In the devices in MANET, energy consumption in devices is an important issue. Therefore we need a energy-efficient routing method that consume less energy and increase the lifetime of network. In this proposed paper, here proposed a energy-efficient routing method by using TORA (Temporally Ordered Routing Algorithm) and BPSO (Binary Particle Swarm Optimization).

Keywords: MANET, Energy Efficient, TORA, BPSO.

I. INTRODUCTION

A Mobile Adhoc NETWORK (MANET) is a self-configuring infrastructure less network of group of mobile devices, and that devices communicating via wireless. Every gadget in a MANET is allowed to move autonomously toward any path, and will, in this manner, change its connects to different gadgets much of the time. A mobile ad hoc network (MANET) is assortments of remote versatile nodes which can communicate with one another without having fixed organize framework or any focal base station. Since convenient centre points are not controlled by controlling component, they have unhindered flexibility and accessibility to other individuals. Guiding and framework the board are done pleasantly by each other center points. As a result of its dynamic nature MANET has greater security issues than conventional networks. A MANET is one type of unprepared, temporary connected devices that are modifying their locations and they configure automatically. Because devices in MANET are moveable, and those devices are connected via wireless. The wireless medium may be standard Wi-Fi, or any other medium, like a satellite or cellular connection.

A mobile Adhoc network (MANET) are infrastructure-free systems made by remote cell phones with limited battery life. This limitation battery limit in MANETs makes it important to consider the vitality mindfulness include in their structure the fundamental qualities of specially appointed systems are as per the following:

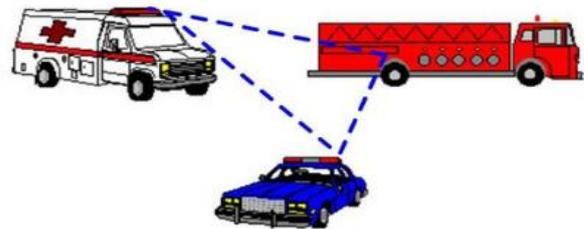


Figure 1: Mobile Adhoc NETWORK (MANET)

Dynamic topology: The nodes in this network can move randomly, and then the topology of network also changes rapidly.

Bandwidth of the Connection: The bandwidth of the connection is milky, and transferring the data capacity of network is also extremely changeable. Due to the dynamic topology, then the transmission time of packets in network will vary with the time to time, then the capacity of the link may change when link change. Then the actual bandwidth of the network may less than as set the bandwidth set in theoretically.

Power Consumption: Limited power in mobile devices is also an important issue. Because of the mobility quality of network, nodes in network are uses batteries as their power source, and the power generation in any batteries are limited in nature.

Security issues in MANET: Due to the dynamic nature of MANET the safety is an also important factor. The nodes in mobile network are easily targeted by malicious authority, and.

The routing algorithm [5] is one of the most challenging phase in the MANET, it is divided into two categories based on when and how to discover the routes: proactive that is a table-driven protocol [3] and the reactive protocol or on-demand. For the table driven routing protocols, consistent and up-to-date routing information are maintained at each mobile host. The protocols those are table-driven, the every mobile node maintains the tables, table may by one or more than one and those table hold routing in sequence to every other node in the network. When topology of the network is change, the node propagates restructured messages to the network to maintain the routing information.

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At the point when a system topology changes, the versatile hosts proliferate the refreshed messages all through the system so as to keep up the steering data about the entire system.

These steering conventions vary in the technique by which the topology data is disseminated over the system and in the quantity of directing related tables. A case of table-driven impromptu steering conventions is the Destination-Sequenced Distance-Vector (DSDV) directing calculation [5]. As opposed to the table-driven directing conventions, the responsive steering conventions don't keep up all state-of-the-art courses at each portable host. Rather, the courses are made at whatever point they are required. At the point when a source have needs to send a datagram to a goal, it conjures the course disclosure component to discover the way. A model is the Ad hoc On-request Distance Vector Routing (AODV), which is an improvement of the DSDV figuring.

Based on energy conservation, there are numerous energy-efficient routing methods has been projected. These methods can be usually divided into two categories: Minimum conservation of energy routing methods [3, 5] and protocols that increases the network lifetime [11]. The protocol that consume minimum energy that is searching the most energy effective route from source to destination, but protocols that increases the network lifetime maintain the balance.

