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A Survey -Multi-channel, and Dynamic traffic allotment in Wireless Sensor Network

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Abstract-WSN sensors be able to sense vibration, electromagnetic strength, light, temperature, humidity, and so on, and transfer the sensed data to the new node complete a series of numerous in-between nodes that assistance to forward the data. A research challenge in existing WSNs MAC protocols is to make available more throughput and little delay, although maintaining low power ingestion. Short duty cycle is all the time applied to expand the energy efficiency and network lifetime in WSN. The energy efficiency in WSN is key essential element for improved communication. The hardware condition is also good in WSN for better communication. If the channel utilization is more then throughput of the wireless sensor network reduces. Its drawback is extended delay and little throughput if traffic is more. The paper provides survey to various dynamic slot allocation techniques. It also provides multichannel and low duty cycle techniques in wireless sensor network.

*Keywords-***Wireless Sensor Network, dynamic slot allocation, MAC, CSMA, TDMA, Queue length.**

I. INTRODUCTION

A WSN is composed of large number of sensor nodes which consist of sensing, data processing and communication capabilities. WSN sensors be able to sense vibration, electromagnetic strength, light, temperature, humidity, and so on, and transfer the sensed data to the new node complete a series of numerous in-between nodes that assistance to forward the data. WSN have sensing ability and communication functionalities. Recent advancement in wireless communication and electronics has enabled the development of low-cost, low-power multifunctional miniature devices for use in remote sensing applications. Wireless sensor networks (WSN) form a particular sort of wireless data transmission networks. The ultimate remarkable benefit of WSN is that they improved the computation capability to physical circumstances where human presences are difficult.

WSNs have been the preferred choice for the subsequent generation for monitoring and control methods. It can sense humidity, light, temperature, vibration, and electromagnetic strength and so on, and communicate the sensed info to the other node complete a chain of various in-between nodes that assistance to forward the data. It also has communication ability and sensing functionalities. Every single sensor node can sense corporeal characteristics. Sensor node is the central module of WSN. Sensor nodes can be castoff to sense moistness and high temperature. It is similarly used to intellect light and temp. Since particular sensor conveyances only incomplete information; a network of these sensors is used to accomplish large surroundings. The data transmission module in sensor node is applied to transfer information. WSN established a particular category of wireless communication systems. Sensor node is the central module of WSN. Sensor nodes can be castoff to sense moistness and high temperature. It is similarly used to intellect light and temp. Since particular sensor conveyances only incomplete information; a network of these sensors is used to accomplish large surroundings. Error free and reliable data transfer between source and destination is the challenges in WSN. In WSNs severe happening data composed by the sensor nodes compulsion to be consistently distributed to the sink for efficacious observing of an environment. Therefore, error free and reliable data transfer between source and destination is the challenges in WSN. WSN is not simply stimulated by antenna angle but then again also weather conditions, obstacles. It is also depends on interference. Consistent transfer of data is the surety that the packet carrying event's information reaches at the endpoint. In WSNs, consistency can be categorized into diverse levels end-to-End or Hop-by-Hop dependability Level, and Event or Packet dependability Level. The data transmission in The a number of applications of wireless sensor network be there energy control systems, smart grids industrial applications, transports and logistics, civil structure monitoring, smart construction for instance internal climate control, health care for instance medical health diagnostics and health intensive care, accuracy in agriculture, animal tracing, urban terrain tracking and security and entertainment, surveillance. Consistency of WSN is affected by mistakes that may happen due to numerous reasons such software malfunctions, malfunctioning hardware, dislocation, orenvironmental hazards. In ad-hoc network batteries [3] can be replaced as and when needed. The furthermost significant restriction imposed on sensor network is the inadequate battery power of sensor nodes. The operative lifespan of a sensor node is directly resolute by its power source. Henceforth lifespan of a sensor network is also resolute by the power source. Hence the energy

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ingestion is foremost design concern of a protocol. Memory size and inadequate computational power is another limitation that disturbs the quantity of data that can be put in storage in distinct sensor nodes. Therefore the protocol must be light-weighted and simple. Transmission delay in sensor network can be great because of inadequate communication channel pooled by all nodes in each other's communication range.

The implementation encounters of WSN are sensor locations, limited energy capacity, inadequate hardware devices, random and massive node disposition, scalability; network system features assorted recognizing application necessities and data aggregation, and also unreliable environment. A wireless sensor network (WSN) comprises of less power and a number of smaller sized sensor nodes. Consistency of WSN is affected by mistakes that may happen due to numerous reasons such as software malfunctions, malfunctioning hardware, dislocation, or environmental hazards. The foremost WSN purposes are less node cost, less security, less power consumption, fault tolerance, better channel utilization, , adaptability small node size, scalability, Qos support and self-configurability. The low battery status of WSN node is also very important factor for better transmission. Throughput of the WSN diminishes because of more channel utilization. Wireless sensor network applied in a wide-ranging of application and to influence these applications in physical world environments, there is a need for more efficient algorithms and protocols. Developing a novel algorithm or protocol address various challenges which are essential to be obviously understoodThe WSN protocols are mobility based, location based, QoS based, data centric, multipath based, heterogeneity based and hierarchical protocols. Location based protocols are MECN, GeRaF, BVGF GAF, TBF, SMECH, GEAR, and Span.

