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A EFFECTS OF QUALITY ON LATENCY IN AN EXCEEDINGLY WSN THAT ACCOMMADATES MOBILE NODES RANGE

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Abstract
Wireless Sensor Networks with mobile nodes finds itself in many applications. However the mobility also leads to link deterioration and of break. In the case the new links are formed. Here are applications which are delay sensitive in nature. Therefore latency is the main parameter which has to be studied in these types of networks. In this project a WSN is simulated in CONTIKI OS COOJA software to further analyze the latency associated with mobility. The latency is studied with respect to mobility and increase in network density as well. A mathematical model for such scenario is to be modelled and checked with simulation result. Linear increase of latency is expected.
Keywords—Wireless Sensor Network, Mobiliy, Latency, MAC Protocols, Link Layer.

I. INTRODUCTION

Wireless Sensor Networks that accommodates mobile nodes many applications. These applications accommodates nodes connected to mobile persons, animals, or objects likewise as static nodes helping the mobile nodes to deliver the perceived knowledge to the bottom station over a multi-hop path. These styles of network are planned for management post-surgery rehabilitation (recovery from a hip or knee replacement); for designation neurological disorder symptoms of patients in Parkinson sickness (PD); for observation and dominant the behavior of animals (such as grazing pattern and aggressive temperament), and for detection oil spills and avoiding harmful gases in refineries [1].
Wireless Sensor Networks (WSN'S), as building blocks of Internet of Things (IOT), became a preferred technology, with a large kind of new applications starting from environmental observation to disaster recovery. Several areas of human action, together with care applications, square measure beginning to see the advantages from utilizing sensing element networks. Typically, WSN'S square measure fashioned of compact-sized, energy economical, comparatively low-cost devices, that square measure capable sensing native environmental conditions (e.g., temperature and humidity), also as point info, like acceleration, before then sending this info to a base station for analysis and processing [2]. By moving towards

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emergency and healthcare-related applications like disaster response, quality awareness has become a lot of vital. These rising mobile sensors area unit primarily mobile unplanned networks; but, they need way more constraints associated with resource management, coverage, routing protocols, etc. These new conditions need improved techniques and reconciling schemes. Power consumption and its management area unit a number of the foremost very important aspects of a WSN node. It's to be noted that the quantity of nodes will be scaled from tens to thousands of nodes especially applications besides this, nodes may be placed in inaccessible locations (i.e., embedded in building constructions or harsh) (i.e., damaging to humans) environments. This limits accessibility for recharging and makes energy-efficiency a priority [3]. Wireless sensor networks have to communicate sensing parameters; therefore, each node needs to have a radio device that transfers data between adjacent network nodes. Radio device is the most power consuming component of a typical sensor. The new link institution can consume beyond regular time, since the mobile node might not be ready to originate a brand new link now once the first link breaks, particularly once the asynchronous duty cycles area unit applied by nodes [4] [5]. This introduces massive packet delivery latency and needs extra packet management overhead at the destination. This paper quantitatively investigates the latency of a single-hop packet transmission in an exceedingly wireless detector network that accommodates mobile nodes. The investigation is predicated on a mathematical model within which a low-power macintosh protocol uses because to alter receivers to initiate a communication whenever they're able to receive knowledge from the mobile transmitters. The mathematical model is complemented with the simulation analysis enforced within the Cooja simulation atmosphere.

II. METHODS AND METHODOLOGY

A. Introduction

From the literature survey researches mentioned the latency of the nodes in ns2 computer code even if the latency drawback can't be corrected. In my paper for the latency drawback Contiki computer code used whereas compared to ns2 computer code. Latency drawback is going to be corrected effectively.

