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Dynamic Packet Length Scheme and Security in WSN

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ABSTRACT:In wireless sensor network, packet size optimization is an important issue in energy constrained. We provide dynamic packet length optimization scheme to achieve best performance in terms of channel utilization, energy efficiency. The adaptation of dynamic packet length is 802.11 wireless system. We increase data delivery ratio, system throughput and decrease network conjunction end to end delay. In the system, the packet delivery ratio keeps high i.e. 95% above and link estimated error within 10% for 95% link. The system provides accurate link estimation method which achieves best performances related to the previous works.

KEYWORDS: Packet length optimization, link estimation, aggregation, fragmentation, wireless sensor networks.

I. INTRODUCTION

A basic problem in wireless networks is that radio links tends to fading, transmission power, and interference, which result in decreasing the data delivery performance. This problem is solved in wireless sensor networks (WSNs), in which resource constraints and severe energy already include the use of many techniques which can be found in other wireless systems but not always. For example, (i) effective forward error correction (FEC) which needs the amount of redundant data transmitted to be tuned to match the link qualities which is really difficult to achieve in dynamic WSNs (ii) Bit rate adaptation protocols, requires special hardware which is not available on general sensor nodes.

The ultimate purpose of this study is to find out the optimal packet length for the real time channel conditions. The basic idea is: if the packet length is too small, much transmission is spent on handling packet headers which result in low effective data throughput. Therefore, we need some optimal packet length exists to achieve maximal throughput[10] on the other hand, if the packet length is too large, due to packet error rate, packet retransmission rate will be high. This packet optimization scheme applicable in sensor networks only. This sensor network must have the following features.

(i) *Dynamic* Packet Length Adaptation Scheme: Fixed packet length optimization scheme is very old technique now. Previously it was the only way for communication in WLAN sensor networks. Because of spatial temporal link quality diversity IN WSN this scheme is not used.

(ii) *Accurate* link estimation: Link estimation accuracy decides the performance improvement in packet length adaptation scheme. There are some unique characteristics of WSNs, which are not considered in previous work e.g. Resource constraints of sensor nodes, which leads to inaccurate link estimation in wireless sensor networks.

(iii) *Easy* to use: No prior work is done to address the application programmability issues on packet length adaptation scheme in wireless sensor network.

II. RELATED WORK

Packet Combining in Sensor Networks In simple packet combining error correction scheme for wireless sensor networks, node buffers corrupts the packets and when two or more corrupt versions of packets are received, a packet combining process attempt to recover the original packet. when the two corrupt versions of packets are received, then

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in HARQ scheme, these two non-coded packets are merged to correct the errors. Rather than transmit the original packe as it is, the sender retransmit the parity bit produced by applying an encoding operation to the original packet.This allows the packet combining decoder to recover from errors.[1]

Collection Tree Protocol It represents andevaluates two principles of wireless routingprotocols.

1. Datapath validation: Data traffic quicklydiscovers and fixes routing inconsistencies.
2. Adaptive beaconing: Extending theTrickle algorithm to routing central trafficreduces route repair latency and sends fewerbeacons.[2]

AIDA: Adaptive Application Independent Data Aggregation in Wireless Sensor Network A novel adaptive application independent data aggregation component. it address the problem of low band width and energy limitations inherent to sensor devices. A novel data aggregation technique distinguishes itself from current state of the art solution in three aspects

1.Prior application dependent data aggregation.
2.No prior work in data aggregation.
3.Previous data aggregation schemes.[3]

Optimal Real Time Sampling Rate Assignment for Wireless Sensor Network Real-Time Wireless Sensor Network (RTWSN) is expected to carry out various applications such as remote control or video/audio monitoring in ad hoc environments. Instead of using conservative (lowest allowed) sampling/actuating rates (since sampling and actuating rate allocation are similar, unless explicitly denoted, sampling rate is used instead of sampling/actuating rate in the following), a sampling rate allocation that maximizes global utility while maintaining real-time schedulability is wanted.[4]

