

Analysis of WSN based Congestion Control mechanism using With PDNC and Without PDNC paradigm

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ABSTRACT: In the Wireless Sensor Network (WSN), nodes are used to observe the surroundings like temperature, humidity, pressure, position, vibration, sound etc. The Quality-of-Service (QoS) is an important issue in order to ensure its effectiveness and robustness. Besides its undoubtedly services and contributions in monitoring systems, WSN's limited resources can severely degrade the QoS in applications. Congestion in WSN will further reduce the expected QoS of the associated applications. In this case, efficient use of the scarce resources is important to ensure seamless data transmission. The power consumption of a sensor node can be reduced by reducing the rate of packet retransmission which is caused by congestion. In this paper, a selective packet discarding method which is known as Packet Discarding based Node Clustering (PDNC) is introduced. All nodes deployed in the targeted area will be clustered into several groups and a cluster head will be selected at a time. The packet discarding process will then be carried at each node to reduce the number of packets contributing to congestion.

KEYWORDS: Congestion control, Packet Discarding, Wireless Sensor Network

I. INTRODUCTION

Wireless Sensor Network (WSN) is one of the paradigms of sensors ranging from hundreds or even thousands of knots to one destination area. It is used to provide continuous remote control supervisory services, targeting operations in limited places where the participation of the human being it might be risky [5]. The idea behind this distribution is normally collect important information about the occurrence of certain event for some applications. WSN uses a many - to-one centric approach where nodes can cooperate communication with each other to transfer the detected data towards a receiving node [7]. However, each sensor node in WSN has very limited resources, apart from producing a large amount of data. The congestion problem is formulated as an optimization problem and selective packet discarding is used to overcome the congestion problem. The scope of the research is focusing on Selective Packet Discarding (SPD) to solve congestion in WSN. In SPD, the data with size larger than 60 bytes and data with 0 Time-To-Live (TTL) will be discarded.

1) Congestion:: Data packets are forwarded from the source to the destination via routers and routers store the packets in buffers. Due to over pumping of packets, these buffers overflow which leads to packet loss. This can delay the delivery of other network packets. This phenomenon is called congestion [8].

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II. OBJECTIVES

1) Selective Packet Discarding (SPD):

SPD is that mechanism that processes the information as level wise on the Router Processor (RP). The main purpose of SPD is to give the priority to routing protocol and some other traffic activities are kept live between the times of process level queue congestion.

2) Time-To-Live (TTL):

Time to live (TTL) is utilized for PC information including DNS servers. It is the only time on the timeframe or number of emphases or transmissions in PC and PC organize innovation that units of information (e.g. a packet) can involve before it ought to be disposed of.

III. REVIEW OF LITERATURE

Nurul Hamimi Bt H., Naimah Bt Y., Azmi Bin Awang Md I [1]. Congestion control refers to the techniques used to control or prevent congestion. A state occurring in network layer when the message traffic is so heavy that it slows down network response time.

Sridevi, S., Usha, M., Lithurin, G.P.A. [2]. In this document we propose a priority congestion control based on heterogeneous traffic in wireless network of multiple paths. The proposal protocol allocates bandwidth proportional to many applications running at the same time in sensor nodes. Each path of the sensor node is right data as well as data generated by another and nodes. The primary node of each sensor node assigns bandwidth according to priority of source traffic and priority of heterogeneous data transit traffic applications in the secondary nodes. Congestion is detected based on the service and congestion ratio notification is implied.

Vyas, G.S., Deshpande, V.S. [3]. In our congestion of the proposed mechanisms, it is reduced by the use of the 4 knots near the sink and after they are overloaded to control increasing the PDR again and is reduced. Then we can increase the number of knots near the 4th sink to improve network performance and even then if we can increase the number of washbasins will add more overhead and is waste of resources.

IV. PROBLEM STATEMENT

A. Problem Statement:

The problem is when packets are in the process, each sensor node in WSN has very limited resources apart from producing large amount of data.

B. Statement Scope

The scope of the project is focusing on Selective Packet Discarding (SPD) to solve congestion in WSN. In SPD, the data with size larger than 60 bytes and data with 0 Time-To-Live (TTL) will be discarded.

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N. Yaakob, M. Atiquzzaman and I. Khalil [4]. The study proposes a new technique to mitigate congestion by deliberately discarding some of the less important packages give enough space to pass the most important. The proposed policy of refusal is integrated with a multi objective optimization (MOO) that can optimize multiple targets simultaneously.

