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CROSS LAYER ADAPTATION FOR QoS IN WSN

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ABSTRACT

In this paper, we suggest Quality of Service familiar MAC protocol for Wireless Sensor Networks its cross layer extension to network layer for providing QoS in delay sensitive WSN scenarios. In Wireless sensor networks, there can be 2 types of traffics; first one is event driven traffic which needs instantaneous observation and the second one is periodic reporting. Event driven traffic is classified as Class I (delay sensitive) traffic and periodic reporting is classified as Class II (Best Effort) Traffic. MAC layer adaptation can take place in terms of (i) Dynamic contention window adjustment per class, (ii) Minimizing the delay experienced by changes in Sleep schedules (DSS) of communicating nodes by randomly altering Duty Cycle based usages and DSS delay of class I traffic, (iii) Different DIFS (DCF Inter Frame Spacing) per class, (iv) modifying all the three patterns suggested above at the same time. Cross layer extension is also proposed, in which MAC layer uses network layer next hop information for better adaptation of duty has based on DSS delay. Routing protocols can utilize MAC layer parameter DSS delay to select the routes which offer least DSS delay latency, thereby minimizing the overall end-to-end delay.

Keywords: WSN.

INTRODUCTION

WSNs run for crucial observing/tracking devices, a few of the applications are responsive to delay, so end-to-end latencies have a definite need. Not only there is delay-sensitive traffic but these do have the backing of the fundamental stations in the environment of the periodic reporting. We are one of the criteria for the deployment of WSNs for monitoring forest fires applications. Application-specific mechanisms to support QoS requirements will be in place for the calls for. There is a more and more exploration and the development of WSNs structure, framework, procedure development, minimal usage, and space have been carried out, but only a few studies in WSNs network capacity (i.e. Quality of Service QoS) have been completed

WSNs are widely accepted as one of the implementation of the MAC layer QoS MAC protocol to use it as our foundation for the implementation of the characteristics considered. SMaC pays no attention to the latency and end-end delay, and control junctions in order to reduce the burden of their normal sleep-awake according to the schedule set up virtual groups. As mentioned above for the delay sensitive traffic and the periodic reporting requirements of the program for supporting the model of traffic Classic (quick observation) and a classII (periodic reporting) defines two classes. Our model, we MAC level frameworks contention window [7], DIFS [7], the nodes in the sleep schedule [1], [2] propose to adjust to provide the QoS traffic classes. [9] MAC level parameters [2], adopted in duty cycle, QoS guarantees can be adjusted, but SMaC effective QoS grades particular way of adapting the duty cycle [1], and MAC-level parameters are suited to the contention window, and for the instance in sensor networks DCF- IFS this paper proposes our cooperation

At the end of the link to the MAC layer QoS parameters to determine the MAC delay the lower channel of the schedule and the allocation of the shared responsibility of the wire. For the class of service guarantees to maintain the dynamic environment, MAC layer (MAC layer are a variety of dynamic traffic class based on the contention window the behavior dynamic adaptation, (i) the current network conditions. The proposed custom-made ii) Utilization and class I traffic dynamic delay of the DSS, (iii) traffic Class DCF inter-frame spacing of different subjects (iv based on the nodes to communicate by adjusting the duty cycle of sleep schedules (DSS) in reducing the delay suffered by the difference) MAC-layer adaptation, combining the three proposed schemes. [12] The basic version of the report on the work presented in this paper.

Cross-layer adaptation is proposed extension of the current MAC layer. In this, MAC layer, the network layer for more efficient to adjust the duty cycle can be adjusted to use the information for the next hop, which was broadcast packets to the next hop information synchronization SMaC used in [1]. These are many of the other nodes of the next-hop nodes that use only and should increase the duty cycle of DSS based on the delay. The second cross-layer approach, we consider the calculation of the way, but this is the link to the underlying MAC layer parameter DSS delay costs, focus on routing protocols. So, only those routes that provide the least amount of delay in the selection of DSS and in turn end-to-end delay is the least.

RELATED WORK

Works to improve the end-to-end delay by the duty cycle adaptation are some DSMAC [2] and the UMAC [6]. Maintaining the duty cycle of a node to sleep, when the DSMAC [2] to communicate with a duty cycle of the neighborhood is still the same, so always double or half of the schedule and the schedule of the node, the node has changed in the duty cycle of the neighbors. The main observation in the duty cycle of the new junction is usually slightly has the values more or less than their corresponding ones. DSMAC [2], they account for changing the duty cycle of the nodes are experiencing a delay in receiving the sending node, but the change twice or half, sensor networks, power consumption increases. Moreover, it does not consider the adoption of WSNs with various sorts of conveyance.

