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A Review on Congestion Awareness Routing in WSN

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Abstract— Minimization of energy consumption and increase in the life- time of sensors is important part of the research in WSN also congestion control is a big problem nowadays. The standard TCP congestion control protocol cannot handle the special properties of a shared wireless multi-hop channel well. Also the frequent alterations of the network structure and the shared nature of the wireless channel pose significant challenges. Here, we present an overview over existing proposals, explain their ideas and show their interrelations. Congestion-Aware Routing (CAR) is introduced to achieve better delivery of the high priority packets in highly congested environment. But CAR drops all low priority data. Low-priority data also contains information that may be needed in future. So the low priority packets are also need to be transmitted and must be delivered.

Keywords: **A-CAR, CAR, M-CAR, WSN**

I. INTRODUCTION

A sensor network normally composes a wireless ad-hoc network, where every sensor supports a multi-hop routing algorithm. Congestion in network will lead to the following problems:

- Indiscriminate dropping of data. Some packets of high priority might be dropped while others of less priority are delivered.
- Cause an increase in energy consumption as links become saturated. Congestion may create the problem of dropping of data (i.e. Packets with high-priority (HP) may be dropped while low-priority (LP) packets are delivered). This congestion may also create the problem of raising energy consumption to route packets that will be dropped downstream as communication links become exhausted. As nodes along optimal routes are depleted of energy, only non-optimal routes remain, further compounding the problem. To guarantee that data with higher priority is received in the presence of congestion due to Lower Priority (LP) packets, differentiated service must be provided. Another prerequisite for sensor networks would be distributed processing capability. This is necessary because communication is a key consumer of energy. Sensor networks pose a number of unique technical challenges due to the following factors:
  - Adhoc deployment with unstructured distribution.
  - Self-reconfiguration and Unattended operation.
  - Dynamic changes due to expansion and node failure

The existing schemes detect congestion while considering all the data to be equally important. It is very much important to examine the data delivery issues in the presence of congestion. The data packets can be prioritized as High-Priority packets and Low-Priority packets.CAR discovers the congested zone of the network that is present between high-priority data sources and data sink and, using simple forwarding rules, dedicates this portion of the network to forwarding primarily high priority traffic. But CAR drops all low priority data. Low-priority data also holds data that may not be useful at that instance but helpful in future. In this case low priority packets are also to be transmitted. So the main objective is to derive a new congestion aware routing protocol for sensor networks to avoid loss of packets.

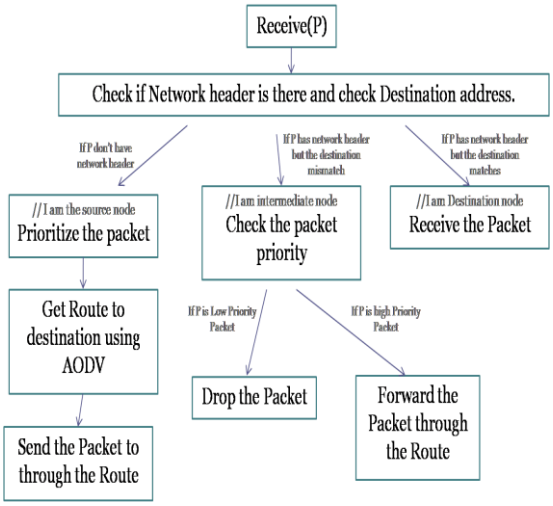

Fig 1 – Functional Flow of CAR

II. CONCEPT OF EXISTING CAR

CAR is a network-layer solution to provide differentiated service in congested sensor networks. CAR also prevents severe degradation of service to LP data by utilizing uncongested parts of the network. Here we connect the independent Nodes and assign the depth to all nodes and Assign all the nodes as Off *Conzone* . In this Nodes discover if they are on the *Conzone* by using the *Conzone discovery* mechanism. A *Conzone* must be then discovered from that neighborhood to the sink for the delivery of HP data. To do this, critical area nodes broadcast "*discover Conzone to sink*" (To Sink) messages. This message includes the ID of the source and its depth and is overheard by all neighbors. When a node hears more than Sink messages coming from its children, it marks itself as on *Conzone* and propagates a single To Sink message. Once the *Conzone* is discovered, HP data is routed in the *conzone*, and LP data is routed off the

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Conzone. LP data generated inside the *conzone* is routed out of the Congested Zone.