Marques and M. Ricardo [5]. This document proposes a wizard application RPL extension that allows you to increase the WSN life span by limiting routing and forwarding functions the network mainly to the nodes that run the same application. Because nodes can join a network at an unpredictable time, must be synchronized with respect to their application work cycles. Therefore, knots should wake up and sleep a synchronized form. This document also proposes these synchronization mechanisms.

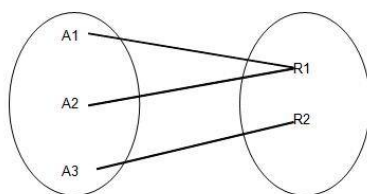
Y. Wang, C. Qian and X. Liu [6]. Two compensation algorithms are proposed in this work for WSN with packet defect. The partial and impartial the compensation algorithms are added with consensus DKF algorithm to design new filters that are effective to fix the general problem of loss of bundled tracking in WSNs.

Hussain, F.B., Seckin, G., Cebi, Y. [7]. In this article we present a new one congestion control scheme based on the delivery of hop-by-hop packages time and buffer size. The new congestion control scheme is located in the level and uses a TDMA-like mechanism to optimize adjust the speed of event reports.

K. Kaushal, T. Kaur and J. Kaur [8]. TCP and UDP, Standard Transport Layer Protocols, are not suitable for WSN for many reasons as; TCP has low performance and, on the other hand, UDP is unreliable. There are three types of existing transport level protocols; protocols that only provide reliability, protocols providing only congestion control, and protocols that provide congestion reliability and control. Two types are presented in this paper.

V. MATHEMATICAL MODEL

A. Mapping Diagram:



Where,

A1: 1 Source and 1 Destination I P address

A2: another source communication with same IP

R1: Same source and different Destination IP

INPUT:

Identify the inputs as number of nodes

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$F = \{f_1, f_2, f_3, \dots, f_n\}$ as set of functions to execute to
routing model}

$I = \{i_1, i_2, i_3, \dots, i_j\}$ sets of inputs to number of nodes /
sensors}

$O = \{o_1, o_2, o_3, \dots, o_j\}$ Set of outputs from the function sets}

$S = \{I, F, O\}$

$I = \{\text{Number of nodes}\}$

$O = \{\text{Shortest routing path for multi hop protocol}\}$ $F = \{\text{Shortest Path algorithm, SPD, TTL, PDNC}\}$

Space Complexity:

The space complexity depends on Presentation and visualization of discovered patterns. More the storage of data more is the space complexity.

Time Complexity:

Check No. of patterns available in the datasets= n If (n>1) then retrieving of information can be time consuming. So the time complexity of this algorithm is O. Failures and Success conditions

Failures:

1. Network failure
2. Hardware failure.
3. Software failure.

Success:

1. Get Proper information of application.
2. Maintain the congestion of nodes.

- 5) If V NOT S
- 6) Dist [V] <- infinite
- 7) Previous [V] <- NULL
- 8) ADD V to Q — if we choose the Q as a Priority Queue, extracting minimum will be easy.
- 9) While Q IS NOT EMPTY
- 10) U <- Extract MIN from Q
- 11) For each unvisited neighbor V of U
- 12) tempDist <- dist[U] + edge_weight(U, V)
- 13) If tempDist < dist[V]
- 14) Dist [V] <- tempDist
- 15) Previous [V] <- U
- 16) Return dist [], previous []

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VI. SYSTEM ARCHITECTURE / SYSTEM OVERVIEW

In proposed system one of the techniques for congestion control in WSN is Selective Packet Discarding which is used for removed unwanted packets from communication. In proposed system we are using RCP protocol for congestion control in wireless networking. RCP-CA controls traffic three different ways: a) to qualify Control. Establish a target flow-rate, such as CPR; b) Acceleration control. Limit to the acceleration (increase in flow-rate); and c) feedback control. The first aim is to reduce the number of packet loss during the transmission. Our subsequent target is to minimize the number of retransmissions to reduce the cost, energy and the corresponding response time.

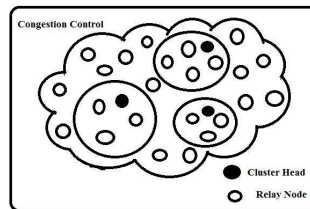


Fig. 1. Block Diagram of Proposed System

A. Software Requirement and Specification

Software requirements specification provides an overview of all softwares used in project which used the operating system i.e. windows 7,8,10. The Language used for implementation is java which required the JDK (Java SE Development kit) .JDK have many versions such as the 1.2, 1.3 and up to 1.7. Platform which used JDK is eclipse, eclipse have lots of versions.

