Performance Analysis of Routing Protocol with Effective Buffer Management Technique in WSN

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Abstract— Routing in WSN has dependably been a dangerous issue of concern mainly because of a few components extending from unfriendly deployment conditions, network topology that change over and over, Network failures, resource constraints at each sensor hub to designing of routing protocol issues. Accordingly, the implementation of routing protocol is influenced by a few fundamental elements which must be thought about before any attempt at designed routing are implemented, since these elements may keep the fruitful configuration and implementation of routing protocol if these difficulties are disregarded. Dynamic-Source Routing (DSR) protocol is mainly source based routing protocol and designed to limit the bandwidth consumed by packets in WSN by eliminating the periodic table-update messages required in table-driven approach. The proposed system is Multilayer Buffer Management DSR (MBMDSR) where multilayer buffer management mechanism is implemented in existing DSR protocol.

Key words: MBMDSR, DSR, WSN

I. INTRODUCTION

Wireless network is a gathering of wireless sensor hubs with no altered structure and communicate with each other through remote connections. Potential applications for wireless sensor networks used in different areas, such as medical monitoring [1] [2] [3], environmental monitoring, surveillance, home defense, military operations, and industrial machine monitoring. For past numerous years analysts have concentrated on major routing protocols such as, DSDV and DSR and their working instruments. In Dynamic Source Routing (DSR) protocol source routing is the key component of DSR. DSR routing is the source based routing protocol, utilizing intermediate nodes for information exchange from source hub to destination hub. In DSR protocol the problem arise by fast movements of nodes causes the collision between the nodes which results in the flooding in the network. The main idea of buffer management policy is to maximize the overall throughput by means of minimizing the number of retransmitted packets required in the case of packet loss. Network Simulator (NS2) is used for computer simulation. The comparative analysis is carried out between the existing DSR and MBMDSR, result shows that the loss of relevant packets is less in MBMDSR when compared to the existing DSR protocol.

II. LITERATURE SURVEY

F. Akyildiz et al [4] found that characteristics of sensor networks such as fault tolerance, flexibility, high sensing fidelity, rapid deployment and low cost creates new and thrilling application areas for remote sensing. Later on, this extensive variety of utilization areas will make sensor networks a basic piece of our lives. However, acknowledgment of sensor systems needs to fulfill the constraints presented by components, for example, adaptation to internal failure, adaptability, cost, hardware, topology change, environment and power utilization.

V. Jacobsn [5] presented that computer systems have encountered an unstable development in the course of recent years and with that development have come extreme congestion issues. For instance, it is presently regular to see web gateways drop 10% of the incoming packets on account of local buffer overflows. Examination of some of these issues has demonstrated that a significant part of the cause lays in transport protocol executions. The "self-evident" approaches to actualize a window-based transport protocol can bring about precisely the wrong behavior because of network congestion.

J. Postel [6] depicted that currently available buffer management mechanisms are divided into two categories mainly congestion avoidance and congestion control. Congestion avoidance mechanism first identifies the congestion in the network then secondly avoids it from happening where as congestion control mechanism focuses on recovery of a packet loss in the network. The main disadvantage of congestion avoidance mechanism is that it does not fit to the type of arrangement where several hubs send their reading to a particular node.

Tarek Mosbah Abdala , Nasarudin Daud [7] and others compared and simulated two routing protocols named DSDV and AODV by considering specific scenarios with WSNs environment.NS2 simulation tool is used for simulation ,DSDV and AODV are simulated by considering performance matrices like packet delivery fraction, throughput and packet loss. The simulation result predicts that AODV is superior to DSDV in terms of packet delivery ratio, loss of packets and throughput.

Zafar Mahmood, Muhammad Awais Nawaz [8] and other authors studied and compared the behavior of AODV, DSR, and DSDV routing protocols. Analysis was carried out using NS2 as a computer simulator tool and results of analysis were depicted in graphical format. The graph is represented with respect to the pause time which depicts DSR protocol is improved than other two protocols, it is mainly because the system was fewer intense and fewer stressful.DSR was better in packet delivery ratio with respect to packet sent when compared to the AODV and DSDV with minimum routing load, but DSDV have highest value for the performance metrics like average end to end delay.

Review of above literature survey indicates that the most of authors worked on routing protocols in WSN, studied their behavior ,compared many routing protocols

with each other and found the results which routing protocol is better in terms of performance metrics by using the NS2 simulation tool. Also many authors worked on the buffer management policies as the WSN has limited memory and power. To overcome limitation of WSN many authors carried out the survey on buffer management policies. The survey on buffer management policy shows that if multilayer buffer management policy is implemented in routing protocol the loss of relevant packets was decreased and the throughput was gradually increased. The main objective of project was to study and compare the DSDV and DSR routing protocol and to check which protocol is better in terms and performance metrics. And also to implement the Multilayer Buffer Management policy to DSR routing protocol (MBMDSR) in order to increase the throughput and decrease the loss of relevant packets.

