



Data Impel scheme for directing nodes in WSNs

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Abstract. *The urging Wireless sensor network (WSN) is dominating all kind of communications, in which offers the numerous tiny nodes formed together even in un-tethered environment application. Keen monitoring and co-operative communication knot the environment with real-time world. WSN collects the large volume further forward it to the sink via various intermediary. It behaves accurate response, when erratic divergence occurs in the settings. Directing huge volume of data in the routing path affects key strength of the network. Many of the existing schemes focused on link level congestion. We propose data impelling scheme, which addresses the congestion free environment in node level. Once congestion notification bit is set, a new data buffer raises near congested point. After its activation, all the exceeding amount of data are re-directed to the data buffer and retrieved back in need. Further CN bit is cleared. Our scheme is not consuming too much of energy of new data buffers and resources. It annotates that nodes are intended for working for long time without human intervention. Further our scheme is concentrating on congestion free critical environmental applications, otherwise which severely decrease the performance of the network.*

Keywords: *data impel; Congestion Control; Node level congestion; sink.*

1. INTRODUCTION

wireless sensor Networks have been rising greatly in various applications like environmental sensing , industrial monitoring and bio-informatics, agriculture etc. Wireless sensor networks assured enormous of sensor nodes, which consist components like sensing, processing and communicating [1]. A node can be deployed anywhere in the field called sensing field [2]. The nodes may or may not close to the sink, similarly the locality of the nodes are neither pre-planned nor fixed. The vicinity nodes also are deployed randomly. The main advantage of sensor node is, instead of sending unprocessed data; they do simple calculation, handle computing and send the precise data. The theme is transmission consist necessary data. Similarly adding and removing of nodes is done without human. The highly distributed network consists of small and light weighted nodes. The size of the network is not predictable because huge number of nodes is deployed in self-organizing natured network. WSN is self-organizing network, since it maintains nodes in hundreds and thousands, which are self-healable too. WSN chooses broadcast, instead of point to point communication in order to stay alive long time. The nodes are sprinkled into the field simultaneously and they gather bulk amount of data and propel it back to the sink. The wireless sensor nodes are more prone to failure and energy drained. Generally they are self-battery powered and they have capability of self-organizing. The nodes are also self-configurable and they form an autonomous setup to establish the infrastructure less network. The network is, “query based addressing” and data centric too. All the information passed is data-centric basis only. Basically it consists three parts such as sensing, processing and communication. They are on board processing with sensing capabilities [5]. In many of the applications, less cost sensors are used and placed in the unattended region [3]. The routing scheme is the main challenge in the distributed and infrastructure less wireless sensor network. The ad-hoc network protocols are not applicable [4], since the sensor network large scalable in nature. The topology also irregular since it is altering its structure animatedly. The traffic in WSNs is the source of the congestion. Late research activities are not well addressed in the area of decent data rate. But it is possible to attain the reasonable rate for each flow in communication. Congestion in WSNs has negative impacts on network performance and application objective, i.e., packet loss, increased packet delay, node energy wastage and severe reliability degradation. Gradual decrement in performance affects the large portion of the effective communication. Congestion plays the negative role and makes the nodes to misbehave along the communication path [11]. Each node in the network exchanges its data with neighboring nodes. Once the congestion is detected congestion notification bit is set, then the packets are re-directed and retrieved back with the help of awakened data-buffer.

The remaining part of this paper is continued with related works, models and problems, proposed scheme, evaluation and finally the conclusion.

2. RELATED WORKS

In the literature, survey works have been conducted on congestion detection, congestion control and communication models in WSNs.

When congestion occurs, the source and destination fail to communicate properly with each other. Generally the nodes have two options such as keep or drop the packets. But a congested node always drops the packet after overflow of the message queue. There are two categories in dropping the packets. EDCAM in WSNs [2] allocates the multiple queue,

they are used for storing the sequential information. But they are not leveling or controlling any type of congestion in the node. Recently many congestion controlling techniques have been introduced.

The congestion can be detected easily by checking queue occupancy and channel occupancy. Mitigating Congestion in Wireless Sensor Networks (Bret Hull in 2004) used hop by hop congestion control and network level congestion control. But the fairness of the network is under progress and performance comparison is left out for future work. On The Interdependence of Congestion and Contention In Wireless Sensor Networks (Mehmet C. Vuran Vehbi C in 2004) investigated widely about congestion in wireless sensor networks and their experiment result says interaction between the nodes directly affects the performance. The interaction among the nodes only determines the well-established communication. They strongly recommending buffer size are to be very small; it is not useful for loading and storing more data in the unattended environment.

3. MODELS AND PROBLEMS IN COMMUNICATION

3.1 Locality

Wireless sensor nodes are scattered randomly within the region. The location of near-by nodes, topology of the network and size are not determined since their position is not predicted earlier. They have sensing capability to measure the abnormal variations. Each node is not only transmitting its own data it also receives data using transceiver unit [6]. So the Node placement is main factor for determining the congestion free environment. The wireless medium is distributed in order to communicate with neighbor nodes [8]. If all the nodes are located very close or sensing field of sink, then propelling the packet among the intermediary will not need. Usually the sink has been placed anywhere in the network [7]. The intermediate nodes result the path more congested, when they are looking for propelling excessive packets than their capacity [2].

