A Survey on Resourceful Estimation of Wireless Sensor Networks

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Abstract
The manufacturing of small and low cost sensors became technically and economically feasible due to recent technological advances. The sensing electronics measure ambient conditions related to the environment surrounding the sensor and convert them into an electric signal. To considerately pass their data through the network to a main location a wireless sensor network (WSN) consists of spatially dispersed autonomous sensors to supervise physical or environmental circumstances. Some or more important data's may be dropped if congestion occurs in the Wireless Network. By addressing differentiated delivery requirements we handle this problem in our paper. Based on the congested areas of a network and data priority a class of algorithms is proposed in our paper to enforce differentiated routing. Using simple forwarding rules a basic protocol, called Congestion-Aware Routing (CAR) discovers the congested zone of the network that exists between high-priority data sources and the data sink and dedicates this part of the network to forwarding mainly high-priority traffic. It is unsuitable for highly mobile data sources since CAR requires some overhead for establishing the high-priority routing zone. For forming high priority paths on the fly for each burst of data, we define Mac-Enhanced Congestion Aware Routing (MCAR), which includes medium-access control (MAC) -layer enhancements and a protocol. MCAR efficiently handles the mobility of high-priority data sources, at the outflow of debasing the performance of low-priority traffic.

Keywords
Wireless Sensor Networks, Congestion Aware Routing, MCAR, Data Priority Traffic, Sensors, Data Sink

I. Introduction

In many applications that require unattended operations have a large number of these disposable sensors can be networked [1] [2]. A Wireless Sensor Network (WSN) contains hundreds or thousands of these sensor nodes [4]. To an external Base-Station (BS) these sensors have the ability to communicate
either among each other or directly. With greater accuracy a larger number of sensors allows for sensing over larger geographical regions [3, 5]. Basically, each sensor node comprises sensing, dispensation, diffusion, mobilizer, position ending system, and power units [6]. The sensor nodes are deployed as they are usually scattered in a sensor field. To produce high-quality information about the physical environment, the sensor nodes coordinate among themselves.

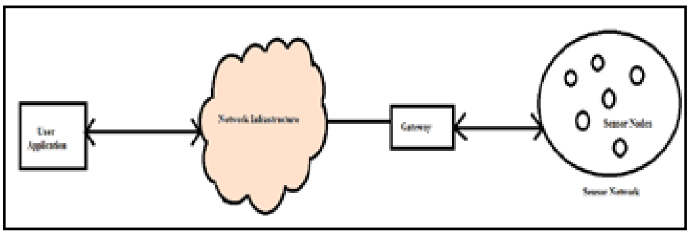

Fig. 1: Architecture of Wireless Sensor Networks

To an external base station, each of these scattered sensor nodes has the capability to collect and route data either to other sensors or back. To an existing communications infrastructure a user can have access to the reported data and a base-station which may be a fixed node or a mobile node capable of connecting the sensor network which is shown in fig 1. On the efficiency of many military and civil applications networking unattended sensor nodes may have profound effect. Deployment of a sensor network in these applications can be in random fashion or can be planted manually (e.g., alarm sensors in a facility). In Mac-Enhanced Congestion Aware Routing (MCAR), each node in the network can be in one of three states, dictating whether it is a part of the con-zone or not or within the communication range of the con-zone. This last mode creates a shadow area that separates High Priority (HP) traffic from Low priority (LP) traffic. The con-zone is formed when one area is generating HP data. Refer to this area as the critical area. This con-zone discovery is done dynamically and during the lifetime of the deployment the critical area is changed, and is triggered when an area starts generating HP data. The con-zone can be discovered and destroyed either from the critical area nodes to the sink or vice versa. In this case, critical area nodes detect an event that triggers discovery. For the delivery of HP data a con-zone must be then discovered from that neighborhood to the sink. To do this, critical area nodes broadcast "discover con-zone to sink" (To Sink) messages.

II. Functions of Congestion Aware Routing

Congestion aware routing includes three steps such as (1) HP network formation, (2) Conzone discovery and (3) Differentiated routing. The grouping of these utility makes the section of the system into on-conzone and off-conzone nodes. Only HP network traffic can be routed by on-conzone nodes. The procedure specially provides accommodation for LP traffic, even though having less competent routes than HP traffic. Imagine that there is one High Priority (HP) sink and an adjacent part of the network which produce HP information in the occurrence of network wide backdrop Low Priority (LP) traffic. Nodes are place conscious and compactly organized with uniform allocation because nodes in the situation send all the information of HP to a solitary sink, tree-based routing, with the suitable HP sink being the root. The tree-based routing systems undergo from congestion, in particular if the messages producing at the leaves is elevated.

III. Routing Techniques

The grouping of these functions segments the network into on-con-zone and off-con-zone nodes and only HP traffic is routed by on-con-zone nodes. The protocol specifically accommodates LP traffic with less efficient routes than HP traffic. For the purposes of this discussion, assume that there is one HP sink and a contiguous part of the network (critical area) that generates HP data in the presence of network wide background LP traffic. Nodes are location aware and densely deployed with uniform distribution. With the HP sink being the root which is more appropriate since nodes in the scenario send all HP data to a single sink, tree-based routing. If the number of messages generated at the leaves is high then the tree-based routing schemes suffer from congestion. When a mixture of LP and HP traffic travel through the network this problem becomes even worse. Therefore, from the critical area to the HP sink the background noise created by LP traffic will create a con-zone that spans the network when the rate of HP data is relatively low. The service provided to HP data may corrupt, as the HP data due to congestion is isolating the sink from the critical area and nodes within this area may expire sooner than others, leading to only suboptimal paths being presented. The HP data collection center initiates the process of building the High priority routing network (HiNet) after the deployment of sensor nodes. The sink will usually have no information on the whereabouts of the critical area nodes because at the time of deployment this network covers all nodes. Different nodes may constitute the critical area based on the locations of events that can occur during the lifetime of the network. The HiNet is based on a minimum distance spanning tree rooted at the sink since all HP data is destined to a single sink and this structure ensures that all nodes have shortest path routes to the sink. A node that has various neighbors with lowest point less than its own considers them all as parents. By providing load balancing and making the routing network more resilient to failures and influence this property to support multipath forwarding. It broadcasts a “Build HiNet” message asking all nodes in the network to organize as a graph once the sink discovers its neighbors. It checks if it has already joined the HiNet once a neighboring node hears this message; if not, sets the source of the message as a parent and it sets its depth to one plus the depth in the message receive.

IV. Results

By using simple forwarding rules a basic protocol called Congestion-Aware Routing (CAR) is proposed so that it uses data organization. To better serve HP data, on-con-zone nodes prevent forwarding any LP data. We render inoperative generating and forwarding of LP data in all nodes that are within the communication range of any significant area node.

V. Conclusion

In the presence of congestion in wireless sensor networks we have addressed data delivery issues in this paper. A differentiated routing protocol called CAR which uses data prioritization is proposed here. For static networks with long-duration HP floods CAR is better suited. In this paper, we proposed MCAR, which deals with mobility and dynamics in the sources of HP data. In the presence of congestion both CAR and MCAR support effective HP data delivery. Traffic and/or mobile HP sources for HP MCAR are a better fit. On-con-zone nodes stop generating or forwarding any LP data to better serve HP data and we call this enhancement as CAR+. The communication range of any critical area node is disabled by generating and forwarding of LP data in all nodes. Once a node discovers that one of its neighbors is on the significant area then it disables generating and forwarding of any LP data, since nodes know their neighbors and their status and we call this enhancement CAR++.

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