Advanced Amalgamation Technique for Congestion Control in WSN with Improved Efficiency

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Abstract— As applications in Wireless Sensor Networks (WSNs) are evolving, congestion control remains an open and, in several cases, a critical problem. A lot of research has been performed on this issue and two general approaches seem to be the most prominent for its solution: traffic control and resource control. Each of these two methods present specific advantages and disadvantages under different scenarios. In this paper we present HRTC, Efficient HRTC the basic design of HRTC is based on the fact that the conditions in WSNs are possible to change then and there. It is possible for a densely deployed network to initially exist, but after some time this to transform into a network full of routing holes or disconnected parts either due to network issues, like heavy traffic. In either case, the target of this work is to find a solution that maximizes the efficiency of the network in terms of throughput and lifetime, using effectively the available network resources. The application this congestion control methods is to reduce the congestion completely. Hence, we propose a hybrid algorithm that aims to exhibit only the positive advantage of both individual methods. In this algorithm, when a node faces congestion, it attempts to inform the source node from which it receives packets with the lowest data rate, to suppress its data rate. To achieve this, it transmits a BPM to the source. We choose to limit the transmission of the source node with the lowest data rate because we prefer to keep serving the nodes with higher data rate(s) in order to affect throughput the least. When BPM receives the source node it lower its data rate. In this paper there are three algorithms called traffic control (TC), resource control (RC) and advanced hybrid technique. These three parameters/ algorithms are used to control congestion in a wireless sensor networks.

Key words: wireless sensors networks, congestion control

I. INTRODUCTION

Congestion is a big problem that affects almost all type of networks. Especially those wireless sensors network that has low power and unreliable. Congestion also situated in communication network in which many pockets are presents in part of subnet and performance degrades. The main reason to occur congestion is, load on the network is more than the capacity of the network. Congestion occurs if the node or link carries so much of data pockets or more than its capacity. The occurrence of the congestion will affect not only the performance of the network it also affect throughput of the network. Congestion increases the delay and loss of data rate.. Congestion can lead to blocking to new connections. Currently, after many researches I came with some parameters as a solution to congestion in wireless sensors network are: Traffic control (TC) and Resource control (RC).

From last few years Traffic control method is used by the majority of congestion control algorithms in WSNs. The algorithm that employs this method is used to reduce the data rate of source till congestion controlled or lessened. In other hand Resource control method, this algorithm is used to avoid the congestion region. In this method, algorithm chooses redundant nodes on the field and create alternative path to reach destination avoiding congested area. These both methods have advantages as well as disadvantages in different fields and different conditions. Consider TC method, this algorithm is efficient than RC in cases like transient congestion and where network is widely apart deployed nodes. On the other hand RC method, this method has good attitude than TC like throughput and power consumption. Only disadvantage of this method is, this can be employed where alternate paths can be created.

The survey on this project show, if we apply RC, the throughput of sink is higher and there is more balanced energy consumption in the network. In reversed manner, there is an increment in pocket delay from source to destination since the pockets needs to bypass from the congested node which is also a part of shortest path from source to sink node using alternate paths. We use TC method where the lifetime of the network is degrades like heavy data load exists and congestion control.

In this project I present AHRTC, this is advanced algorithm that gives complete solution to the congestion problem in wireless sensor networks. In this work we are giving knowledge to the node. Node will decide that which parameter should be applied. At the same time it checks for congestion and apply for traffic and resource control to source nodes. Source node applies for TC algorithm and checks for congestion. If congestion is there it will apply traffic control action and alternatively it checks for alternate path so that it can apply for resource control algorithm. This technique provide congestion free network and improves the quality of service (QoS) of the network.

II. PROPOSED METHODOLOGY

The chapter contains the information on the project and results of the project. Complete working procedure is explained in this section and the snap shots of the output has been taken and shown.The snap shots of output show the efficient throughput.