MAC-Enhanced Congestion Aware Routing

MCAR is primarily a MAC-layer mechanism used in conjunction with routing to provide mobile and lightweight canzone to address sensor networks with mobile HP data sources and/or bursts HP traffic. Compared to CAR, MCAR has a smaller overhead but degrades the performance of LP data more aggressively. We compare CAR and MCAR to an AODV scheme enhanced with priority queues (AODV+PQ). Both CAR and MCAR lead to a significant increase in the successful packet

Delivery ratio of HP data and a clear decrease in the average delivery delay compared to AODV+PQ. CAR and MCAR also provide low jitter. Moreover, they use energy more uniformly in the deployment and reduce the energy consumed in the nodes that lie on the Conzone, which leads to an increase in connectivity lifetime. In the presence of sufficient congestion, CAR also allows an appreciable amount of LP data to be delivered. We further show that, in the presence of mobile HP data sources, MCAR provides mobile Conzone, which follow the HP traffic.

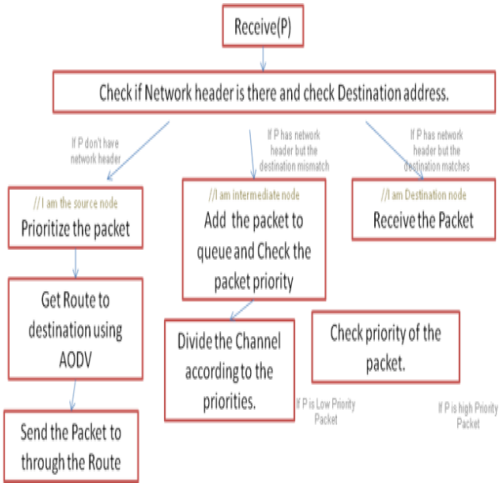

Fig 2 – Functional Flow of M-CAR

III. CHARACTERSTICS OF A-CAR

CAR is a network-layer solution to provide differentiated service in congested sensor networks. CAR also prevents severe degradation of service to LP data by utilizing uncongested parts of the network. Whenever a node has to transmit a packet to the destination, it prioritizes the packet. It sends a route request RREQ to find the best route to the destination. When an intermediate node receives a RREQ, it calculates the approximate congestion in the network surrounding. The congestion is calculated as the density of the packets passing through the node.

Advanced Congestion Aware Routing

In presence of congestion the High Priority data is forwarded through the congested but short route and the Low Priority data is routed in a less congested but long route by a **Route_Change** message intimated to source by the neighbor of congested node. Discovery of Conzone (congested zone) is very easy in this method. The request and acknowledgements traffic is reduced in this method.

IV. KEY PHASE OF A-CAR

In the proposed system (A-CAR) the data is differentiated as High Priority and Low Priority to make the delivery of the High Priority data delivery fast. In presence of congestion the High Priority data is forwarded through the congested nodes and the Low Priority data is routed in a less congested long route by a *Route_Change* message intimated to source by the neighbor of congested node. Discovery of Conzone (congested zone) is very easy in this method.

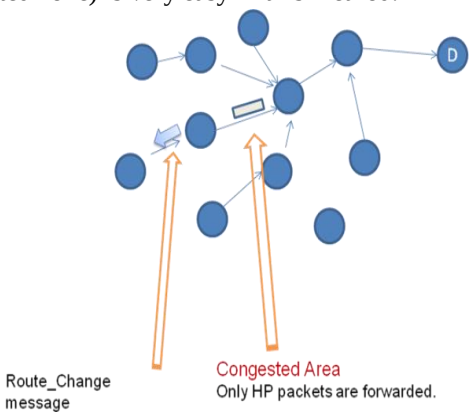

Fig 3 – ACAR: System Description

V. MERITS AND DEMERITS OF A-CAR

Advantages of A CAR

- Low Priority data delivery is assured to maximum extent.
- The burden on intermediate nodes is decreased for discovering Conzone (congested zone) which is overhead in existing system.
- The request and acknowledgements traffic is reduced in this method.

Demerits of A CAR

- The Low Priority data has to travel in long path which has less congestion, but in the long path all the sensor nodes has to be in active position which increases battery consumption.

VI. CONCLUSION

Along with HP packets, LP packets also contain information that may not be useful at the instance of time but may be helpful in future. Hence without the loss of QoS and the effect of the congestion, the packet delivery of both the HP packets and the LP packets is to be achieved. We proposed a new mechanism that achieves the packet delivery of the HP and LP packets by predicting the congestion in the network. The prediction of the congestion avoids the effect of congestion in the network and dropping of the LP packets.

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Thus the packet delivery is achieved without any compromise in QoS.

VII. FUTURE WORK

Early results encourage us to investigate toward the designed framework even further for optimization. For the future work, this area will investigate not only the congestion control in wireless sensor network but more on the other issues like security implementation in ACAR, extensive complex simulations could be carried out using other existing performance metrics, in order to gain a more in-depth performance analysis of the Congestion Aware routing protocols. Other new protocols performance could be studied too as well as implementation of the proposed protocol in real world scenario.

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