RSSI is Under Appreciated There is a general belief in the Wireless Sensor Network (WSN) community that the received signal strength indicator (RSSI) is a bad estimator of the link quality. This belief is due to the existence of many asymmetry links in older radios such as CC1000 and TR1000.Newer radios that are based on IEEE 802.15.4 standard such as CC2420 implement another parameter called link quality indicator (LQI) which is believed to be a better indicator than RSSI. There is so far no extensive evaluation of CC2420 to validate this claim. We have conducted such an evaluation and our preliminary results indicate that RSSI for a given link has very small variation over time for a link. Our results also indicate that when the RSSI is above the sensitivity threshold (about -87 dBm), the packet reception rate (PRR) is atleast 85 percent. Around this sensitivity threshold, however, the PRR is not correlated possibly due to variations in local phenomena such as noise. LQI, on the other hand, varies over a wider range over time for a given link. However, the mean LQI computed over many packets has a better correlation with PRR.[5]

PPR: Partial Packet Recovery for Wireless Networks Bit errors occur in wireless communication when interference or noise overcomes the coded and modulated transmission. Current wireless protocols may use forward error correction (FEC) to correct some small number of bit errors, but generally retransmit the whole packet if the FEC is insufficient. We observe that current wireless mesh network protocols retransmit a number of packets and that most of these retransmissions end up sending bits that
have already been received multiple times, wasting network capacity. To overcome this inefficiency, we develop, implement, and evaluate a partial packet recovery (PPR) system. PPR incorporates two new ideas: (1) SoftPHY, an expanded physical layer (PHY)
interface that provides PHY-independent hints to higher layers about the PHYs confidence in each bit it decodes, and (2) a postamble scheme to recover data even when a packet preamble is corrupted and not decodable at the receiver. Finally, we present PP-ARQ, an asynchronous link-layer ARQ protocol built on PPR that allows a receiver to compactly encode a request for retransmission of only those bits in a packet that are likely in error. Our experimental results from a 31-node Zigbee (802.15.4) testbed that includes Telos motes with 2.4 GHz Chipcon radios and GNU Radio nodes implementing the 802.15.4 standard show that PP-ARQ increases end-to-end capacity by a factor of 2 under moderate load.[6]

III. PROPOSED SYSTEM

In this section, we present the design of DPLC, a dynamic packet length control scheme for WSNs. Below, we Identify the major design goals.

- Dynamic adaptation. DPLC should provide a dynamic adaptation scheme to achieve performance improvements in dynamic, time-varying sensor networks.

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- Accurate link estimation. DPLC should implement an accurate link estimation method that can capture both physical channel conditions (due to channel fading, mobility, or power degradation) and interferences (from exposed and hidden terminals).
- Ease of programming. DPLC should provide easy to use services to facilitate upper-layer application programming.
- Lightweight for implementation. DPLC should be lightweight for resource constrained sensor nodes.

The DPLC theme works as follows.

1. The appliance passes an application-level message for transmission.
2. The DPLC module at the sender decides whether or not to use the aggregation service (AS, if the message length is small) or the fragmentation service (FS, if the message length is larger than the utmost packet length supported by the radio, i.e., 128 bytes for CC2420).
3. The link computer among DPLC dynamically estimates the acceptable packet length for transmission.
4. Supported this, the DPLC module at the sender decides what number messages ought to be mass (for AS), or what number frames the message ought to be fragmented into (for FS).
5. Once a frame is prepared for transmission (enough messages are mass or time is get in AS), DPLC transmits it out via the mac layer.
6. Once the DPLC module at the receiver receives a mac frame, it deaggregates or defragments the shut in order to get the initial message.
7. Once the message is prepared (all frames within the message havebeen received or the receive buffer is full in FS), the DPLC module at the receiver notifies the higher layer for additional handling.