3.2 Sink's identity

The access point or the sink is taking vital role in the wireless sensor network and it acts as the gateway to link the outside world. The transceiver unit connecting a node to the network, if it fails the node starts to misbehave [12]. The Access point is recursively doing reception and transmission of all the packets to outside world. Source node has to find locality of sink by choosing broadcasting [10].

3.3 Traffic detection

Situation which stands behind congestion is, when the node seeks to onward the more packets than their capacity. Once the node could not able to detect neighbor node, it is the simple indication for congestion [11]. Some of the reasons are addressed for not able to detect next node below, Node may be out of range, Failure/damage of hardware and Energy drained. After congestion detection, the Congestion notification bit is set in the packet format. The quality of the service in the network is ruined because congestion. And yet broadcast the packet to find out the sink properly. For this process the intermediate nodes should forward the packets among them towards sink.

4. DATA IMPEL SCHEME DESCRIPTION

4.1 CN Bit configuration:

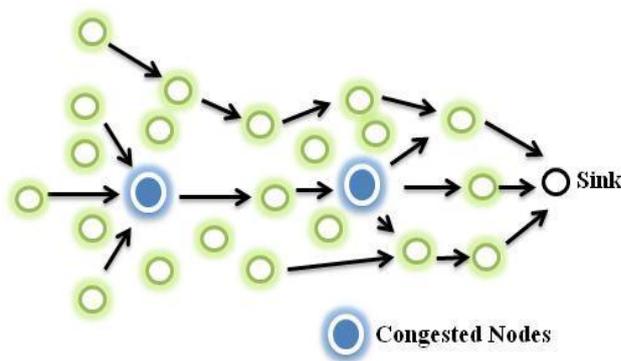


Figure 2 Logic scheme for packet dropping

The above logic illustrates 2 kinds of situations like one to many and many to one. This is popularly known as funneling effect. In first case, some of the packets are distorted or dropped while intermediate nodes are promoting excessive data than their power. In second case, many nodes try to seize same channel concurrently called link collision, which leads to channel contamination further results badly busy in the channel.

4.2 Node's Behavior

From the source node to sink, there may be numerous hops. The data are passed through the multi hop with the following possible constraints.

- ✓ Interference in transmission medium.

- ✓ Damaged internals in hardware.
- ✓ Weak in Energy.
- ✓ Runtime change in topology.
- ✓ Nature of fault tolerance.

Fault tolerance gives the ability to endure the entire functionalities without any disruption. If the node meets any of the above constraints, it starts to misbehave.

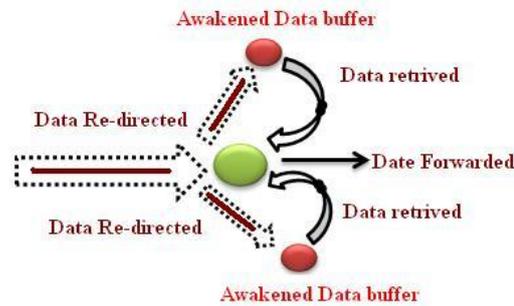


Figure 1 Data impel model

The algorithm illustrates that,

1. Every sensor node has its own CN bit format, and its status is continuously listened.
2. Check the near-by data buffer.
3. If the CN bit status is set to 1, then awaken the new data buffer further re-direct the data.
4. Else directly forward the packet to node itself.
5. On the other hand Re-directed data can be retrieved back in need and then clear the CN bit status.
6. Continue the algorithm recursively.

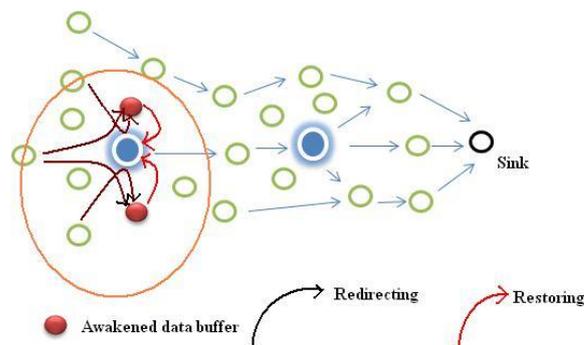


Figure 2 Overall views in communications

4.3 Data-buffer's capacity:

Data-buffer receiving the packets from the nodes, and it is stored in its local queue. The circular queue is for storing the incoming data and loading the data for transmission. There is no need of processing the incoming data. If the incoming rate is slow, the path becomes free. If the incoming rate is too fast, the node fails to process the data properly and so re-directing to it.