Other method, is the duty cycle dynamic has altered/modified and the value is not repeatedly made half or twice the initial, but according to the use of the junction is changed, it is sending data to a node of the delay suffered by the one-hop neighbor pays no attention. It pays little attention to the traffic demands of various class of service.

Primarily on the network and the MAC layer, while providing QoS in WSNs will be at the various layers contributions. One such task force is aware QoS routing. [3], the authors requested the image sensors, WSNs real-time traffic generated by the proposed QoS aware protocol. Best-effort and real-time: This protocol divides the two classes of traffic streams to implement a priority system. All the nodes of two queues, one for each traffic class use. In this way, different types of services that can be used for this kind of traffic.

Another MAC-level QoS support in WSNs B-Mac [4]. It had an immediate impact on memory size, occupation and power saving design and implementation of its simplicity, it stands for. B-Mac does not have any specific QoS policy implementation; however, this is compensated by the fact that it is a good design. Some components of this model is capable of avoiding collisions, channel invasion efficiency at low and high data rates can be changed around the patient, or better to be addressed to improve the scalability characteristics.

[5], the author of the dynamic adjusts traffic load in accordance with the duty cycle MAC protocol is proposed, which is aware of the traffic. Adaptive scheme that operates in a tree topology, and the nodes wake up time is measured only successful transmissions. By adjusting the duty cycle, it can save energy and prevent packet drops. [11], the author of the MAC layer and network layer in wireless sensor networks, energy efficient usage of a proposed cross-layer scheme. These nodes, RTS, and also includes information on the final destination and the NAV of the nodes in the node, so that the energy as a result of the expiration of the timer not only awake, so that other sleep to rest for the next CTS, the nodes have to address the effective use of information.

POWERFUL MAC LAYER ADAPTATION FOR QoS IN WSNs

Our plan, MAC-layer dynamic (obtained by continuous monitoring) network conditions and traffic admitted on the basis of service quality requirements, designed to adapt their behavior.

Evaluation of MAC delay

MAC delay computational expertise is uncomplicated. A node packet time (TS) from the MAC layer, ending time (TR) by subtracting the MAC delay (d) computes, in fact, a packet is sent over the link. The delay is measured that is d^i, d_{avg}^{i-1} and the Mac is stored in a service class, the average MAC delay. formerly kept mean MAC delay decides how much influence the current mean has, MAC delay is a positive constant η. The rules of contention window in our two service classes are listed below.

$$d_{avg}^{i} = (1-\eta) * d^i + \eta * d_{avg}^{i-1} \quad \rightarrow \quad (1)$$

Contention Window Adaptation

We comply with the MAC layer to presuming Quality of Service in WSNs is one of the schemes proposed for the vigorous contention window adaptation to various classes of traffic. Contention window CW_{min} and CW_{max} traffic parameters and different class difference between the intra-node provides the service. Dynamic network conditions in a range of different service classes, non-overlapping window and a QoS class assigned to the service level is adjusted by adaptation based on the CW. During the contention window adaptation to supply assistance distinction for various classes of traffic, but managed a series of overlapping contention window

Class I (delay sensitive service) traffic in the class of event-driven traffic in WSNs (urgent care) does not. We are based on the requirements of each node delay per hop, the class I of DI for the traffic to ensure a maximum MAC delay, and the delay observed in the class of periodically monitoring, and in this case, by adjusting accordingly

CW series have wanted to try to manage the traffic to the node for Class I is measured in DI, and the current MAC delay, D, is given as class I, CW will be adjusted to the maximum algorithm is shown in algorithm 1. $CW_{maxprev}$ class I represents the value CW_{max} before applying the adaptation, and CW are expected to avoid the possibility of a maximum class I. the maximum delay, DI, and the current measured delay, D is the difference between the controversial window by applying dynamic adaptation is the new value of CW_{max}, an initial setting of unnecessary volatility Threshold value of the contention window CW_{thresl} CW threshI used in the algorithm. Max rapid adaptation to the prevailing situation in the CW network, where αI to enable the appropriate choice is a small positive constant.