II. LITERATURE REVIEW

Sheu et al. proposed an [10]energy efficient routing method that maintains dynamic path to send data from source to destination in MANET. Due to the nature of high mobility active route may not be power efficient. So they make a new protocol, in that protocol each node in a data route dynamically update the route by the adjusting energy consumption. In the MANET every device determines the power for data transmission and it organizes the packets transmission according to the arriving hello messages from node in neighbour.

Satya Bhushan Verma [7] proposed a Energy Efficient Routing technique in MANET, he used ZRP (Zone Routing Protocol) and Anycast. He used two Zone radius and taking simulation time is 15 second. In her paper he used CBR (Constraint Bit Rate) traffic type and takes 512 packet data in her simulation. He used NS2 simulator for simulation of the experiment.

Ning Li et al [6]proposed a methods based on topology by using minimum spanning tree, and they named it localized minimum spanning tree. In their localized distributed protocol that is proposed by him has following three properties: (1) the proposed routing protocol provides sturdily linked communication graph; (2) degree of any node in network at most six, (3) and they asymmetric links and make it symmetric without impairing the connectivity.

Xiang-Yang Li ET. al. [13] proposed a distributed routing mechanism to create a minimum power topology and proposed a technique which directly finds a route that length is within a constant factor of the shortest path. Based on energy consumption length of route is measure. Only local information is taken in this algorithm.

III. PROBLEM FORMULATION

In the mobile ad hoc network all nodes are mobile and autonomous, and each node also works as host and router. Every node is powered by an energy constrained battery the size and power of battery is limited is we increases the size of battery in mobile node then problem during the mobility of node. Then we need some powerful routing scheme then consume less power and increases the lifetime of node in any network.

The main problem is in developing an energy efficient approach, is finding the area where most power consumed in the mobile nodes. The energy management in mobile node is divided in to a lot of categories that are the transmission power management, processor power management, battery energy management, and device power management. The radio frequency module is in mobile node is first area where too much consume power. The main work of this radio frequency module is to transmit, receive data packet to the other nodes. Battery energy management module is designed at maximising the battery life of node by the adding advantages of its chemical properties, discharge pattern, and also select the best battery.

IV. METHODOLOGY

TORA Routing protocol: TORA (*Temporally Ordered Routing Algorithm*) [11] is a extremely adaptive scattered routing technique, and this algorithm perfectly for the mobile ad hoc networks. In TORA, The every node contains five types of information: Hi, Ni, HNi,j, R Ri, and LSij.

Particle Swarm Optimization: Particle Swarm Optimization is a searching method that has been stimulated from the bird flock and the fish school. In year 1995, Kennedy and Eberhart are designed and introduced this population based algorithm [8]. There are Swarm of particles are present in PSO algorithm where each particle indicates a potential solution. The particles can moves in multidimensional search space in which the position of each particle is adjusted according to its own experience and the knowledge of its neighbours. PSO scheme combine the local search methods with the global search methods. Many particles are randomly set into movement through this space. During the every repetition they check the fitness of themselves and their neighbours and emulate successful neighbours by moving towards them.

Binary Particle Swarm Optimization (BPSO): The binary version of PSO technique was presented by Kennedy and Eberhart in year 1997 [3]. This technique is proposed for the problem with distinct optimization. In this given technique, each particle has a position in a D-dimensional space. In this method, each part of a particle position can take a binary value ie. 0 or 1. 0 means "not included" and 1 means "included". The main difference between binary PSO with uninterrupted version is that velocities are defined in terms of the probability. Using this import a speed must be controlled in the range [0, 1] [5].

Methodology of System: In the proposed system the TORA is used for the providing the path source to destination by using multiple routes. The TORA routing protocol always uses a path with lesser hops. Due to this property of the TORA, energy consumes earlier than others nodes on the smallest path during the heavy traffic.

Then it reduces the network life time and as a result it reduces total throughput of network.

In the proposed method, solve this type of problems by building a new routing technique that is not only consider length of route in its calculations, but also includes energy level of routes during the route decisions.

