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Voting Based Reliable Route Selection Protocol in MANET

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ABSTRACT

Cognitive radio is important property of intelligent radio which helps in changing its transmission parameters based on the environment in which they are present. It was introduced long back but the development in this field is still going on. Routing in this field started recently. Its two main properties are considered in our paper: sensing and sharing. This property will allow to use the vacant portion and dynamically programmed. Based on this knowledge new routing protocol is introduced Voting Based Reliable Route Selection Protocol (VBRRS). It selects the reliable path during transmission of packet. Efficient packet delivery ratio and maximum throughput was seen in NS2 simulator.

KEYWORDS: Cognitive radio, spectrum sharing, spectrum sensing, Reliable route.

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INTRODUCTION

Ad-hoc network is a wireless interface formed by mobile nodes without any central administration to send packet data. Nodes act as source, destination and routes in the network. The nodes of ad hoc network are considered to mobile where they can move freely. The nodes in the ad hoc network can suddenly disappear from one place, or come up in another so they are considered as dynamic environment. And Routing in such dynamic network is a most challenging task because of the mobility of nodes. As the nodes move randomly in the network it was a biggest issue for designing routing protocol. If a path was considered at some time will not be same after some period of time.

The applications of Ad hoc networks are, meetings or conventions in which persons wish to quickly share information, search-and-rescue operations in emergency, and rugged surface of data acquisition operation. Table-driven routing protocol sand On-Demand routing protocols are two categories of ad-hoc routing protocols. Table driven routing protocols, contains the routing information of all nodes up-to-date. Destination-Sequenced Distance-Vector (DSDV) and Temporally Ordered Routing Algorithm (TORA) are table driven routing protocols. In On-Demand routing protocols, whenever a source has the data and if it is ready to send that then only paths are established on Demand of source. Examples of On-Demand routing protocol are Dynamic Source Routing (DSR) and Ad-Hoc On-Demand Distance Vector Routing (AODV). In our paper we are studying AODV protocol and comparing AODV protocol with our Voting-Based Reliable route selection protocol with respect to packet delivery ratio and end to end delay.

Cognitive radio that can be modified and designed progressively which can change its transmission parameters based on the interaction in which it participates described by (Rayan Abdelazeem Habboub Suliman1 et al., 2018)[1]. Its transceiver, which is designed to get the best use for wireless channels in its vicinity. The cognitive radio automatically detects channels, which are available in wireless spectrum, then according to that environment change its transmission range. Figure 1 shows the spectrum hole representation where empty spaces are called spectrum holes or white spaces and already occupied spaces are called spectrum in use. From the definition we observe of the cognitive radio have two main characteristics which are as defined as follows: Cognitive capability: Cognitive capability refers to the ability of the radio technology to capture or sense the information from its radio environment. Re-configurability: The cognitive capability gives information on spectrum whereas by dynamically programming we canre-configure the radio environment in re-configurability.

Hence a routing protocol that selects a reliable route or path during the transmission of packet is needed. Therefore we propose a protocol that performs this main function in the transmission of packet through the network. We study and analyze the ad-hoc on demand vector routing protocol (AODV) and compare with our proposed protocol voting based reliable route selection protocol (VBRRS).

RELATED WORK

The concept of cognitive radio as a solution to the problem of spectrum resource utilization. Radio etiquette consists of a set of RF bands, protocols, air interfaces also spatial and temporal patterns which helps to moderate the use of the radio spectrum proposed by (J.I.Mitola and G.Q. Maguire et al., 1999)[2].Cognitive radio is extension of software radio with radio-domain model-based reasoning about such etiquettes. Concluding cognitive radio improves the performance of personal services via a radio knowledge familiar language.

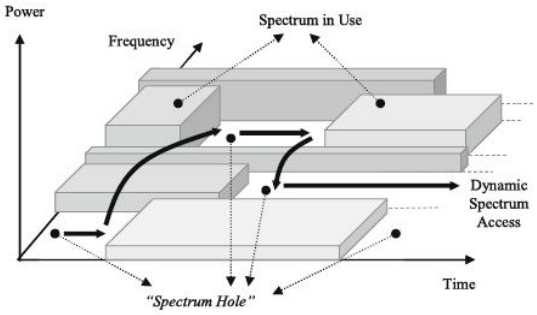

Figure1.Spectrum hole representation

The author described that for wireless network the simple and best routing protocol is Epidemic routing (Flooding) by (Pendharkar Nivedita Arvind kumar et al., 2014)[3].In Epidemic routing protocol the nodes transmit whatever data or information they have to all the neighbors who does not have that information. Thus it was a big disadvantage as it exerts stress on the data transmission and also on storage capacity of node devices present in the network.