III. EXISTING SYSTEM DISADVANTAGES (EXISTING DSR)

The Route Maintenance protocols do not fix a broken connection. The broken connection is just conveyed to source. The DSR protocol is just productive in Mobile System with less than 200 hubs. Problem occurs due to rapid moving of more nodes, so that hubs can just move around for such situation with a moderate speed. Flooding network may lead to collision among the packets. Additionally there is dependably a little time delay at the start of another association on basis that the initiator should first discover the route to the objective.

IV. PROPOSED SYSTEM ADVANTAGES (MBMDSR)

- It finds the multiple reliable paths from source to destination so that if one link fails the information is send through other alternate paths.
- The MBMDSR protocol is efficient for large number of nodes.
- There is less chance for flooding the network which reduces the collusions between the packets.
- As the main buffer is divided into multiple buffers the relevant data can be saved and successfully transferred to the destination and drop of packets is less at destination side when compared to the existing DSR.

V. IMPLEMENTATION LOGIC

Multilayer buffer management technique is implemented to the existing DSR protocol (MBMDSR). Comprehensive analysis and comparison is carried out between existing DSR and MBMDSR. It includes four mechanisms, DSR route discovery, packet classification, buffer partitioning and a discard policy.

A. DSR Route Discovery

Source node Send request (RREQ) to intermediate nodes if respond (RREP) from the true destination is received by the source then it begins to transfer data packet. Otherwise exceeded dynamic hop discovery again source node send RREQ & process repeats. Data packets are transmitted to destination through shortest path.

When path is set up and if target finds that packet delivery ratio drastically falls to the threshold, the detection scheme is activated to recognize the constant maintenance and real time reaction efficiency. The threshold is a differing value in the range [85%, 95%] that can be balanced by current system efficiency. The initial threshold value is set to 90%.This can be done by utilizing a dynamic threshold calculation that control the time when packet delivery ratio falls under the same threshold.

B. Packet Classification

Every node divides the arriving packets into three distinctive types and subsequently every packet is said to be of type i, $1 \leq i \leq 3$. First type of packets is relevant packets that include relevant and important data. Second type of packet is irrelevant packets that include diverse type of information that is not related to the receiver information. Last type of packets is normal packets that incorporate hello packets and regular packets those created at consistent time interval. Regardless, it ensure that there is no losing of important packets and allow other types of packets to be lost.

C. Buffer Partitioning

Buffer partitioning indicates measure of storage space accessible to specified queue and characterizes how memory is shared between distinctive queues. In network situation, every hub comprises of a total buffer size B, shared by T diverse kind of queue. Whole buffer space is dividing into T queues as per expected incoming packet type. Main buffer is divided in three queues (relevant, irrelevant and normal) and every queue accept packets with corresponding type only. The capacities of relevant, irrelevant and normal type of queues are L, M and N respectively. Consequently, total capacity of three queues should not cross total limit of main buffer, $L + M + N \leq B$. Every hub can recognize the kind of received packets by the data represented in packet header.

D. Discard Policy

Discard Policy primarily manages the policy that incorporates tolerating or dismissing of arriving packets and moreover pushing out a previously stored packets to make a space for an incoming packets. The judgment is made in perspective of the type of incoming packets. Arrived packets are explicitly divided in three types, relevant, irrelevant and normal. When the main buffer is full, discard policy is implemented and it executes as below.

If incoming packet is of normal type then and if there are a couple of packets in normal queue, then it replaces the oldest packet in normal queue with the newly arrived packet. If the length of normal queue is zero, i.e. there are no current normal packets to be dropped or evacuated, and basically it drops the incoming packet. If the incoming packet is important, it drops oldest packet either from normal or relevant queue to make a space for new incoming relevant packet. If the incoming packet is irrelevant, it drops the irrelevant packets.

VI. EXPERIMENTAL ANALYSIS AND RESULTS

The result of simulation is depicted in the graphical format and by default the x-axis is always taken as simulation time period. Simulation of DSR protocol and Multilayer Buffer Management DSR (MBMDSR) is done and the result is depicted in graphical format shown.