B. Software need for simulation

Simulation tool: WSN is simulated in CONTIKI OS
Software: COOJA software and MATLAB

C. Contiki

Contiki may be a light-weight open supply OS written in C for WSN detector nodes. Contiki may be a extremely transportable OS associate degreed it's build around an event-driven kernel. Contiki provides preventative multitasking that may be used at the individual method level. A typical Contiki configuration consumes two kilobytes of RAM and forty kilobytes of

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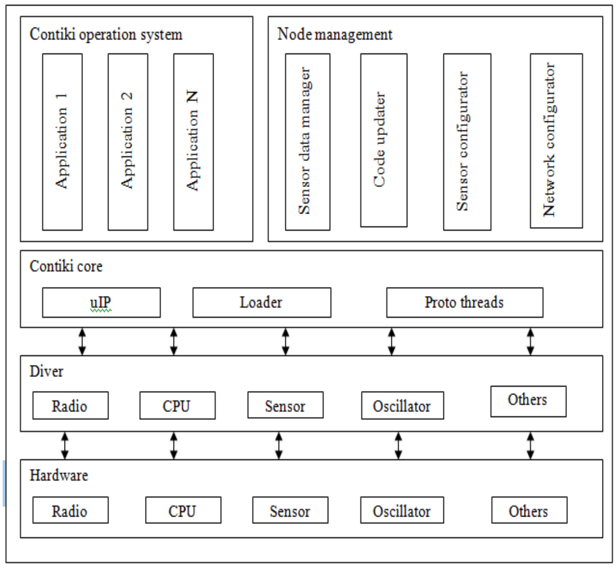
computer memory [6]. A full Contiki installation includes options like: multitasking kernel, preventative multithreading, proto-threads, TCP/IP networking, IPv6, a graphical program, an easy telnet shopper, a screensaver, and virtual network computing.

D. Architecture

The Contiki OS follows a standard design. At the kernel level it follows the event driven model, however it provides ex gratia threading facilities to individual processes. The Contiki kernel includes of a light-weight event computer hardware that dispatches events to running processes. Method execution is triggered by events sent by the kernel to the processes or by a polling mechanism. The polling mechanism is employed to avoid race conditions. Any scheduled event can run to completion, however, event handlers will use internal mechanisms for preemption. Two types of events are supported by Contiki OS: asynchronous and synchronous events. The distinction between the two is that synchronous events are sent forth with to the target method that causes it to be scheduled. On the opposite hand asynchronous events are a lot of like delaying procedure calls that are en-queued and sent later to the target method. The polling mechanism employed in Contiki will be seen as high-priority events that are scheduled in between every asynchronous event. Once a poll is scheduled, all processes that implement a poll handler are known as so as of their priority. All OS facilities e.g., device knowledge handling, communication, and device drivers are provided within the sort of services. Every service has its interface and implementation. Applications employing a specific service got to understand the service interface. Associate application isn't involved concerning the implementation of a service.



E. Cooja software

While Cooja has been established to be a perfect tool for the simulation of RPL in WSN's there are a unit challenges concerned in its use. This is often notably pertinent in relevancy the dearth of documentation offered. The Contiki web site is also a primary port of decision in relevancy Cooja, and

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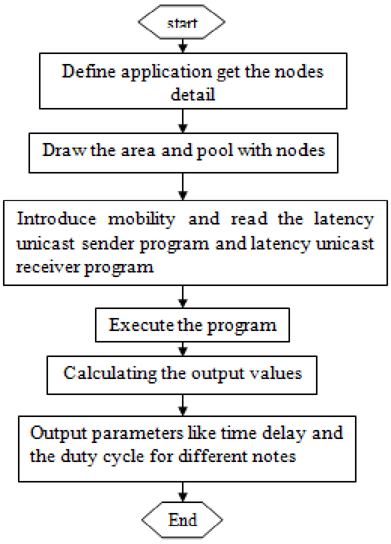
provides a picture of instant Contiki which might then be used with the virtualization tool VMware. However, once instant Contiki is with success started, the Contiki web site will then be noted for nothing over temporary directions concerning a straight forward network setup on Cooja. With this the accumulation of any official documentation concerning Cooja, with the bulk of support being provided at intervals web discussion boards [7] [8]. The aim of this tutorial, therefore, is to produce an in depth instruction set within the use of Cooja. This is often supported the private a number of the contributors concerned, enabling the reader to avoid a number of the pitfalls inherent in making an attempt to use Cooja with no or restricted expertise.

This may first off modify somebody with no previous to Cooja to be ready to produce network layouts, compile motes, examine output mistreatment the sensing element knowledge collect insert and additionally utilize scripts to provide additional fine grained results [9]. From this start line we tend to move onto additional complicated tasks as well as the manipulation of the Cooja in physical nodes. This tutorial seeks to be each a point of reference for a user seeking specific information in an exceedingly explicit task, further as a step by step instruction set for the new user.