Class II (Best Effort Service) traffic in WSNs this class corresponds to the periodic reporting. This class needs to ensure no delay in the traffic. This class of contention window adaptation of the service properly without degrading the quality of the other high-class service, the network is needed to utilize the available resources. Class II traffic dispute the window, because of the high priority traffic continues to be degraded performance, best-effort traffic checking the value of CW_{min} other high priority traffic is carried out not less than CW_{max}

<u>Algorithm 1 Procedure for Contention Window Adjustment of Class I</u>

CW_{max} Is calculated based on Mac delay

CW_{max}: = $CW_{maxprev}$ (1αI (D} DI) D)

If (abs (CW_{max} $CW_{maxprev}$) <$CW_{threshI}$) then

CW_{max}:= $CW_{maxprev}$

Return

end if

If (CW_{max} <$CW_{maxprev}$) then

CW_{max}: = max (CW_{max},CW_{maxdef})

else

If (CW_{max}>$CW_{maxprev}$) then

CW_{max}: = min (CW_{max},$CW_{maxprev}$)

end if

end if

For class I, $CW_{mindefault}$ value is 7, CW_{maxdef} is 15 and CW_{max} is 31.

For class II, $CW_{mindefault}$ value is 32, CW_{maxdef} is 63 and CW_{max} is 63.

Duty Cycle Adaptation

We comply with the MAC layer for providing QoS in WSNs proposed for the second scheme, the classic traffic receiving node, a node and a hop delay based on the utilization of dynamic change in duty cycle. Duty cycle adaptation in our proposed scheme, we consider the one-hop neighbors suffered by the Utilization and change the duty cycle of the delay in taking the oath. We have to take into account the algorithm in Wireless Sensor Networks 2.

As mentioned above, taking two factors, the appropriate percentage change in duty cycle, MAC layer protocol SMaC [1], we noticed that the other nodes in WSNs is the main reason behind the delays in the schedule to sleep. SMaC in [1], the nodes to reduce the control overhead and enable traffic-adaptive wake-sleep schedule is based on a common set of virtual groups. At various nodes in the data sent from source to sink, so it has to go to a different virtual cluster virtual group, and the border node follows the sleep schedule.

The difference in total sleep schedule, end-to-end Class I (delay sensitive) is incorporated in delay. For traffic, this delay is undesirable. We propose that one of the solutions to this problem, the dynamic Class I of the duty cycle varies nodes which are receiving more and more traffic. If the difference is due to a sleep schedule to broadcast a number of nodes, node 2, node 2, node 1 to some of the class, I suppose some of the traffic stream, it will incur a delay of almost all of the increase that this delay will be beneficial to delay the end of the class i traffic to the end. So we node to node 2 is based on the utilization of the increase of the duty cycle and the nodes sending the information in the data frames received by the proposed delay.

The estimate of the difference is very easy to delay sleep schedules. From time to time a packet is sent to the MAC layer of a transfer node at that time (Ts_s) by subtracting the delay (s) computes (Ts_c), which is sending the packet starts for the carrier sensing. The MAC frame header, then it's too late (Ts_s) (Ts_c) and the node sends the frame receiving avg. S^i then extracts the delay, and calculates the average delayS^i_{avg}. Here S^i and S^{i-1} DSS delay is measured, and the average DSS delay may be stored in a service class. ζ previously stored average delay of DSS, DSS current average delay determines how much effect a positive constant have,

$$S^i_{avg} = (1- \zeta) * S^i + \zeta * S^{i-1}_{avg} \rightarrow \quad (2)$$

SMaC it was not for the neighbor discovery packets to transmit sync with the time when the duty cycle can vary and each node can transmit packets can also sync periodically synchronized with its neighboring nodes. When a node changes the duty cycle of its new updated before it goes to sleep, time synchronization packets, and not desynchronize nodes changing the duty cycle, so that in this way, it is broadcast. In addition to this, we had just updated its duty cycle of the node, all other nodes in the sleep schedule to reduce the difference.

We do not have to double or half the duty cycle of the algorithm 2 so that it will not be desynchronized with other nodes in the proper doses , as calculated by the duty cycle, changing the duty cycle of a node should be updated at the time of sending packets of sync. Following which a node is the most common sleep schedule, there may be many different sleep synchronized virtual groups. Duty cycle with a hop away from the current node and all nodes should be included in the schedule for all the times changed so when the synchronization packets should be informed.