In further survey, the author describes the exact definition of cognitive radio network and also its advantages, characteristic highlights and the limiting elements of the current CR MAC routing protocols by (Le The Dung, Beongku et al., 2014)[4]. They said that CR take care of the issue of spectrum short age by making proficient and opportunistic use of band frequencies which is allocated for only reserved/licensed users of the network.

Describing that in Cognitive networks the spectrum have the tendency to change its transmission range and configure its range according to the environment in which they operate is

done by (A.S. Caciapuoti, M.et al., 2012)[5]. He proposed the challenges of finding the shortest path in cognitive radio networks and suggested solutions. Cognitive ad-hoc networks are can be characterized into two primary classes: and local/neighborhood spectrum knowledge and full spectrum/range knowledge.

As CR perform over a single range channel in its network, therefore the addressing of spectrum allocation is not done in previous paper. SEARCH routing protocol sends RREQ packets which is same to GPSR proposed by (Nitin Manjhi et al., 2012)[6]. The sink makes the combination of routes and then to each link a channel is assigned so that delay between them is minimized.

In GPSR GPS device are used for location by (B.Karp, H.T. Kung, et al., 2000)[7], In GPSR, a forwarders ends a notification to the node in neighbor who is close to the sink and which is in the area of its forwarding. GPSR can prompt a dead end/lock, where no hopeful can be found in the sending the message. When such a case occurs, the message is bypassed around the deadlock until achieving a hub that has at least one applicants

In many papers on the Cognitive Radio where introduced, but all the papers mainly spoke on issues of physical and medium access, and also said about problem in finding the route cognitive networks. So this paper addressed one of theissue by assessing the feasibility of reactive routing for such networks.

The ad-hoc network is gathering the bundle of mobile nodes with cooperation of nodes and without any central management system or existing infrastructure introduced by (C.E.Perkins, et al., 1999)[8]. AODV is a novel algorithm for the operation of such ad-hoc networks. In this technique nodes store only the routes which are needed, they reduce memory, quick response to breakage is done.

The author said that the topology of a cognitive radio network depends on the behavior of both licensed (primary) and unlicensed (secondary) users. But by the activity of licensed users the network connectivity between the nodes could be impaired. This it affected the design of routing protocols in cognitive network. For this issue author designed a different routing protocol named Gymkhana, which has the information of the degree of connectivity for possible paths which leads tosink. The convention courses the information through the ways that stay away from arrange zones that don't ensure steady and high availability.

When observed at the node level the performance of mobile ad-hoc wireless networks is more sensitive as there is a connection caused by node movement was described by (L.T. Dung, et al., 1999)[9]. Thus, to make powerful versatile mobile ad-hoc networks against mobility of node, path established should be stable and route should be selected adaptively based on instantaneous network parameters. In this paper, author presented a practical adaptive plan to enhance arrange dependability

in portable specially appointed systems by adaptively choosing most stable steering ways and ideal directing.

Introduction that without any existing network infrastructure the protocol can self-organizing and self-configuring is by (D.Johnson,D.Maltz et al., 2001)[10]. The DSR protocol has two main mechanisms finding the route/route discovery and maintaining the route, which work together to allow nodes to discover and maintain Source routes to arbitrary destinations in the ad hoc network. Multi-hop wireless ad hoc networks.

DESIGN OF VBRRS

The algorithm used in the present paper is Euclidean distance algorithm. One of the major problem is how to minimize the link failure due to the random fluctuation of nodes in MANET, for this reliable path which is stable. The path which is built up for a satisfactory period for transmission is called stable route/path. Keeping this in mind the new method was introduced for routing in MANET for stability. While designing our protocol we did two sections. In first section route to destination is calculated by using use signal strength metric, if we are unable to find the route from signal strength metric then the second section is considered where it works on minimum hop count method as AODV and find the path which has signal strength of RREQ packet is predefined threshold value from this we can increase the network lifetime as well as performance of complete network.

Calculation of RSSI

$$P_r(d) = \frac{P_t * G_t * G_r * h_t^2 * h_r^2}{d^4 L}$$

Where,

P_R Power received at a distance d,

P_T Transmission signal power

G_T Transmitted gain

G_t Receiver gain

h_t Transmitted antenna gain

h_r Receiver antenna gain

d Distance from the transmitter

L Path loss

This method measure signal strength between nodes and compare with RSSI threshold values if it is greater than threshold value then it is accepted for further processing otherwise it is discarded.

The principle-preferred standpoint of this procedure or method is by selecting the efficient path to the sink node we can increase the lifetime of the system.

