Security Routing With Analytical Hierarchy Process in Wireless Ad Hoc Networks

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Abstract: Over the past decade wireless multi-hop ad-hoc networks have received a tremendous amount of research focus.In wireless ad-hoc networks a new routing scheme for congestion control is proposed as called Novel Routing Approach. This method adopts reinforcement learning framework to route the data from Source to Destination in the absence of detailed knowledge of entire channel.It proceeds with the overview of routing protocols used in the MANETS their properties and simulation methods. This paper introduces a new routing scheme developed by the use of evolutionary algorithms (EA) and analytical hierarchy process (AHP) is used for getting the optimized output of MANET. Congestion is elastic traffic that degrades the result of the entire network. The concept of multi-hop ad-hoc networking was successfully applied in many classes of networks In order to predict the future congestion situation a relevant estimation is designed for each forwarder node and our proposed algorithm (ABCC) Agent Based Congestion Control routing protocol. In this paper cryptographic technique caser cipher is also employed for making the optimized route secure. This is achieved by both sufficiently exploring the network using data packets and exploiting the best routing opportunities.

Index Terms: Opportunistic routing, wireless ad hoc networks, Cryptography, EA, MANET, Optimized output.

1. INTRODUCTION

MANET is defined as autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. The network model is change rapidly and unpredictably over time. The origin networks are traced back to DARPA packet radio network project in 1972 [1]. First generation of MANETs is used for different military scenarios for aiding combat operations around 1970 and packet radio networks was the first ad hoc networks [2]. In ad hoc networks nodes do not have a priori knowledge of topology of network around them, they have to discover it. Hybrid Hierarchical, Geographical, Power Aware, Multicast Geographical Multicast Routing protocols select paths dynamically while the packets are being forwarded as in source routing from a source node to a destination [3]. The nodes cooperate in routing the data packets from the transmitting node to the intended destination node. In doing so efficient routing protocols must be chosen respecting the power and delay constraints. Novel Routing approaches for wireless ad-hoc network uses the network self-interference model in to characterize the network throughput[4].

.Motivated by classical routing solution in the internet conventional routing in ad hoc network attempts to find a fixed path along which the packets are forwarded such fixed path schemes fail to take advantage of broadcast nature and opportunities provided by the wireless medium and results in unnecessary packets retransmission [5]. The opportunistic routing decisions, in contrast are made in an online manner by choosing the next relay based on the actual transmission outcomes as well as a rank ordering of neigh boring nodes [6].
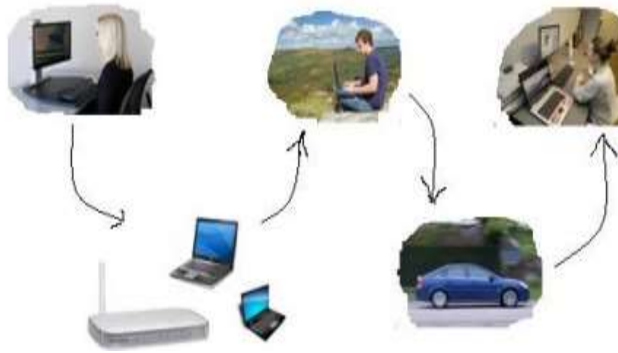

Fig. 1 Example of Opportunistic Networking

2. RELATED WORK

In such a network each mobile node operates not only as a host but also as a router forwarding packets for other mobile nodes in the network that may not be within direct wireless transmission range of each other. Every node that participates in an ad hoc routing protocol.The idea of ad-hoc networking is sometimes also called infrastructure-less networking [7], The mobile nodes in the network dynamically establish routing among themselves to form their own network [8]. Some examples of the possible use of ad-hoc networking include students using laptop computers to