F. Methodology flow chart



G. Explanation

The system starts with define application get the nodes detail. Then we draw the area and pool with nodes and adding the number of motes. For that we have to compile the program called latency sender and latency receiver program. Then we have to start the simulation after starting the simulation we have to calculate the following terms like latency and the duty cycle for different conditions after doing this we stop the simulation.

III RESULTS AND DISCUSSION

A. Latency before link termination

The time consumed before link termination is caused by the initial medium competition and also the following communication of many information packets between a try of nodes. As shown in figure 3.1, with the increment of each the duty cycle and also the network density, the latency decreases. This decrease is attributed to the rear off interval a node needs to wait before digital communication. For a

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set network density larger than two, the amount of neighbors of a selected node that square measure awake at an equivalent time will increase once the duty cycle grows.

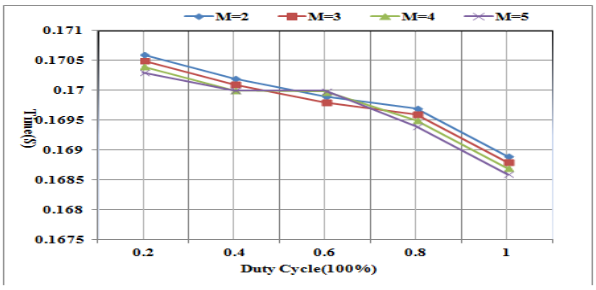

Figure 3.1 Latency before link termination result-1

This enables more neighbors of the receiver to contend for the channel, since each medium competitor is required to choose a random value between 0 and BW once receiving a beacon. The more the nodes participate in the contention, the smaller the average back off interval will be. When the network density is two, the latency remains unchanged regardless of the duty cycle. This is because the optimized protocol formulates the rule that when a beacon without a BW field is broadcasted, collision will definitely occurring if more than one transmitter with [10] pending data are awake. To embody the feature of base beacon, we assume that at least two nodes take part in the channel contention, even though both of them have a low duty cycle. No matter which one finally wins the medium, the back off interval remains the same, leading to a constant latency of 0:1806s. This is also the reason why the time cost before link deterioration is equal for all the network densities once the duty cycle approaches zero.

For a fixed duty cycle, the increment of the network density results in a large quantity of nodes in channel occupation and a small back off value. This shortens the time that the winner transmitter idle-listens before it start with its own data transmission. Especially, when the duty cycle reaches one, all the neighbors of the receiver are active and will participate in the medium contention, resulting in the shortest communication latency.

B. Latency for setting a new link

Once the original link disrupts, the transmitter will wait for the appearance of a new receiver to try to establish a new link. With the decrease of the duty cycle and the network density, the number of nodes that are awake at the same time minimizes.

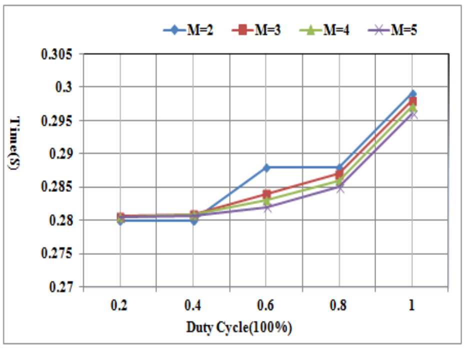

Figure 3.2 Latency for setting a new link

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As show in figure 3.2 displays the time needed for the remaining information transmission when the link breaks. As the entire active neighbors of the new receiver are allowed to participate within the channel competition, the likelihood that the initial transmitter once more wins the medium when the link termination becomes higher, [11] resulting in a shorter time for fitting a replacement link. Once the duty cycle approaches zero, the latency includes a restricted worth and remains identical for all the network densities. Underneath these simplifications, the latency consumed for fitting a replacement link is delimited between 0:347s and 0:43s.

C. Latency foe sending a burst of data packets

Provides an outline of the time needed for transmittal a burst of information packets. the whole latency is evaluated by combining the time intervals consumed before the link termination and for the subsequent new link institution. Obviously, the latency introduced before and when the disruption of the link has completely different variation tendency below a similar duty cycle and network density. It will increase within the former case, however decreases within the increment in each parameters.