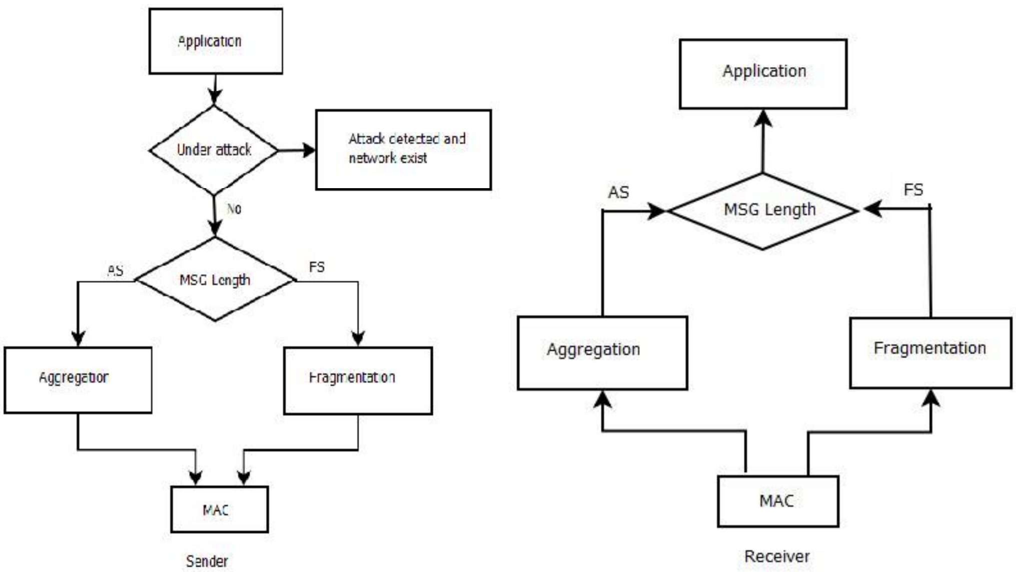

Figure: System architecture

The DPLC theme provides 2 services for upperlayer applications, i.e., the aggregation service (AS, for little messages) and therefore the fragmentation service (FS, for giant messages).
(i) AS is beneficial for little information assortment, e.g., CTP [7]. Both AS eight and ASn needs L2 ACKs provided by the link layer, as a result of packets got to be retransmitted (at least once) after theyar lost. For AS 0, we have a tendency to to boot give a additional economical ACK theme known as AggAck that doesn't think about L2 ACKs, and therefore mitigate the ACK overhead we have a tendency to use AS zero-L2 to denote AS 0 with L2 ACKs and AS0-AA to denote AS0 with AggAck afterwards). (ii) FS is beneficial for bulk information transmission, e.g., Flush. FS provides reliable transmissions as an oversized message is typically vital for upper-layer applications. FS doesn't

essentially depend upon L2 ACKs. As mentioned on top of, we have a tendency to boot give the AggAck mechanism to mitigate the ACK overhead, and additional significantly, to upset information packet retransmissions (we use FS-L2 to denote FS with L2 ACKs and FSAA to denote FS with AggAck afterwards).

IV. Mathematical model

I. Set Theory

1. N is the set of Nodes. N= n1, n2, n3 Where N is main set of Users like n1, n2, n3 . . . . ni
2. Cn is set of node ns child nodes;c belongs to Cn denotes one child
3. m is set of retransmission threshold
4. Ton(11ms) Channel polling time
5. Toff (500ms) Sleep interval

We analyze energy efficiency of node nin terms of the duty cycle, i.e., the fractionof time the radio spent in transmission mode(Dtxn) and receiving mode (Drxn).
The dutycycle can be calculated as
Dtxn + Drxn
Ftxn and Frxc are the rates at which noden transmits packets and receives packetsrespectively.Node ns fraction of time spent in receivingmode due to actual communication is as givenin the second equation.Node ns fraction of time spent in receivingmode is given in third equation

