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RADNET Routing Enhancement by Red Algorithm

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Abstract: ***RED algorithm is a technique which has been introduced in MANETs as well as in RADNETs to avoid the congestion and contention. As compared to some of the existing mechanisms, the concept of RED algorithm is put into practice for the monitoring of traffic within the network and to avoid it in order to enhance the efficiency of the network. RED works on the basic principal of Active Queue Management (AQM) technique which is developed to work in large IP networks. Hence, because of routing the channel contention and congestion within the network can be get introduced which restricts the efficiency of the network. Therefore, in this paper, an improved form of interest centric mobile ad hoc network (RADNET) named as Adaptive RAD (ARAD) is being used along with Random Early Detection (RED) algorithm in order to enhance the routing behavior of the network. This algorithm informs the transmitter or sender to stop the sending of packets if any type of congestion occurs or to avoid the excessive congestion. This reduces the delay also and hence gives rise to enhance routing and efficient network. The simulations have been carried out on Network Simulator NS-2 by the implementation of RADNET protocol along with RED algorithm for the enhancement in the routing of MANETs. The simulation results revealed that the proposed ARAD shows highly efficient results as compared to conventional ones.***

Keywords: Mobile Ad-hoc Networks (MANETs), Interest Centric MANET (RADNET), Random Early Detection (RED), Base Station (BS), Quality of Experience (QoE)

1. Introduction

The needs of daily life in the field of expert networking have been increasing rapidly. The wired networks have been playing an efficient role in networking but the development in the network technologies the wireless networks come forward and have overtaken the position of wired networks in many important areas. Wireless Sensor Networks (WSNs) and MANETs are one of the important networks which work in a wireless manner and used for the flow of information or messages from one node to another. These networks are composed of monumental scale of nodes which are very small in size and are placed, located or positioned in a stationary or haphazard manner. But, MANETs are those networks which consist of nodes positioned in a random manner or in a dynamic behavior [3] [7].

MANETs are infrastructure independent networks which use the conception of multihop routing scheme [3]. Therefore, the nodes always locate for an intermediate node so that the information can be passed to destination node from the source node. Hence, this shows that the nodes always depends upon the abstraction of mutual understanding between the nodes while transference of information within MANETs. Thus, the nodes in MANET exhibit the role of host as well as router. An extension to MANETs called RADNET is proposed in this paper, which uses a new mechanism for the process of communication based on the concept of Active Prefixes (APs). In contrast to traditional MANETs, RADNETs implements APs within the header file of the information or the messages sent over the network. These messages or information sent over the network always have two objectives. The first one is for the conservation of the network and the second one is to provide Quality of Experience (QoE) [2] [4].

The algorithm used for the routing RADNET [3] uses the concept of drop tail queue for the transmission of data. This causes the congestion and contention of information within the network. Hence, to overcome this matter, a novel algorithm is put into practice called Random Early Detection (RED) algorithm [1] which diminishes the overflow of messages and avoid the congestion upto a certain extent. This efficiently enhances the efficiency of the network by providing a secure and efficient routing scheme for the flow of messages or information.

The network simulator used for the simulation is NS-2 in which the scenario is being created by the deployment of sensor nodes in a dynamic manner. For the efficient routing, RADNET is used which is an improved version of MANET along with RED algorithm. The simulated results show that the implementation of APs reduces the channel contention and congestion within the network for the efficient transmission of data over the network. This increases the latency in the network and supports the messages for the delivery of high data rates.

The paper is organized as follows. Section II explains the related works and the study of RADNET and description of RED algorithm in Section III. Section IV shows the proposed methodology and Section V describes the simulated results and discussion. The Section VI focuses on conclusion and future scope.

2. Literature Survey

The random early detection (RED) algorithm was introduced in [1] over a decade ago which stimulated toward novel attention for the control of congestion on a region of active queue management (AQM). The concept of AQM is purely

based on router type of congestion control mechanism. In this concept, the routers inform end-systems of developing congestion. The main objective of all the designs of AQM is to sustain the standard size of queue in routers. This concept has an extent of enviable effects which includes one of the fact to provide gap for a queue which are implemented to absorb bursts of arrival of packet, second is to avoid bias and look-out the consequences from a little number of flows which controls space for queues, and third one to provide lower delays for several and important interactive applications which includes Web browsing [2] The design of Adaptive RED implements a weighted-average queue size for the evaluation of congestion. The dropage of packets reduces under the condition that when the weighted average has values smaller than that of minimum threshold value.