Sync packets [1] SYNCPERIOD SMaC as defined in the sent after a few times. We have to change the duty cycle of the schedule, as well as the primary node, or by selecting the first schedule of the implementation of the scheme. Algorithm 2, the synchronization is performed to be broadcast in the schedule. If the duty cycle needs to be changed, then we refer to a change in the duty cycle synchronization in the broadcast schedule, and now they can also sync packets for transmission to other issues, we have some non-zero to the number of periods in the remaining periods of zero to the left, so that the schedule, the neighborhood sync to send the packet to the node could see a change in the duty cycle of the nodes, and the nodes desynchronized by the way, not even after a variety of dynamic duty cycle

Duty Cycle Adaptation Class I (delay sensitive service): We SI for each node in the class I traffic to ensure a maximum delay of DSS, and periodically monitoring the delay observed in the class, and have wanted to try to maintain by adjusting the duty cycle based on the Utilization accordingly. This case is shown in Algorithm 2, SI, given the class I and class I measured the DSS node for traffic delays, S, based on the requirements of delay per hop, duty cycle (DC) adjustment. In the algorithm, DC adaptation of the duty cycle indicates that the value of the class I DC, and DC is believed to be due to the difference between the maximum delay of a dynamic adaptation of the duty cycle, the new value of the Duty Cycle is obtained by applying, SI, and the current measured delay, S, class for I. DC, DC squeeze the algorithm used by the Duty Cycle threshold setting a threshold value to avoid the possibility of unnecessary fluctuations. Here, U_{min} DC is to change the min Utilization, DC_U ρ is the classic proportions of class II packets, allowed DC Utilization is calculated from.

Classic Dc_{min} 30, and DC_{max} 60, and the classic $DC_{default}$ and class II 30. DC can squeeze 5% DC is the last option. We do not want to become too low Changes. 0%U_{min}. ρ_{min} Depending on the application, the application is sensitive to delay. We took ρ_{min} to be 30%. Umin and functionality presented in this ρ_{min} WSNs, depending on the traffic and there are parameters depending on the application. U_{prev} Utilization of the previous value, we Utilization (U) DC increase in proportion to the increase.

DCF Inter Frame Spacing Adaptation

We comply with the MAC layer for providing QoS in WSNs is proposed for the Adaptation DIFS is the third class of the scheme. DIFS any node to send the channel to try to get a new frame after frame for sending it in the past, then it is time to take a break. The proposed framework, we DIFS different class of traffic based on the intra-node service differentiation, as well. Thus, class I, class II, we define difsI and we difsII should be used to define the parameter. DIFS values of the different classes of traffic for I and class II difsI 8 difsII I Class II frameworks, a new Class I send traffic frame is the last frame to wait after sending a low class 15. Class. In this service is provided based on the MAC layer parameter DIFS. In this case, the synchronization packets for managing the synchronization of nodes DIFS, Class I DIFS should be adjusted.

Combining all the Schemes

We are all in it together WSNs MAC layer for providing QoS in the previous three policies implemented in accordance with the scheme for the proposed Fourth, CW Adaptation, Adaptation Duty Cycle, and DIFS

Adaptation. This is a dispute as to the adoption of the window CW Equation 1, depending on the class of traffic to be transmitted and received as specified in the measured delay MAC algorithms 1. Each node in the node receiving the packet, I also duty cycle adaptation delay DSS sends information to the class, and coincides with, and receiving node transmits packets to sync its time, the classic round DSS packets, the average delay keeps updating. In this case, change the algorithm to identify and inform the nodes in 2 runs. Adaptation starts communicating nodes will be held before the DIFS, DIFS period of intra-node traffic service differentiation of class I and class II set of traffic. They are the most important messages for the synchronization to synchronize the packets, follow the classic packets DIFS interval. This works with all three proposed schemes.

Algorithm 2 Procedure for Duty Cycle Adjustment of Class I

U: = (T_{rx} + T_{tx}) (T_{rx} + T_{tx} + T_{idle})

T_{rx} Is the receiving time, T_{tx} is transmitting time, T_{idle} is the idle time, in last SYNC period

If (U < {U_{min}})

Then DC: = $Dc_{defreturn}$

end if

DC_U is calculated duty cycle of node according to its utilization

If (U > {U_{min}}) then }

DC_U = min (DC (1 +U_{prev})/U_{prev}),DC_{max})

{ ÷ , DC_{min})

DCU = max (DC_U)

DC is calculated based on DSS delay

{If ρ > ρ_{min} then}

DC: = DC_{prev} (1 + (S SI) SI)

If (abs ((DC DC_{prev})/ DC_{prev}) < DC thresh) then

DC: = DC_{prev} return

end if

If DC based on DSS delay is less thanDC_{prev}, then DC is based on utilization

If (DC <DC_{prev}) then– `

DC: = max (DC_U, DC_{min})

{Else on DSS delay is greater thanDC_{prev}, then DC

If DC based is minimum of ∗ − ÷

{DC_U And− DC based on DSS delay, so to minimize energy consumption}

If (DC > DC} prev) then

DC: = min (DC, DC_U)

end if

end if

end if

end if

CROSS LAYER EXTENSION

Adapting duty cycle based on Network layer information

10 bytes

Length	Type	Src Addr	Sync node	Sleep time	CRC

10+2 bytes

Length	Type	Src Addr	Sync node	Sleep time	Next hop	CRC

Figure 1.