participate in an interactive lecture, business associates sharing information.
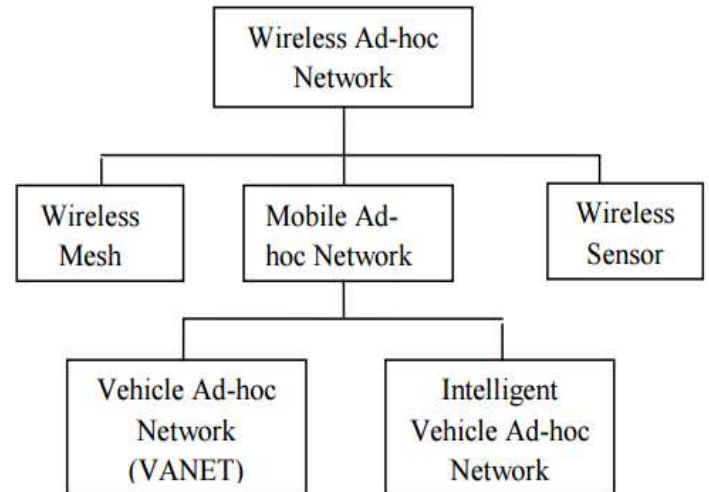

Fig. 2 Hierarchy/categories of Wireless Ad-hoc Networks

Interference or low SNR signal-to-noise ratio can cause loss of ACK and FO packets. Loss of an ACK packet results in an incorrect estimation of nodes [9] that have acquired the packet thereby affects the performance of the algorithm. Loss of FO packet negatively impacts the throughput performance of the network. In specifically, missing of an FO packet can result in the drop of data packets at all the potential relays, reducing the throughput performance. Hence, in our design, FO packets are transmitted at lower rates to ensure a reliable transmission [10]. Another routing protocol was proposed which selects the routes and the corresponding power levels such that the time until the batteries of the nodes drain-out is maximized [11]. A simple, efficient and scalable multi level fish eye scope routing algorithm reduced routing update overhead in large networks in which nodes exchange link state entries with their neighbors with a frequency which depends

on distance to destination and from link state entries nodes construct the topology map of the entire network and compute optimal routes [12].

3. SYSTEM ARCHITECTURE

A system architecture or systems architecture is the conceptual design that defines the structure methods of a system. It explains the system architecture or building blocks and provides a plan from which products can be secured and systems maintained, that will together as a joint venture to implement the complete system [13]. This may activate one to manage system in a way that meets business needs. A routing scheme which is tunable and which also allowed for tradeoffs between setup overhead and delivery reliability was described. To protect the authenticity and integrity of the message in MANET, digital signatures can be used .For battery-powered nodes and externally powered nodes, an energy aware routing scheme was described which achieved better system lifetime compared to the conventional energy efficient routing protocols [14]. An designated arrangement of physical components which provides the design solution for a consumer product or lifecycle process intended to satisfy the requirements of the functional architecture and the necessary baseline. System is the most vital, pervasive, distributive, top-level, decisions and their colligate rationales about the overall structure and associated characteristics and behavior [15].
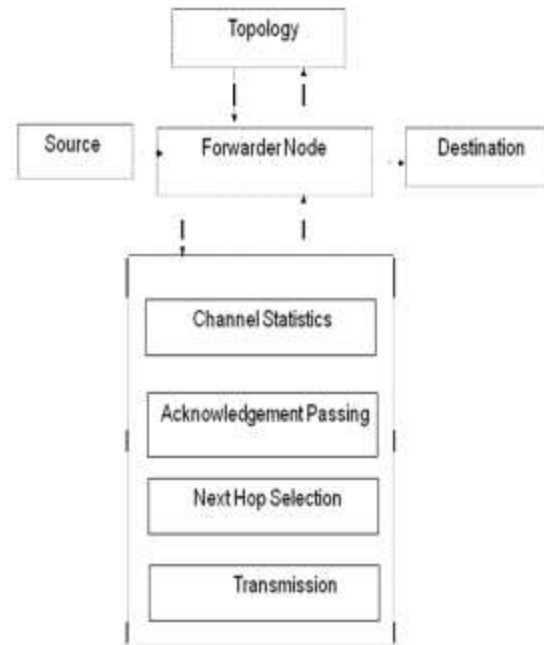