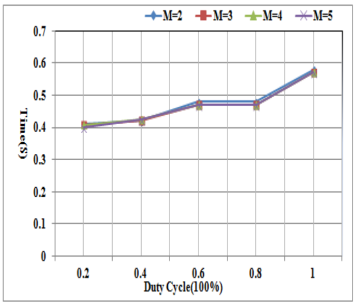

Figure 3.3 Latency for sending a burst of data packets

As show in Figure 3.3 since the transmitter might not straight off discover a replacement receiver or win the medium once it discoveries, itdesires longer to proceed with its remaining information transmission once the link breaks compared with the time required before the link breaks. The curve presenting the [12] full latency for the communication of n information packets contains a similar exhibition with the latency for the institution of a replacement link (as shown in Figure 3.3).The latency changes from 0:528s to 0:609s once the duty cycle and therefore the network density increase.

D. Simulation result and comparison

To specialize in our study goal, solely the simulations within which the mobile node seizes the medium square measure regarded valid. However, because the network density will increase, the likelihood that the mobile transmitter wins the channel becomes little. For the sake of evaluating the communication latency supported an equivalent range of the valid samples, the running times of the simulation ought to completely different vary differ diverge show a discrepancy} beneath different network densities [13]. To the present finish, we have a tendency to divided the duty cycle into a hundred partitions and run the simulation (100 nine M) times for the network density capable M, among thoroughly a hundred simulation results square measure helpful. The latency for every duty cycle is obtained by averaging the values perceived from of these valid simulation samples.

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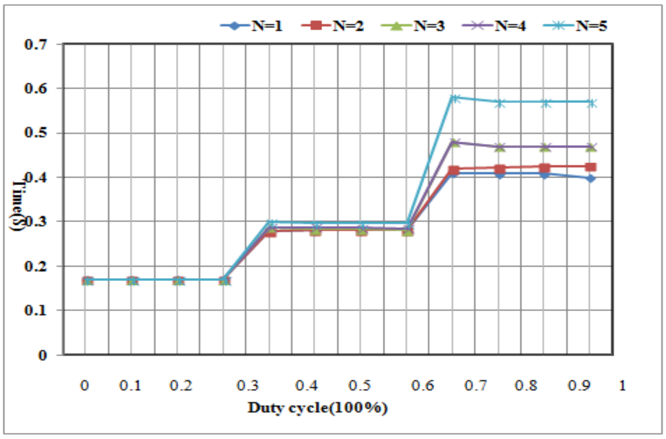

The simulation figure of the latency for communication of a burst of information packets presents similar latency trend however with additional fluctuations compared with the figure given by Matlab. totally different from the mathematical model, the simulation permits the first transmitter to win the medium at any competition spherical once the link breaks. In alternative words, the constraints that the first transmitter seizes the channel at latest within the third competition and therefore the range of information packets transmitted is at the most one hundred forty before it wins square measure relaxed. This makes each the latency for fixing a replacement link and for the entire knowledge transmission a lot of larger. The channel competition within which the first transmitter wins and therefore the range of collisions and competition failures occurred before it wins square measure every which way chosen by the simulations. Thanks to the whole randomness, the latency needed for fixing a replacement link beneath a [14] tiny low duty cycle will be even bigger than that beneath an enormous duty cycle. Similar development will seem in terms of the network density. notwithstanding, on the complete, the entire latency for transmission of a burst of information packets is directly proportional to the duty cycle and therefore the network density. As a result, the latency 0:35s is consumed once solely the mobile transmitter is active and participates within the digital communication.

IV CONCLUSION

In this paper, we proposed a burst transmission pattern to optimize RI-MAC. Supported it, we evaluated the result of quality on latency. The analysis was enforced each on paper by fitting a mathematical model and much by running Cooja simulation. We declared that the overall latency varied from 0.237s to 0.31s and from 0.43s to 0.59s within the analytical and simulation results, severally. Within the future, we commit to style a seamless relinquishment mechanism that allows a mobile node to transfer the communication to a much better link before the standard of the present one deteriorates. Once scrutiny with the time introduced by the relinquishment mechanism, we will verify the latency trade-offs.

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