SMaC in [1], synchronization packets periodically to the next node in the destination (base station) can be added to their next hop information within the synchronization packet nodes, is shown to maintain their sleep schedule. They are on the way from the source to the destination (base station) that lies out of the synchronization of the nodes receiving packets. Figure 4, the next hop to the number of nodes, the nodes are 1, 2,3,4,5. In a WSN, this effect is more prominent. Figure 1 shows the original and revised packet formats.

Algorithm 3, $N_{nexthop}$ and $N_{\min nexthop}$ adaptation of the parameters used to control the duty cycle is unnecessary. In Algorithm 2, the duty cycle of the delay in the adoption of DSS based on the utilization of the node, which is only a few nodes to communicate with their high consumption at the pier and the DSS would delay the case and it is the result of inefficient energy usage of WSNs may cause a change in the duty cycle. Algorithm 3, the next hop information of the network layer handles the case. $N_{nexthop}$.It synchronization packets based on the destination node can be calculated for the base station to the next hop node, and the number of nodes of the information for which this node is the choice of the number of nodes, which gives a measure of the parameter $N_{nexthop}$ hop over the course of the last synchronization. If it is, then the more $N_{\min nexthop}$ entrance, which is delayed by DSS and Utilization of the node based on the follow-up to the general duty cycle. Its entire next-hop neighbor node is based on the optimum value of $N_{\min nexthop}$ choose.

<u>Algorithm 3. Procedure for Duty cycle Adjustment of class I according to next hop information</u>

U: = (T_{rx}+ T_{tx}) (T_{rx}+ T_{tx}+ T_{idle})

(T_{rx} is the receiving time, T_{tx} is transmitting time, T_{idle} is the idle time, in last SYNC period ÷

If (U < (U_{min})}

Then DC: = DCdef return

end if

{If ($N_{nexthop}$> $N_{\min nexthop}$) then

$N_{nexthop}$ is the number of different Src nodes for which this node was selected as next hop, $N_{\min nexthop}$ is the threshold number of times a node should be elected as next hop to do duty cycle adaptation in last SYNC period.

DC_U is calculated duty cycle of node according to its utilization

If (U >U_{min}) then

DC_U = min (DC (1 + (U U_{prev})/ U_{prev}), DC_{max})

DC_U= max (DC_U , DC_{min})

DC is calculated based on DSS delay

If ρ > ρ_{min} then

DC: = DC_{prev} (1 + (S SI) SI)

If (abs ((DC DC_{prev})/ DC_{prev}) < DC_{thresh}) then

DC: = DC_{prev}

Return

end if

if DC based on DSS delay is less than DC prev , then DC is based on utilization if (DC < DC_{prev}) then

DC: = max (DC_U , DC_{min})

Else If

DC based on DSS delay is greater than DC_{prev} , then DC is minimum of DC_U and DC based on DSS delay, so to minimize energy consumption

If (DC > DC) then

DC: = min (DC, DC_U)

End

If end

If

end

If end

If

Adapting route calculations based on DSS delay parameter of MAC layer
Wireless sensor networks, MAC layer protocol SMaC [1], the nodes to reduce the control overhead and enable traffic-adaptive wake-sleep schedule is based on a common set of virtual groups. So the data sent from source to sink at many nodes it is to go from different groups within the boundaries of the virtual cluster virtual node scheduled for the following two nocturnal sleep schedules. This difference in the end-to-end delay inserted. Delay, the delay is known as the node of the DSS in the next two communicating nodes incurred because of the different sleep schedule. In our proposed scheme, the cost of the link to the network layer routing protocol that takes into account the delay in DSS link and route calculation, it computes the total cost.