SEQUENCE DIAGRAM

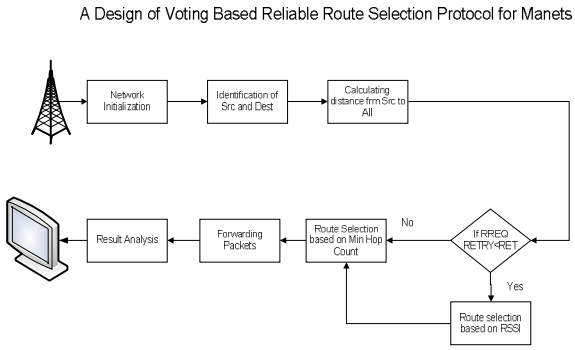

Figure 2. Block diagram of VBRRS

Our VBRRS routing protocol sequence diagram is shown in figure 2 at the first it start with the network initialization after network is setup the source and the destination node to be set. Where source is the node, which send data in the network. Destination is the node which receives the data from the source node. The step after this is calculating distance from source node to destination node through all the nodes and selecting the shortest distance. The next step a condition where source node will send a route request to its intermediate nodes if it is less then retry threshold the route selection is done based on RSSI method or else route selection is doneby min hop count. When the path to the destination is setup packet forwarding takes place.

RESULT AND DISCUSSION

We simulate VBRRS using NS2.34. Under Linux Ubuntu platform, In this section, we present the simulation results and show the improved performance in delay, throughput and PDR parameters, and also VBRRS requires less rerouting and leads to less control over head as it avoid unreliable mobile nodes from the route. So in large network VBRRS performance is better than AODV.

We have studied and analyzed AODV protocol. Experiments where conducted to compare packet delivery ratio (PDR), Delay and Throughput for different values of number of nodes. Figure 3 shows PDR decreases as the number of nodes in the network increases. When number of nodes increases the total number of packets sent is greater than the number of packets received therefore there is the loss of packet.

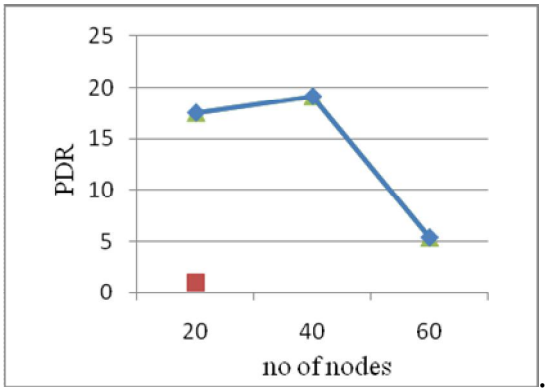

Figure 3. Packet Delivery Ratio Vs. no of nodes

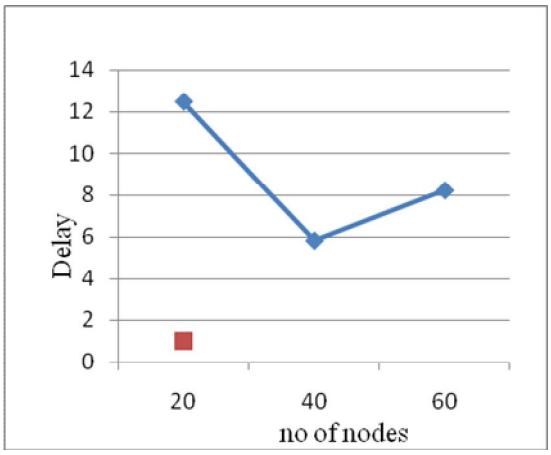

Figure 4. Delay vs. no of nodes

Figure 4 shows Delay Vs. number of nodes. When number of nodes are more the delay between them also increases. Figure 5 shows Throughput Vs. number of nodes.

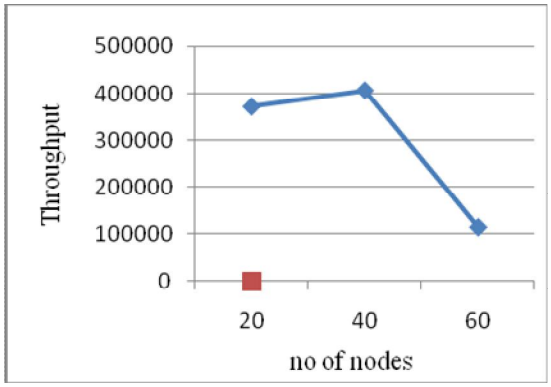

Figure 5.Throughput vs. no of nodes

CONCLUSION

In this paper we have introduced a Voting Based Reliable Route Selection Protocol for MANET. We efficiently conclude that our routing protocol is better AODV in providing efficient PDR, throughput and delay. Specifically, VBRRS selects the reliable route while data packet transmission.VBRRS requires less rerouting and leads to less control overhead as it avoid unreliable mobile nodes from the route. So in huge network VBRRS performance is better than AODV. By the simulation results we conclude PDR decreases as number of nodes increases.

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