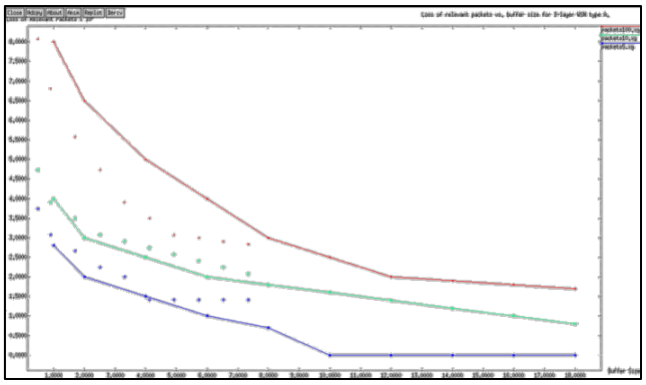

Fig. 1: loss of relevant packets vs buffer size for three layer WSN

Figure 1 shows the loss of relevant packets vs the buffer size for three layer WSN. Packet loss is gradually decreasing for three layer WSN, which means as the buffer size increased its capacity to accommodate the packets is also increased. Hence the maximum packets can be accommodated in buffer. As the buffer size increases the number of packets accommodation is more, as a result the loss of relevant packets is less.

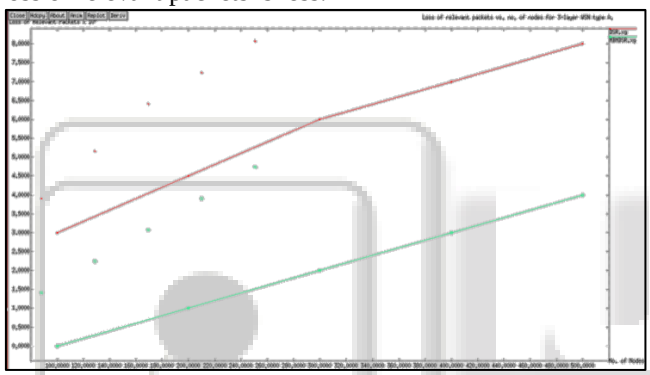

Fig. 2: loss of relevant packets vs number of nodes for three layer WSN

Figure 2 shows the loss of relevant packets vs number of nodes for three layer WSN. Loss of relevant packets is less in MBMDSR when compared to DSR. The graph depicts that loss of relevant packets is gradually decreasing with respect to increase in number of nodes in case of MBMDSR.

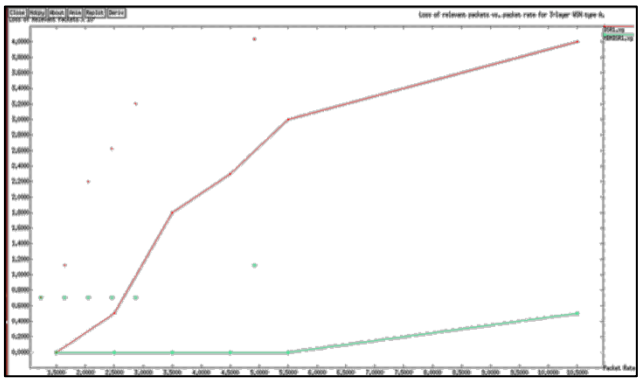

Fig. 3: loss of relevant packets vs packet rate for three layer WSN

Figure 3 shows the loss of relevant packets vs packet rate for three layer WSN. Loss of packets is more in case of DSR when compared to MBMDSR. The graph depicts that the loss of relevant packet is more in DSR protocol because when the packet is moved faster in a network, there is collision of packets in network which results in loss of packets. But when MBMDSR is considered it overcome with that problem as it is efficient during the fast movement of nodes

At the end overall conclusion is that MBMDSR is better than DSR protocol in terms of packet rate, loss of relevant packet and buffer size. The MBMDSR overcome major limitations of DSR protocol such as loss of relevant packets, it can be used in network were there are more number of nodes. It can be used during the fastest movement of nodes as it avoids the collision between the packets. It also helps in accommodating more number of packets and useful relevant packets. MBMDSR avoids the useful information to be lost. As the WSN has application in critical and important areas loss of important packets should be considered as major issues. The unwanted information can be dropped and useful information can be stored and utilized.

VII. Conclusion

- The main focus of the project is on routing protocols with respect to their performance in the wireless sensor network. And implementing the multilayer buffer management technique to one of the routing protocol is a step towards achieving a network with better Quality of Service.
- If node energy of one path is less than the threshold, packets are sent through the alternate path.
- MBMDSR protocol is efficient for large number of nodes.
- There is less chance for flooding the network which reduces the collusions between the packets.
- As the main buffer is divided into multiple buffers relevant data can be saved and successfully transferred to the destination. For MBMDSR drop of packets is less at destination side when compared to the existing DSR.
- At the end the conclusion is that by implementing the buffer management technique in DSR protocol it is possible to reduce the loss of relevant packets in WSN.
- The present work can be extended to design, develop routing protocol with new buffer management technique which can help to reduce the loss of relevant packets. As WSN has applications in critical areas where packet loss is major issue.

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