Sleep is the link to the link to the schedule of the DSS delay measurement technique for the assessment of the time delay difference (ts_s) by subtracting, the most common and the delay of a transfer node (S_{link}) Equation 2 calculates the average DSS is similar to the calculation of the delay from the time a packet is out of the MAC layer (TSC), which starts sensing the carrier for sending the packet. This delay is then stored in the node and link that calculates the average delay. Here S^i_{link} and $S^i_{linkavg}$ for the delay is measured, and the link to the past, the average delay stored in the DSS. β for that link, that link to the current average delay was previously stored in the average DSS determines how much influence the delay is a positive constant. Algorithm 2 is the same as used in the SI expected maximum delay is.

$$S^i_{linkavg} = (1-\beta) * S^i_{link} + \beta * S^i_{linkavg} \rightarrow \quad (3)$$

Algorithm 4 Procedure for calculating overall link cost including DSS delay of the link

LCoverall is calculated based on DSS delay
If S_{link} > SI then}
LCoverall: = LCori (1 + ($S_{linkavg}$ SI) SI)
Else LCoverall: = LCori
End if

In Figure 2, node 4, the sending to the base station and one path is 4> 3> 2> 1, and another path is the way 4> 5> 6> 7, the same link costs, but if the links constituting the delay of the various DSS, then delays in the way of constituting the links below DSS 4> 3> 2> 1, {low end-to-end latencies compared to other ways to give. Algorithm 4 covers all our total cost of the link that takes care of such cases and delay sensitive traffic in WSNs at least the end-to-end delay of the selected facilities.