A. Flowchart

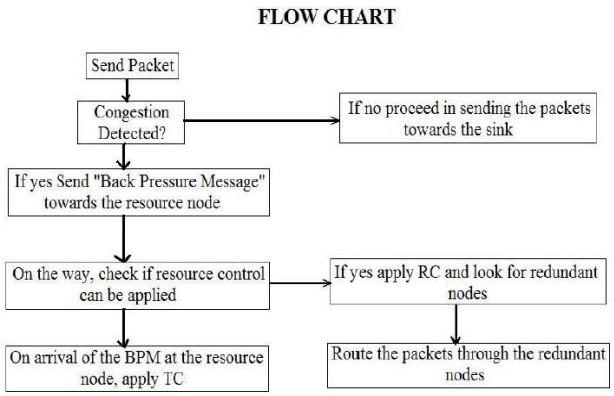


Fig. 1: Flow Chart

The flowchart of the system is shown in above figure. We need to send data from source node to sink node. First, pockets checks congestion at intermediate node, if no congestion then proceeds to send pockets towards sink node. If congestion detected then intermediate node sends back pressure message to source node. Then source node reduces its data rate so that it can reduce congestion. But this increase delay of sending data. So it will check for alternate path to apply resource control. By this action we can send data pockets efficiently.

B. Working

Efficient HRTC the basic design of HRTC is based on the fact that the conditions in WSNs are possible to change then and there. It is possible for a densely deployed network to initially exist, but after some time this to transform into a network full of routing holes or disconnected parts either due to network issues, like heavy traffic. In either case, the target of this work is to find a solution that maximizes the efficiency of the network in terms of throughput and lifetime, using effectively the available network resources. The application this congestion control methods is to reduce the congestion completely. Hence, we propose a hybrid algorithm that aims to exhibit only the positive advantage of both individual methods. In this algorithm, when a node faces congestion, it attempts to inform the source node from which it receives packets with the lowest data rate, to suppress its data rate. To achieve this, it transmits a BPM to the source. We choose to limit the transmission of the source node with the lowest data rate because we prefer to keep serving the nodes with higher data rate(s) in order to affect throughput the least. When BPM receives the source node it lower its data rate.

In this paper there are three algorithms called traffic control (TC), resource control (RC) and advanced hybrid technique. These three parameters/ algorithms are used to control congestion in a wireless sensor networks.

In traffic control there is a bottle neck node which is used to transfer data packets from source nodes to the destination nodes. Bottle neck node is a point where we check the congestion. If congestion occurs at bottle neck node it will send a back pressure message to the source nodes so that source node should reduce its data rate to avoid congestion. This causes a delay and loss of data.

Resource control technique uses source nodes to send the data to the destination through bottle neck node. Bottle node checks whether congestion is occurred at bottle neck node or not? If congestion is occurred at bottle neck node so that it will send a back pressure message to source nodes that congestion is occurred. Then source nodes look for alternative paths to send its data to respective destination nodes. Even this causes the delay and the loss of data and we cannot the data efficiently.

So coming across these two algorithms we are going for an advanced hybrid technique in which we can reduce the time delay and loss of data rate. We are giving knowledge to a node whether it should apply for a traffic control or a resource control. In hybrid technique source nodes sends its data to destination through a bottle neck node or intermediate node. If congestion is seen at bottle neck node then it will send a back pressure message to a source node then source node reduces its data rate and the same time it will look for alternate path to send its data. This improves the quality of service (QoS) and time delay.

Illustration of this process is explained below with figure. Consider source node1 is 20 and source node2 is 19 sending data through the bottleneck node 14. If there is no congestion at bottleneck node 14 it proceeds to send pockets to the sink node. If there detects congestion then node 14 sends BPM to source node giving acknowledgement about congestion. Source node2 then reduces its data rate to reduce congestion. TC is in action at node 14. At the same time source node checks for alternate path which is called RC. Then it finds the path with nodes 11, 12 and 2 to the sink node. By this path it will send data pockets efficiently.