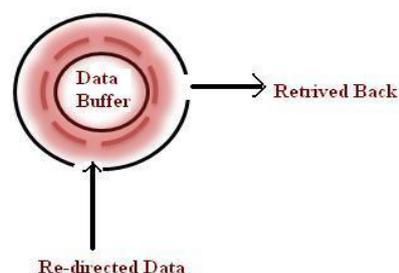


Figure 3 Actuated Data-buffer

4.4 Control flow of the data impel

The IEEE 802.15.4 is the popularly accepted standard for wireless sensor networks. Node's capacity determines the geographical location of the node in the system. It specifies the multiple data rates and multiple transmission frequencies widely used in the wireless sensor networks. The above figure indicates packet overflow, when nodes are trying more than its capacity. In order to avoid the overload in the communication, the propagations are accomplished the transmission frequencies in the range of 868 MHz, 902-928 MHz and 2.48-2.5 GHz.

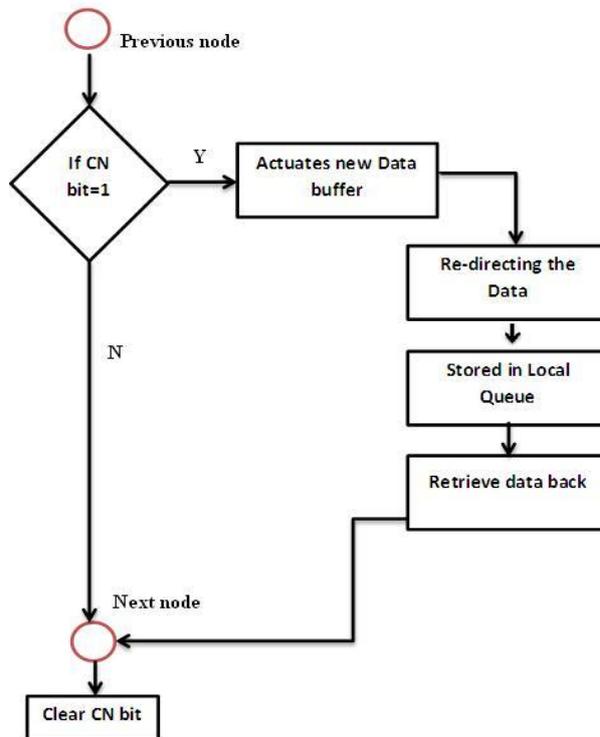


Figure 4 Flow diagram of data impel scheme

5. PERFORMANCE VALUATION

5.1 Performance metrics

Vicinity of the sink fails only they run out of energy. The traditional technique applied for congestion control is back-pressure which fails because there the node has to collect new data then they start to drop previously stored data. In order to regulate the amount of data we propose impel data scheme [9]. The source node emits the data packet at some specific constant bit rate (CBR), but the node that receives the packet is not equal to rate which is forwarded to it.

Some of the consequences to produce the best performance from the network are

- Save the resources like node's energy.
- Increase the efficiency/throughput of the communication through obtaining congestion free network.
- Be sure that the node's buffer size is adequate to hold all the packets.
- Reducing the end-end delay in the packet delivery. The re-directed data are stored in the buffer like circular-queue manner.

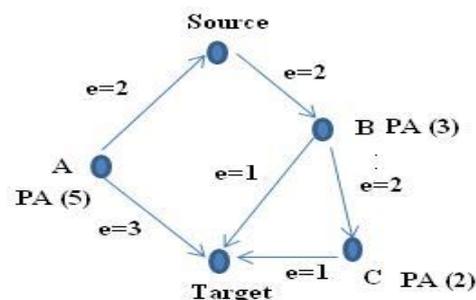


Figure 5 Efficient routing paths

Route1: S-A-T Route2: S-B-T Route: S-B-C-T is shown in above figure. The total power available and energy required are calculated. Route1:- PA=5 & e=5, Route2:- PA=3& e=3, Route3:- PA=5 and e=5. From this we conclude that Route 2 is best for disseminating data since high power available and minimum energy required.

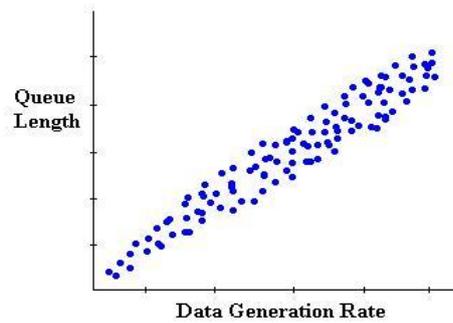


Figure 6 Data Rate Vs Queue Length

Let us conclude with the condition that the nodes are not even spending much energy for this scheme and congestion is controlled at node level in order to obtain the throughput effectively. In the formal methods packet dropping is noted and compared with data propelling scheme. The graph indicates both the situations, when node meets formal parameters configuration and our proposed parameter configurations. Node level congestion is in control and no misbehaving node is taking place.

6. Conclusion

We have estimated this scheme to normalize the amount of data among the intermediate node and control congestion in node level itself in the WSNs. It achieves reasonable data rate and strike than previous results. The simulation results the produces the packet delivery ratio, packet dropping and resource saving much better. The proposal becomes trustworthy for avoiding packet loss when a node is load full during data transmission and reception. In order to achieve a fair rate along the communication path, this scheme is opted. It alleviates congestion less environment at node level, particularly among intermediate nodes.

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