$$D_{txn} = F_{txn}T_{txn} + \sum_{c \in C_n} F_{rxc}T_{txc}$$

$$D_{rxc} = F_{txn}T_{rxn} + \sum_{c \in C_n} F_{rxc}T_{rxc}$$

$$D_{rxn} = D_{rxc} + (1 - D_{rxc})F_{cc}$$

V. Simulation Results

It is apparent that if the packet length is too short, it suffers from an efficiency problem due to the larger overhead. On the other hand, if the packet length is too long, it experiences higher packet error rates especially for the wireless channel with high error rates. Since an error packet means a total loss of energy consumed for the packet transmission, it also suffers from an efficiency problem in this case. Therefore, there exists an optimal packet length in the sense of maximizing the energy efficiency. 90 packets sent to base station. Different values are given as packet length. If packet length is 10,32,64 or 128 byte, received packets is not changed. 70 packets received by base station. Dropping of packets (90-70=20 packets) is because of network's topology. Distance between nodes in the network is too far. So, when the node is sent the packets, then there is an interference and packet is dropped. Optimum Packet length is should be between 128 byte and 256 byte. While Packet length increases until 128 byte, received packets is same and 70. But; each of packet length after 128 byte, received packets are decreasing. Therefore, the packet length values which between 128 byte and 256 byte are tried to find optimum packet length. The results are presented in Fig
Yellow line is shown received packets, Pink line is shown sent packets and navy line is shown packet length at data link layer in each figure.

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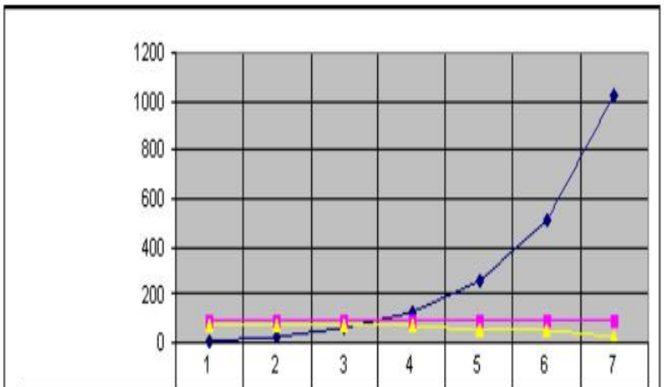

	1	2	3	4	5	6	7
Packet length	10	32	64	128	256	512	1024
Sent packets	90	90	90	90	90	90	90
Received packets	70	70	70	70	60	53	32

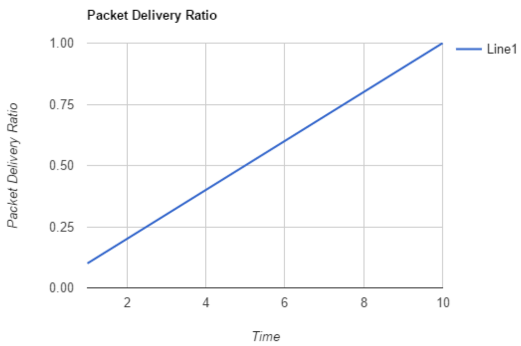

Figure: Data packet delivery ratio

Above graph is showing variation of packet delivery ratio according to no of nodes. As the no of nodes are increased packet delivery ratio is increasing. It is because of broadcasting is increasing with the no of nodes. Another reason is delay is decreasing.

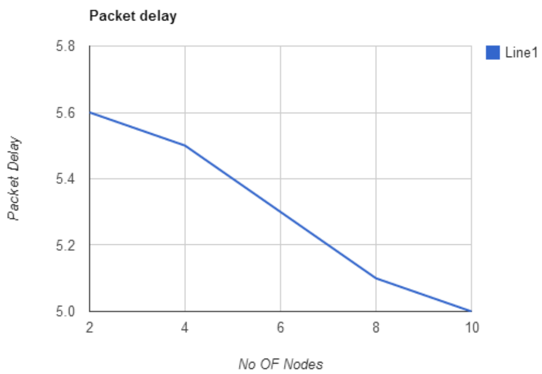

Figure: Packet delay

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Above graph is showing variation of packet delay according to no of nodes. As the no of nodes are increased packet delay is falling down. It is because of broadcasting is reducing.

VI. CONCLUSION

In this paper, we have shown optimum packet length over data transmission for wireless sensor networks. Optimal packet length is variable in each of application. So; network topology is important point. If distance between nodes in network too far, there will be packet lose. When optimum packet length is found, dropped packets and packet errors reduces. However; Energy efficiency provides which is critical for sensor networks.

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