On the other hand, when the average queue length lies in between the minimum threshold which is called minth and the maximum threshold known as maxth, then the probability varies linearly between 0 and a maximum drop probability of dropping packets. When the average quenth length go beyond the maximum value, then all the packets get dropped.

In the year 2001, an enhanced form of this unique adaptive RED proposa was proposed by doing replacement in the MIMD (multiplicative increase multiplicative decrease) technique with an AIMD (additive increase multiplicative decrease) approach [5]. The authors applied control theory is proposed in the year 2000 for the development of a formation for AQM and TCP dynamics and implemented an innovative model formation for the analyzation RED [4] algorithm. In this paper two constraints in the new RED design are asserted where the one is that, RED algorithm is either unbalanced or shows slow reactions when any change in network traffic occurs, and second one is the utilization of a weighted-average queue length method for the detection of congestion. The use of loss probability as a feedback response to the senders was flawed. The flow of data or information in overloaded conditions can suffers the high delays as well as high loss of packets.

In the year 2002, a TCP/AQM model is being proposed for a system which is linear in nature and to design a Proportional Integrator (PI) regulator which regulates the queue length to a destination value which is known as the “queue reference,” qref [7]. The Random Exponential Marking (REM) AQM technique is planned in [6] in which REM updates a congestion measure called “price” in a periodic manner that reflects any disparity between arrival of packet and rate of departure at the link and any queue size mismatch.

3. Description of RADNET and RED Algorithm

A. RADNET

RADNET is an open communication protocol that defines the organization of information to be communicated between known hardware and electronic interface. RADNET is mainly uni-directional, with the exception of alarm acknowledges, source check commands and surpass through messages. It describes the methodology of communication between instruments and software which presents that information to the end user. This protocol is based on the Universal Datagram Protocol / Internet Protocol (UDP/IP) which is common to all systems by using TCP/IP protocols for data transmission. UDP messages are layout in RFC's 768, 862-865, 867, and 1119 [6] [11].

B. Random Early Detection (RED) Algorithm

Random early detection (RED), also known as random early discard is a queuing system for a network scheduler used for congestion avoidance. The regular behavior of router queues on the Internet is known as tail-drop. Tail drop mechanism involves the transmission of data to the current load state in the internet by changing the congestion window as a function of the packet loss rate. This is very inequitable, and also leads to retransmit synchronization [3]. During retransmit synchronization, an abrupt burst of drops from a router occurs and cause a delayed burst of retransmits that will over fill the congested router again. These issues with tail-drop are becoming more and more troublesome on the Internet because the use of network inhospitable applications is rising [3].

To cope up with above mentioned problems Linux kernel offers RED which monitors the average queue size and drops packets based on statistical probabilities. With the growth of queue, probability of dropping an incoming packet also grows. RED is based on three parameters: Min, Max, and burst. “Min is used to set the minimum size of queue in bytes before the beginning of dropping, Max is known as soft maximum under which the algorithm tries to settle down. At last, Burst is implemented to set the maximum quantity of packets that can be burst through [12] [6].

4. Proposed Methodology

The routing in each and every type of network either it is a wired or a wireless network plays an important role in the proper communication of nodes. The nodes can transfer the messages either directly from the source node to destination node or by the use of intermediate nodes. Hence, the concept of mutual understanding is significant in MANETs. The extension to MANETs called RADNET is implemented in this paper along with RED algorithm which enhances the routing behavior of network in a positive manner. This reduces the congestion within the network and also the contention get also be minimized. The comparative analysis has also been taken out among conventional AODV, RAD and ARAD protocol.

All the work is done in a symmetrical manner which is shown as follows in the form of flowchart.