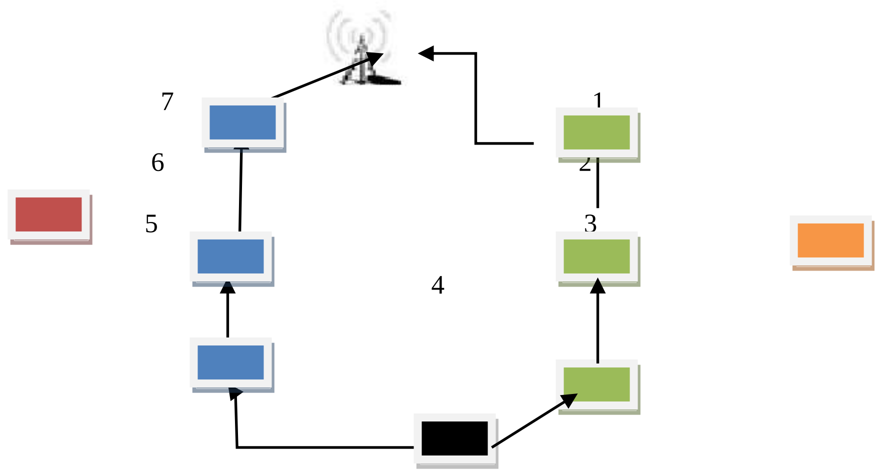

Figure 2. Adaptation of route

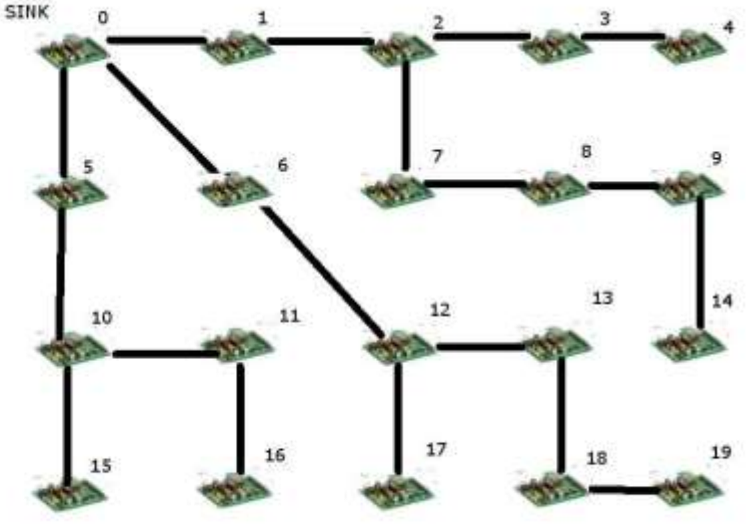

Figure 3. 1st Scenario

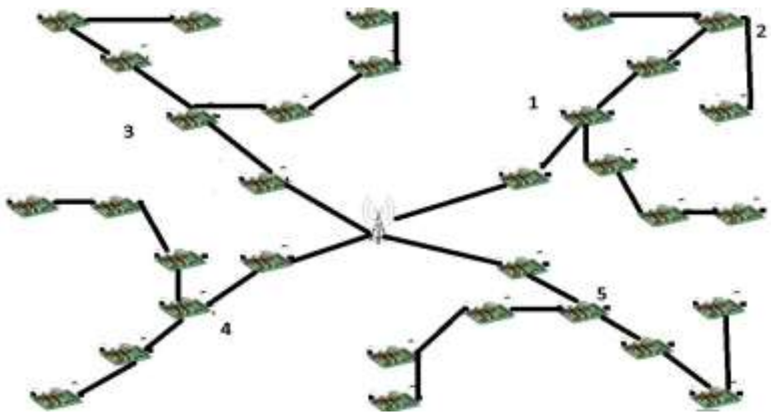

Figure 4. 2nd Scenario

SIMULATION AND RESULTS

Simulations of various investigations and traffic conditions are discussed in this section of the WSN MAC layer QoS adaptation and evaluated over two simulation scenarios. 29. Adoption of the proposed scheme is implemented in the simulator ns2 [10] of the MAC layer to emulate. We used in our simulations a topology representing in fig 3. In this the node zero sink and all the remaining sensors will be transmitted to the node. Class I and Class II packets are equal to the product of single nodes. Here in the topology, the two nodes are separated by 140 meters horizontally, vertically apart and diagonally around 196 meters. Each node in the communication range of around 200 meters. Lines shown in Figure 3, there are ways. For understandability, we use static routing is the only one from each node to the next hop.

Fig 5, shows the contention window adaptation, Fig 7 shows Duty Cycle Adaptation and Fig 6 shows DIFS Adaptation and Fig 8 display shows the combination of the three proposals. In each graph, the X axis and Y axis sink at the number of packets received for each class, each class of packets received by the end of the end of the delay is cumulative. SMaC the number of packets received at the sink and the proposed scheme is the same, since the two schemes reported an average delay of all traffic.

In Figure 5, as proposed in section 3.2, is based on the class of contention window adaptation. A ClassII packet to delay the adoption went more than the original SMaC classII packets, and has become a classic of the packets delay is less than the original classII SMaC traffic. This is because the classII (best effort) traffic than the (sensitive to delay), which gives priority to the classic algorithm 1 is the class of traffic is to differentiate.

Adaptation of contention window, SMaC packets, the average end-to-end delay compared to the Class I to 30% profit.

In Section 3.3 as proposed in Figure 7, there is shown a duty cycle adaptation. Increasing traffic to reduce the duty cycle of the two-class latencies Figure 7, the average delay, both classic and classII traffic, compared to the original SMaC cuts. The average delay duty cycle adaptation of the classic, classII less than the average delay. Duty Cycle Adaptation, SMaC packets, the average end-to-end delay compared to the Class I lead to a profit of 37%.

Figure 6, the level of differentiation is based on the DIFS values. A ClassII packet to delay the adoption went more than the original SMaC classII packets, and has become a classic of the packets delay is less than the original classII SMaC traffic. This is because the classII (best effort) traffic than the classic traffic (sensitive to delay) will give priority to the full class differentiation, that is. Adaptation DIFS, SMaC compared to the average end-to-end delay of the packets are Class I to 25% profit.

Figure 8, the three follow-up, simultaneously, Duty Cycle, CW, DIFS Adaptation SMaC packets are compared to the average end-to-end delay in Class I, combined with the benefit of 60% of the leads are shown.

To be used for the analysis of the topology and the topology of 3 different traffic conditions more than the number of sensors are shown in Figure 4. The topology of the nodes in the horizontal and vertical separation of 250 meters and the communication range of each node is around 300 meters. To produce the same amount of traffic nodes classic and classII. In Figure 9, the topology of the three MAC layer applications SMaC examined and compared to the average end-to-end delay of the packets are Class I leads to a profit of around 55%.

CONCLUSION

In this Paper, the proposed schemes, periodic reporting delay sensitive traffic in the presence of (event-driven) to deal with the traffic. The MAC layer and the network layer can be achieved by involving the cross-layer adaptation. Utilization at the MAC layer and MAC layer adaptation DSS Unlike previous works in the literature, according to Le dependency (iii) DIFS adapted to fit the parameters of the traffic (ii) Duty Cycle different class (i) CW can be achieved by implementing various contention window (iv) a combination of the above three schemes proposed . Duty cycle of the dynamic adaptation of our scheme, instead of the previous approaches [2] in the appropriate amount to double or halve the duty cycle of the covers, so our scheme reduces the power consumption of the application of the duty cycle, but the burden of the cost of the additional control messages and simulation results at the SMaC to establish dominance over all the proposed schemes. All four of the proposed schemes in the presence of class II traffic end-to-end delay the development of class I show the traffic. Cross-layer simulation, the relevant policies to adapt to the duty cycle of the node synchronization of the incoming packets to the next hop from using the information (i) MAC layer is proposed. (ii) Delay sensitive traffic in favor of the best ways to choose, consider ways of computing the link to the network layer of the MAC layer parameter using DSS delay.