Fig 3. System Architecture

4. PROPOSED SCHEME FOR OPPORTUNISTIC ROUTING

The proposed scheme isused a reinforcement learning framework to change route the packets even in the absence of reliable knowledge in channel statistics and network model. The mesh clients is either stationary mobile client mesh network many themselves and with mesh routers. The coverage area of the radio nodes working as a single network is called a mesh cloud [16].
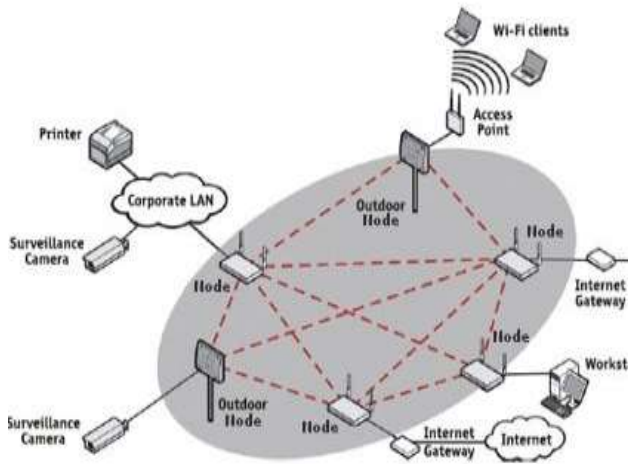
Fig. 4 Wireless Mesh Network

We have taken up a MANET in two places on a map and have divided the region into many zones. [17]. After the shortest path is backbone and assigned it the highest priority. In order to achieve the desired result evolutionary algorithms and analytical hierarchy model is used for optimizing and securing the route [18].

A. Evolutionary Algorithm: (EA)

An evolutionary algorithm is security and search technique used in computing to find the true approximate solutions to optimization [52] and search problems and the evolution usually starts from a population of randomly generated different and happens in generations [1]. The number of steps involved in evolutionary algorithm

1. Generate random population of n chromosomes

2. Evaluate the fitness f (x) of each chromosome x in the population.

3. Create a new population by repeating following steps until the new population is complete.

a. Select two parent chromosomes from a population according to their fitness

b. With a crossover probability cross-over the parents to form new offspring

c. With a mutation probability mutates new offspring at each locus

4. Use newly generated population for a further run of the program.

5. The end condition is satisfied ,stops ,and returns the best solution in the current population
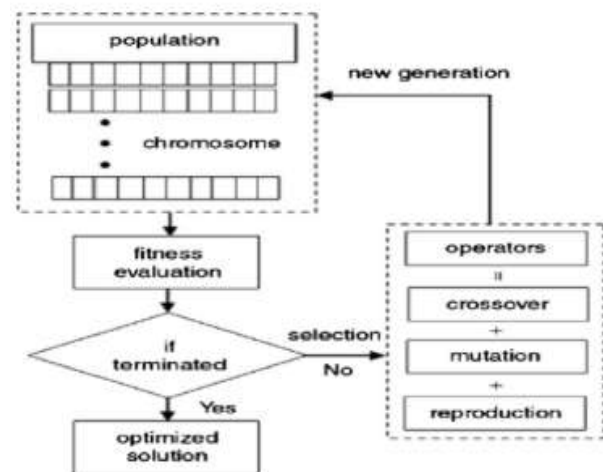
6. Go to step 2 [19].

Fig. 5 Evolutionary Algorithm Flow Chart

B. Analytical Hierarchy Process

AHP schema is comparing list of objectives or alternatives. It is comprehensive logical and structured framework. The incorporation of all the relevant decision criteria and their pair wise comparison the decision maker to determine tradeoffs among objectives [20].Comparative judgment of elements and synthesis of priorities.