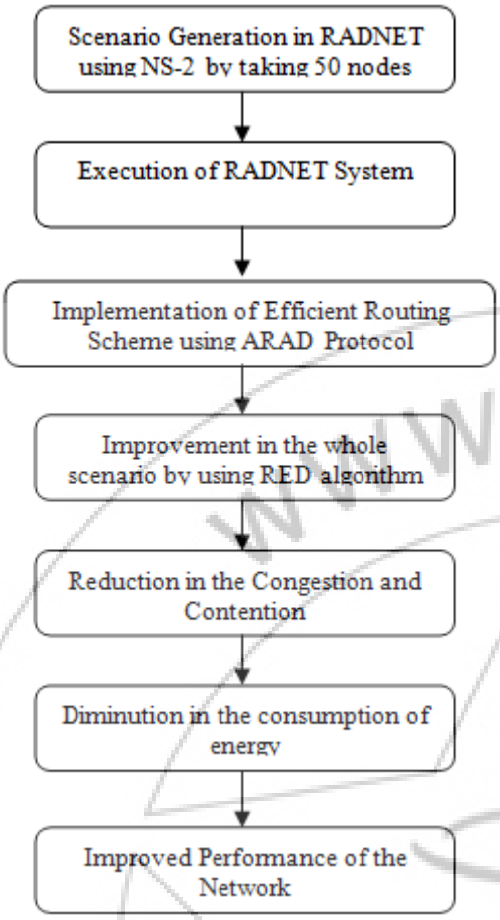

Figure 1: Flow of Work

Figure 1 represents the flow of work which has to be implanted in this paper for the enhancement of routing in RADNET which used ARAD protocol along with RED algorithm. In the first step, the generation of scenario takes place by the deployment of 50 number of sensor nodes in a random manner. The generation of scenario occurs in Network Simulator NS-2.

The Step II is known as the execution step where the execution of RADNET system takes place and in the Step III the effective and efficient routing scheme is modeled with the proposed scenario in order to improve the routing process. Step IV is the phase where the proposed algorithm named as RED algorithm is put into practice for the improvement of the network. This algorithm reduces the congestion and contention of messages while transference form one node to another as shown in Step V by reducing the consumption of energy by nodes in Step VI.

The Step VII shows the improved performance in the network by the use of RADNET with ARAD protocol together with RED algorithm.

5. Results and Discussion

In this section, the results have been taken out by the use of Adaptive RAD (ARAD) protocol with RED algorithm. A comparative analysis also been carried out by using AODV, RAD and ARAD protocol. The algorithm used for the routing enhancement is RED algorithm. All the simulations have been done on NS-2 simulator.

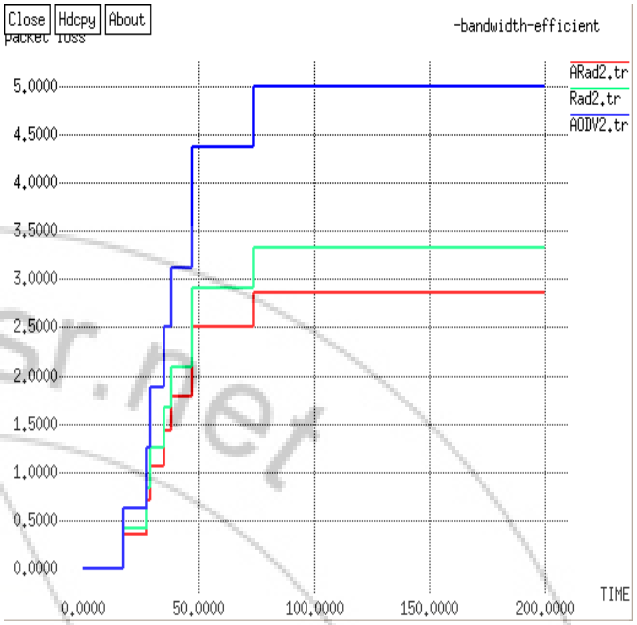

Figure 2: Packet Loss

Figure 2 demonstrates the loss of packets within the network when the packets get transferred from the source node to destination node. It can easily be seen that the proposed protocol ARAD protocol in red color is showing an efficient behavior than that of traditional ones i.e. AODV and RAD protocols which are shown as blue and Green color respectively.