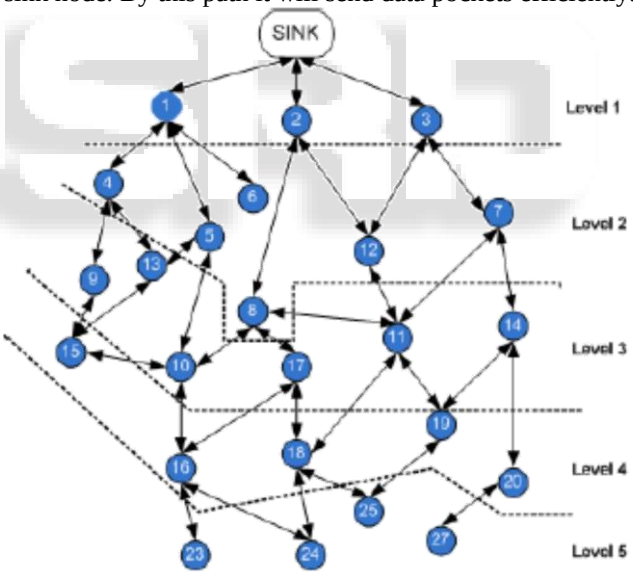


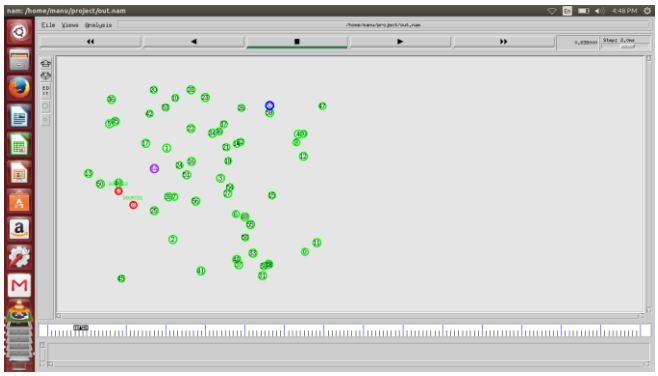
Fig. 2: Network Connectivity

C. Snap shots of experimental results

The simulation of the project is done in ns2 network simulator software. Output of work is put by taking snap shots. In thus project, first we deploy node randomly in a area. After deploying nodes we decide some source nodes and sink node. We send data pockets from source node to the sink node. The snap shots give clear picture about output.

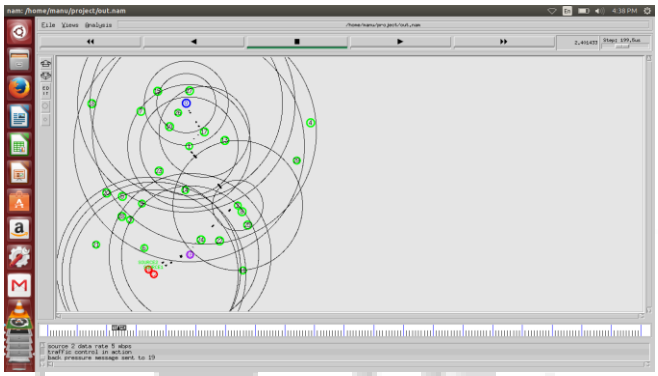
First we deploy nodes then apply traffic control algorithm. Then we simulate the resource control algorithm and finally hybrid simulation can be done which apply both the algorithms called traffic and resource algorithms.

D. NAM Window with Source and Sink Nodes



The above window shows the deployment of nodes. When we simulate the network, two nodes were took as source node1 and source node2 (window source node1 is 8 and source node2 is 13). Node 14 is bottleneck node. Node 32 is destination node or sink node. For every simulation this same process repeats.