Step 1.Creating hierarchies to resolve the problem

Step 2.Comparison of alternatives and the criteria

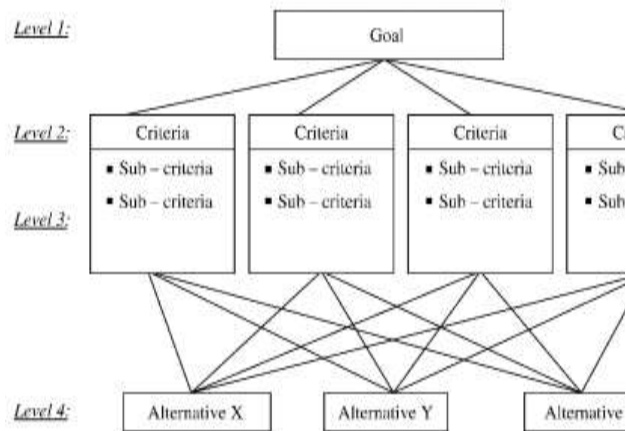Step 3.Synthesize the comparisons to get the priorities of alternatives

Fig. 6 AHP Multiobjective Selection Criteria

5. ENCRYPTION ALGORITHM

Following steps involved in encryption

A. Enter the agent key which will decide the encryption pattern of the message at the transmitting side.

B. Once the agent key is entered, the message is passed to the transmitting end which gets encrypted according to the agent key (security key).

C. Once each of the packet reaches to the receiving side it gets decrypted and the original message is received [20].

1. AGENT BASED CONGESTION CONTROL ROUTING ALGORITHM

Step 1: The source S look into the number of availability one hop neighbors and clones the Node Agent (NA) to that neighbors

Step 2: The Node Agent pick out the truncated path of the route to move towards the destination.

Step 3: The NA1 moves towards the destination in a hop-by-hop manner in the path P1 and NA2 in P2 and NA3 in P3 respectively

Reception and acknowledgment Stage: Let denote the (random) set of nodes that have received the packet transmitted by node. In the reception and recognition stage successful acceptance of the packet transmitted by node is acknowledged to it by all the nodes. We assume the delay for the acknowledgment stage is small enough. The ACK packet of node to node includes the EBS message. Upon reception and acknowledgment the counting random variable is incremented [21].

6. RESULTS

Simulation results using Evolutionary algorithms and Analytical Hierarchy Process take with cipher encryption show an average throughput gain of 55% to 75%, depending on network density over traditional minimum hop route selection in 802.11b networks. Also in this case the message is more secure as the message is encrypted and sent in the optimized route. Currently there publicly available data capturing node movement in real large-scale mobile ad hoc environments. Taken together for those systems in which mobility is important and for which a synthetic mobility model is an essential ingredient, it would appear to be important to consider the influence of the human-level social network many informs
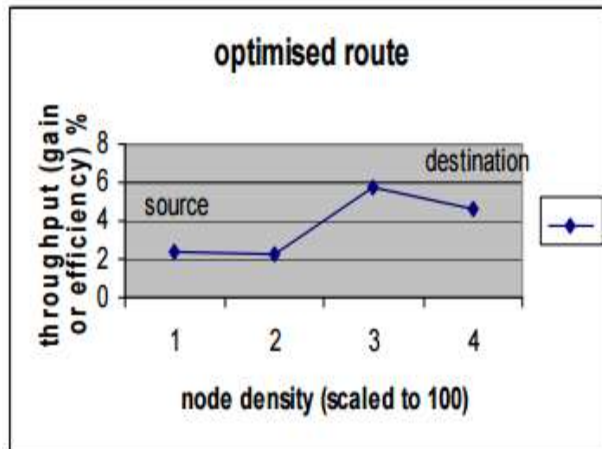
likely individual and group mobility patterns.

Fig. 7Throughput Vs Node density characteristics

7. CONCLUSIONS

From the results obtained it is concluded that the use of modify techniques in combination with the mathematical tools such as AHP brings a pronounced throughput improvement in ad-hoc networks which results is secured and search message transmission. To propose Agent based Congestion Control routing protocol algorithm in optimal with zero knowledge regarding network model and channel statistics. Also solve the congestion problem and improves the throughput that minimizes the delay. Also in this algorithm the message that is sent through the optimized route is secured from hacking as the security concern is taken care of cipher encryption. Also by using EA and AHP we found that the chance of a particular node appears once in 3 iterations. These results in probability of 33.33% resulting in saving of near about 70% Research challenges specific to modify networks is discussed and it requires a lot of research for improving the routing result in

these networks. The requirements of the opportunistic networks make these networks a promising and challenging research field.

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