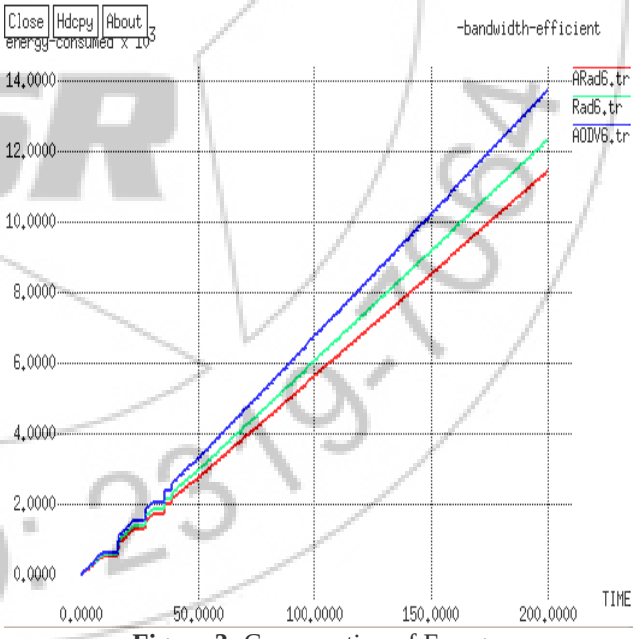

Figure 3: Consumption of Energy

Figure 3 clearly shows the consumption of energy factor in RADNET. Again, in this figure, the proposed protocol ARAD protocol exhibiting an efficient and effective behavior by using the less amount of energy as compared to tradition protocols.

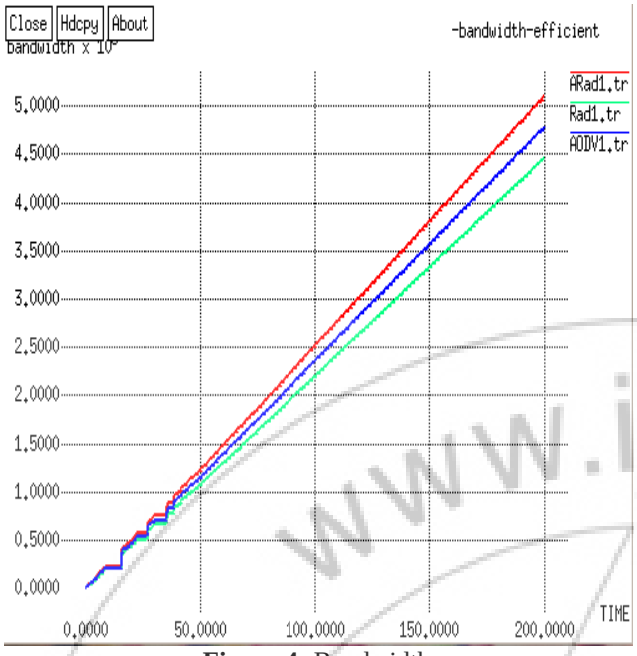

Figure 4: Bandwidth

It can easily be specified in Figure 4 that the ARAD protocol is one of an effective and efficient Bandwidth protocol which is at the top level among AODV and RAD protocols. The Adaptive RAD (ARAD) protocol is showing its highly efficient behavior in terms of Bandwidth when it get integrated with RED algorithm. Hence, the RADNET shows a significant enhancement in the routing of information from source node to destination node when get used with ARAD protocol and RED algorithm.

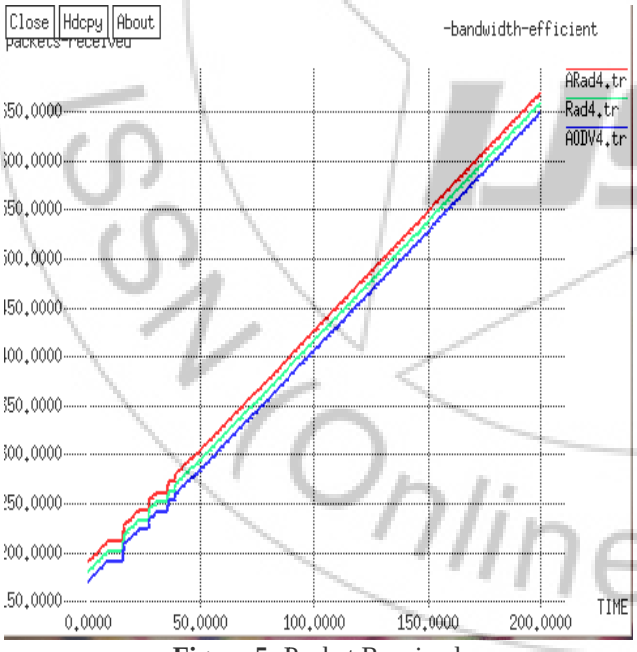

Figure 5: Packet Received

It can be observed from the Figure 5 that the highly efficient protocol i.e. ARAD protocol is receiving the highest quantity transmitted packets.