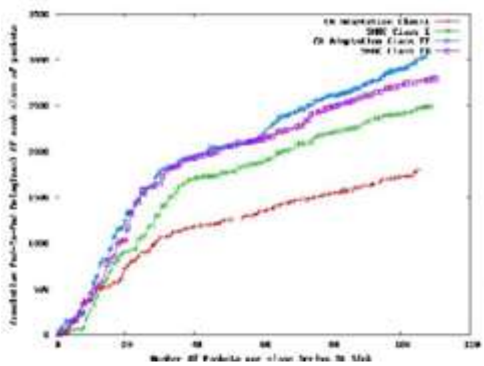

Figure 5. Progressive end-to-end delays of packets at sink with CW Adaptation

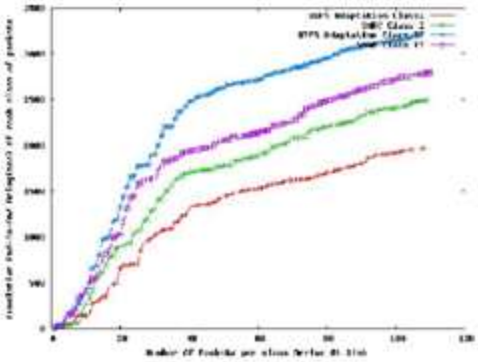

Figure 6. Progressive end-to-end delays of packets at sink with DIFS Adaptation

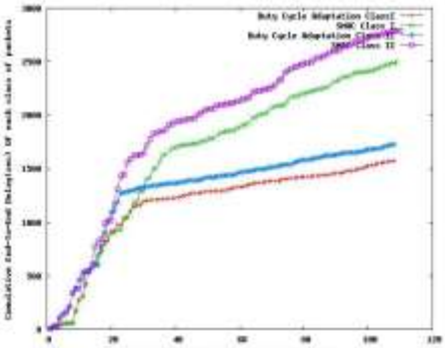

Figure 7. Progressive end-to-end delays of packets at sink with Duty cycle Adaptation

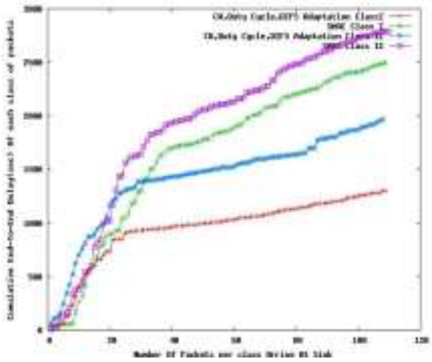

Figure 8. Progressive end-to-end delays of packets at sink with all three Adaptations (i.e. CW, DIFS, Duty cycle)

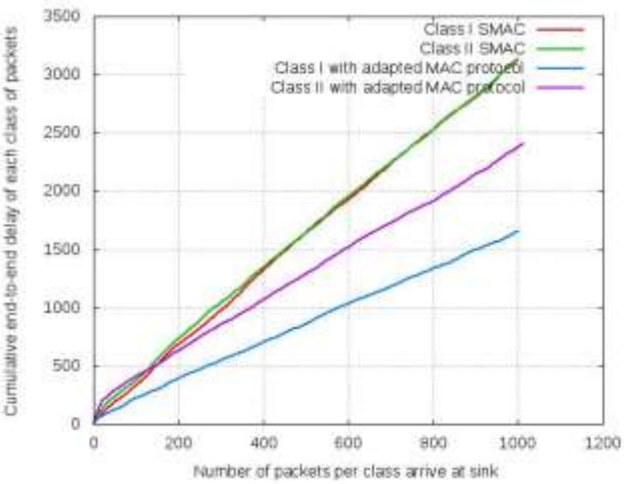

Figure 9. Progressive end-to-end delays of packets at sink with all three Adaptations

i.e. CW,DIFS,Duty cycle using 2nd Scenario

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