VII. ALGORITHM

A. Shortest Path Algorithm

Steps:

- 1) Function $dijkstra(G, S)$
- 2) $Dist [source] \leftarrow 0$
- 3) $Previous [source] \leftarrow NULL$
- 4) For each vertex V in G

The outer loop runs for $|V|$ times the inner loop runs for $|V-1|$ times for a complete graph as each vertex has $|V-1|$ edges. For each iteration of the inner loop we do an $extractMin$ and a $reduceKey$ operation for the vertex. Hence the total running time has an upper bound of $O(|V| * |V-1|)$. This is the upper bound, $O(jV j^2)$

Point worth noting is that the complexity will actually depend on the implementation of the data structure which is used as the Queue.

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B. Packet Discarding:

If in the system memory space is not enough for reconstruct that packets to store the packets then the packets will be discarded. In that system each node can discard the packets. Every node sends the packet to another node. The main goal of packet discarding is that reduce the number of packets sent to cluster head. Packets are discarded based on the size of packet and TTL (Time to live).

Input: Packets, size and TTL of packet

Output: Packet Discards successfully if they are in that situation otherwise transfer successfully.

Steps:

- 1) If size < 60 bytes then
- 2) Packet = ACCEPT! ;
- 3) Else
- 4) Packet = DROP! ;
- 5) If TTL > 0 then
- 6) Packet = ACCEPT! ;
- 7) Else
- 8) Packet = DROP! ;

VIII. EXPERIMENT RESULT

A. Result

In the result analysis of proposed system describe two methods like 1) Packet loss Percentage and 2) End-to-end delay as below,

1) Packet Loss Percentage:-

In this, it measure two parameters that are number of cluster head and the packet loss percentage without PDNC and with PDNC. In the previous system PDNC is not used and that's why packet loss percentage is more than proposed system.

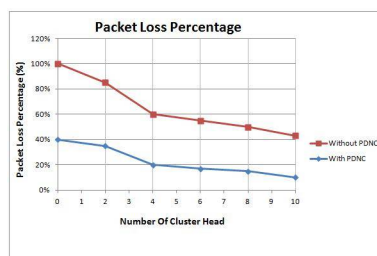


Fig. 2. Graph for packet loss in percentage

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TABLE I

PARAMETER VALUES WITH PDNC AND WITHOUT PDNC

With PDNC	Without PDNC
40%	60%
35%	50%
20%	40%
17%	38%
15%	35%
10%	33%

TABLE II

DELAY VALUES WITH PDNC AND WITHOUT PDNC

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PDNC No PDNC

500	1000
300	800
1500	2000

1700 2200

2000 2500

B. Comparison with Similar System

In this system, it compares the energy of node to other node. Packet Discarding based on Node Clustering (PDNC) gives lower percentage of packet loss and lower end-to-end delay compared to original method.

IX. CONCLUSION

Congestion in WSN happens when the movement of loads surpass the accessible limit anytime in the system. The bigger the quantity of information sends, the higher the likelihood for clog to happen. The impact of blockage can be seen by the debasement in the general quality and the expansion in the bundle misfortune rates prompting parcel drops,

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support postponement and increment the utilization of vitality in the hubs. Worried with this issue, Packet Discarding in view of Node Clustering (PDNC) is acquainted with understanding the issue of parcels overpowering at the constrained cradle condition. The hubs are partitioned into groups keeping in mind the end goal to diminish movement loads. Hub bunching can decrease the quantity of parcel misfortune and in addition the vitality utilization. PDNC do control the clog in WSN by disposing of the parcels in light of the size and TTL. PDNC gives bring down level of bundle misfortune and lower end-to-end postpone contrasted with unique technique.

X. FUTURE SCOPE

2) End-to-end Delay

In this, it measures two parameters are number of cluster head and the end-to-end delay without PDNC and with PDNC. It means delay of packet between sending. In the previous system PDNC is not used and that's why delay is more than proposed system.

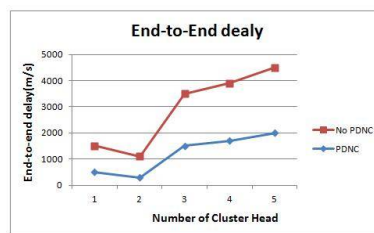


Fig. 3. Graph for end-to-end delay

In the future work, check for trade off between efficiency, delay, fairness and coverage. And can also provide the security to the packets using some algorithms.

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