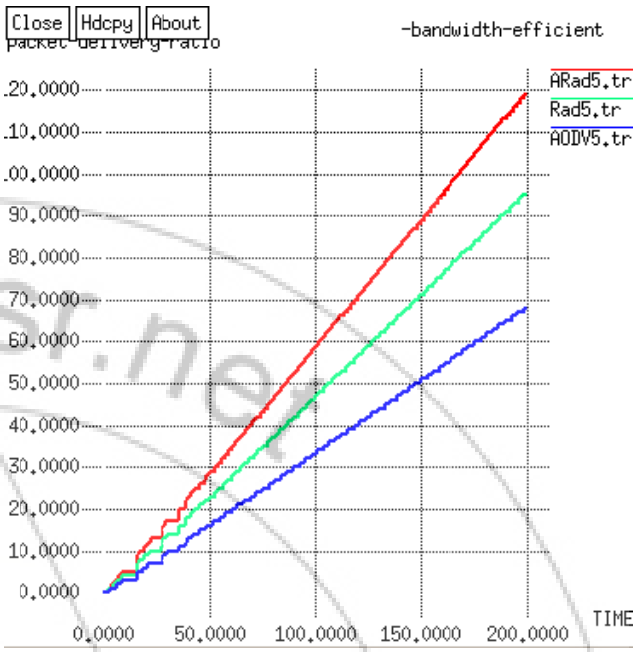

Figure 6: Packet Delivery Ratio

Figure 6 shows that the packets are delivered by proposed protocol ARAD is maximum as compare to AODV and RAD protocol.

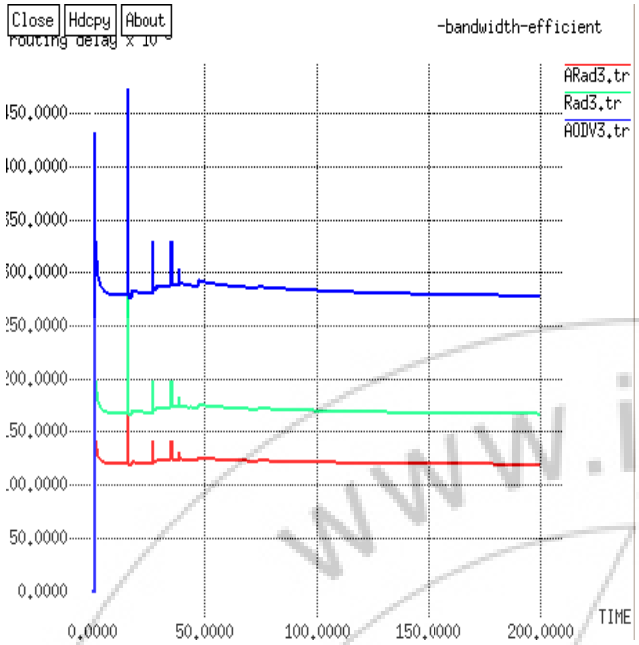

Figure 7: Routing Delay

The above figure shows clearly that the proposed protocol ARAD is highly energy effective and enhancing the routing of RADNET by minimizing the delay in routing. This also reduces the contention in messages and congestion of information at nodes. This also results in increasing the efficiency of the whole network. All the parameters are showing an efficient enhancement in their routing as well as the packets transmission and receiving. The protocol ARAD is showing an outstanding performance and improved over AODV and RAD protocols when get modeled with RED algorithm. The last and the final parameter i.e. delay in the routing is shown in the figure 7 in which the proposed scheme outperforms the effectiveness of conventional one.

6. Conclusion and Future Scope

The enhancement in the routing of any network plays an important role in the affectivity of the network. An efficient protocol or an improved version of AODV and RAD protocol is proposed in this paper which enhances the routing of RADNET. The proposed protocol called ARAD is highly efficient which is used with RED algorithm for the enhancement in the routing scheme. A comparative analysis of three protocols has been carried out among which the proposed ARAD protocol outperforms the behavior of conventional AODV and RAD protocol. The algorithm used for the whole of the process is RED algorithm.

This concept can also be applied in future works so that the routing can be improved for the transmission of messages from the source node to destination node without delay in routing by using greedy approach.

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