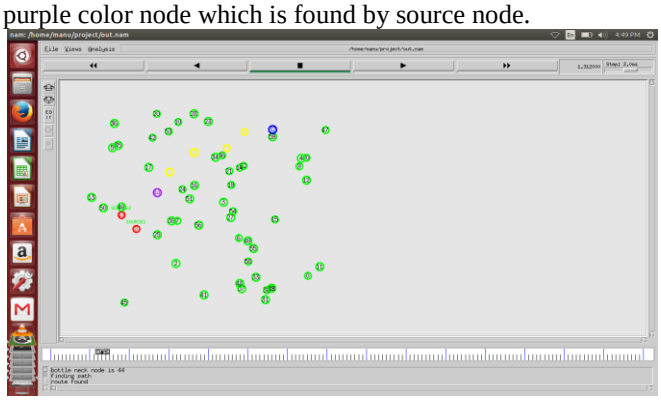
E. Traffic Control Algorithm



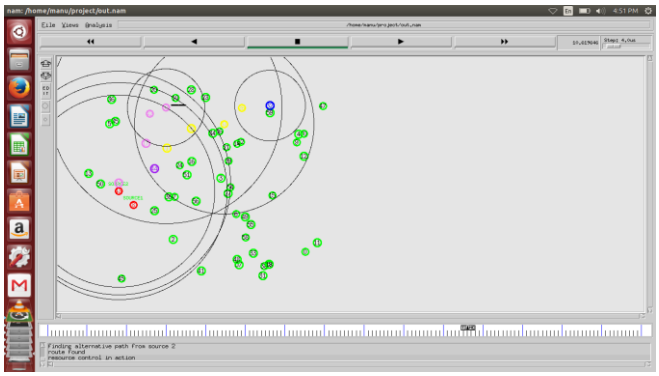
The above window shows the simulation of Traffic control algorithm with transferring pockets from source node to sink node. Source node data rate decreased and avoiding congestion. Source node chooses the path towards sink node randomly in the direction of destination node. The above window shows path with pockets transmission

F. Resource Control Algorithm

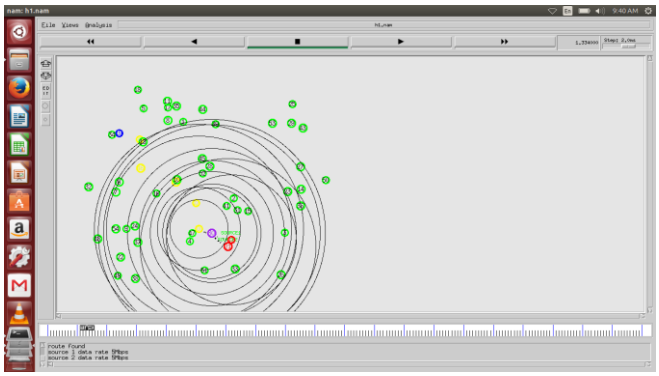
In below window, there is a path from source node to sink node. The nodes with yellow colors are the first path. If congestion is detected at bottleneck node, source node 2 will look for alternate node. The alternate path is shown with purple color node which is found by source node.



G. Snap shot of Resource Control in Action



H. Hybrid Algorithm



In hybrid technique source nodes sends its data to destination through a bottle neck node or intermediate node. If congestion is seen at bottle neck node then it will send a back pressure message to a source node then source node reduces its data rate and the same time it will look for alternate path to send its data. This improves the quality of service (QoS) and time delay. We are giving knowledge to a node whether it should apply for a traffic control or a resource control.

III. SYSTEM SOFTWARE

To fulfill the above objectives, network simulator software is used called NS2. This software is installed on UBUNTU 14.04 as we using Ubuntu operating system. We use NS2 and NAM.

NS-2 is a discrete event simulator. NS-2 provides complete support for simulation of TCP, routing and multicast protocols over wired and wireless networks. NS-2 written in C++

NAM is a TCL based animation tool for viewing network simulation traces and real world packet traces. It is mainly planned as a companion animator to the NS simulator.

IV. CONCLUSION

In this project we propose efficient HRTC algorithm, a hybrid scheme for congestion control in WSNs. This scheme practices to complement the resource control method with traffic control. In particular, when resource control is unable to be effectively applied in a specific network instance, the algorithm employs the traffic control method. So coming across these two algorithms we are going for an advanced hybrid technique in which we can reduce the time delay and loss of data rate. We are giving knowledge to a node

whether it should apply for a traffic control or a resource control. In hybrid technique source nodes sends its data to destination through a bottle neck node or intermediate node. If congestion is seen at bottle neck node then it will send a back pressure message to a source node then source node reduces its data rate and the same time it will look for alternate path to send its data. This improves the quality of service (QoS) and time delay. The advantage of this hybrid solution lies on the fact that due to the frequent variations that take place in WSNs topologies and node placements, each node is able to figure out which congestion control method is the most appropriate to apply at any moment, giving priority to resource control that extends network lifetime as well as throughput. Simulation results verify the efficiency of this hybrid scheme in terms of throughput and network lifetime.

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