To select a path that route is short in length and also with the high energy level is the main objective of proposed protocol. It is not necessary that is shortest one, since the shortest route may have a lower energy level. We use BPSO algorithm to find such type of route.

In this paper length of path and energy are used to evaluate the fitness of possible routes, each one getting started from one of neighbor nodes. The fitness value of node k, in case of choosing neighbor node i as the next node of the route, can be given using equation (1).

$$Fitness = W1 \left(\frac{energy}{max_energy} \right) + W2 \left(\frac{min_hopcount}{hopcount} \right) \quad (1)$$

Where

- **energy**: bottleneck node energy level of possible route i,
- **max_energy** : highest bottleneck node energy level among all possible routes starting from the current node
- **hopcount** is the number of hops from neighbor node i to the destination,
- **max_hopcount** is the maximum hopcount among the neighbor nodes
- **W1** and **W2** weighting factors for route energy and route length respectively.

Result and Analysis:

The proposed algorithm is tested by NS2 (Network Simulator). The NS2 (network Simulator) is one of the famous tool that use in networking research and to simulate the behaviour of wired and wireless networks. NS2 provides wide support for the simulation of many routing protocols over wired and wireless (local or satellite) networks.

In the simulation we send some packets at the rate of 10 packets per seconds and observe at the different node size in the network, it shows that the total data transfer is high in BPSO-TORA algorithm than the TORA algorithm.

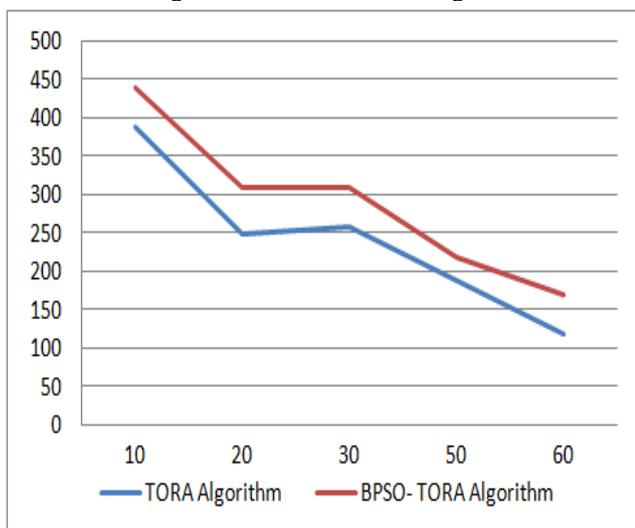


Figure 2. Total delivered data versus number of nodes

The Following Figure 3 shows that network life time vs. number of nodes, it clearly shows that the network life time is high in BPSO-TORA algorithm than the TORA algorithm.

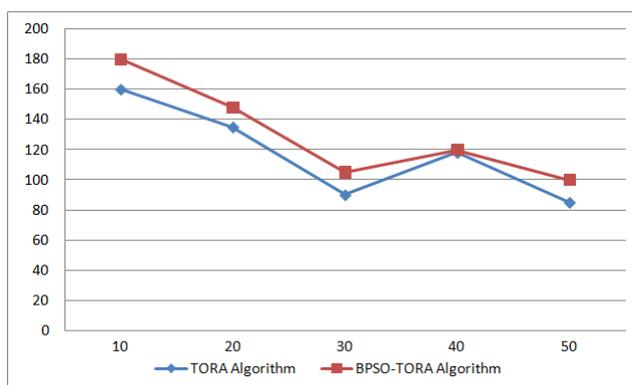


Figure 3: System life time versus number of nodes

V. CONCLUSION:

A MANET (Mobile Ad hoc Network) is infrastructure less self configuring a set of mobile devices, and those devices communicating via wireless. Nodes in MANET can free to move anywhere and any direction. In the devices in MANET, energy consumption in devices is an important issue. Therefore we need an energy-efficient routing method that consume less energy and increases the lifetime of network. In this proposed paper, here proposed a energy-efficient routing method by using BPSO (Binary Particle Swarm Optimization) and TORA (Temporally Ordered Routing Algorithm). In this proposed algorithm shows that the in proposed method total data transfer and network lifetime is higher than the TORA algorithm.

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