The remarkable benefit of WSN is that they improved the computation capability to physical circumstances where human presence is difficult. Because of more energy consumption the lifespan of the system wireless sensor network reduces. If the channel utilization is more than throughput of the system wireless sensor network reduces. Wireless sensor networks medium access control (MAC) procedures for system energy proficiency come from the cost of extra packet delay and limited throughput, since a sender is permitted to communicate in the short active periods, only.The low duty cycle involves long delay and limited throughput and the drawback is even greater under mutable traffic patterns. Low cycle duty is every time applied to grow the system lifetime in WSN. If the system channel consumption is more than throughput of the sensor network diminishes. The low duty cycle and energy efficiency in WSN is key essential element for improved communication. The rest of the paper is organized as follows. Section 2 provides a brief overview of dynamic slot allocation, and duty cycle. Section 3 provides the literature survey.Section 4provides concluding remarks.

II. DYNAMIC SLOT ALLOCATION, DUTY CYCLE

The foremost WSN goals are better channel utilization, scalability, less power consumption, less node cost, small node size, self-configurability, security, fault tolerance, QoS support and adaptability. The inbuilt battery is the core energy source in the wireless sensor network. Nodes in sensor networks possess very limited energy. The battery power should be sufficient for better performance. The lifespan of the WSN diminishes due to additional energy consumption. Because of more channel utilization throughput of the WSN decreases. WSN Medium Access Control (MAC) protocols for energy efficiency come from the cost of limited throughput and extra packet delay, meanwhile a sender is permitted to transmit in the small active time slot, only. Though, in typical applications, further in addition to short rate periodic traffic, similarly present burst traffic initiated upon event recognitions. As a result, there is an emerging necessity for a MAC protocol that adjusts its existing bandwidth to a dynamic traffic load. The MAC protocol should retain low duty-cycle in light traffic situation and plan additional transmission prospects when traffic upsurges so that the energy is simply used for transporting the application traffic at any time when needed. Accordingly, under great traffic load, the nonappearance of collisions makes them more efficient supportive high throughput.

Nevertheless, if the obtainable bandwidth does not maintain exactly the communication necessities, also bandwidth will be unused if nodes have not anything to transmit and queues will be constructed if nodes have extra to communicate than what fits in the distributed slots, leading to extended delays.

The other little duty-cycle protocols provide low energy efficiency according the assumption that the method has low rate interrupted traffic. Subsequently, there is leading need for a WSN protocol to obtain bandwidth dynamically with increasing traffic load, i.e., support low duty-cycle in less traffic circumstance and make available more data transmission when data traffic upsurges, that the energy is only used for transport the

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network traffic on every single situation.The approaches may have additional traffic overhead and extra energy consumption.

How to offer high throughput, short delay and a lesser amount of power consumption is leading problematic and investigation challenge in existing multichannel WSNs MAC protocols. Principally two MAC protocol kinds are applied in WSNs, contention-free and contention-based. The contention-free, usually based on Time Division Multiple Access (TDMA) and the contention-based usually based on Carrier Sense Multiple Access (CSMA) technique.

The contention free use bandwidth on request, without pre-allocating slots to nodes. It is very efficient and flexible in less traffic load conditions. Conversely, when the load grows, the amount of collisions and retransmissions intensely cut down their bandwidth effectiveness and make long delays. On the other hand, the contention based technique assign slots to nodes so that there is no contention as soon as gain access to the medium. As a result, in high traffic load, the nonappearance of collisions creates them very capable supporting great throughput. Conversely, if the accessible bandwidth does not match accurately the transmission necessities, either bandwidth will be misused if nodes have not anything to communicate or queues will construct up if nodes have further to transmit than whatever fits in the assigned slots, leading to extended delays. Consequently, so long as an adaptive protocol that is bandwidth effectual and acquires little delays from small to more traffic load circumstances necessitates not only a grouping of TDMA and CSMA mechanisms but also a uninterrupted adaptation of the TDMA part to track as precisely as probable the rapid communication necessities.

Duty cycle is termed as the division of time nodes which are active for the duration of their lifespan. Duty cycle is the ratio amongst listen time and the complete listen-sleep cycle. Duty cycling is frequently applied to decrease the energy ingestion make happen by idle listening in Wireless Sensor Networks (WSNs). Utmost studies on WSN procedures terms a collective duty cycle value throughout the system to accomplish bringing together among the nodes. The utmost common technique to lengthen the system lifespan in WSNs id to apply low duty-cycle. Duty cycle exploit the node redundancy in sensor network by putting in a sleep state all unnecessary sensors for connectivity. Three categories of duty cycle are sleep and wake, Duty cycle control from side to side topology management, and Low duty cycle collective with MAC protocols.Sleep and wake is independent from the network topology and MAC protocol. Low duty cycle collective with MAC protocols is incorporated in the MAC protocol. Duty cycle control from side to side topology management is exploiting the compact feature of sensor networks. Three techniques to reduce the duty cycle TDMA, Low power listening LPL and Schedule contention period. How to improve the energy efficiency by reducing the traffic improving duty cycle and lifetime to increase the overall system throughput and performance of the WSN.

The improvement of the lifespan and duty cycle of the WSN should be necessary for better data transmission. The WSN should have reduced traffic and energy efficiency to increases the overall system performance. Wireless sensor networks be able to be applied in a lot of fields. The countless applications[12] of wireless sensor network are health monitoring, smart building for example indoor climate control, industrial applications, logistics, precision agriculture, smart grids and energy control systems, transportations and health care for example medical health diagnostics and animal tracking, urban terrain tracking, entertainment, security and civil structure monitoring, and surveillance.Precisely following node request and dynamic distribution of time slots to data senders that have one or more queued packets. Precise transmission queue length i.e. load information with minimal overhead; Burst communication between nodes, for shortening the channel access delay; These features, predominantly provide the perfect information on the position of transmission queues, outcome in an extremely proficient protocol that, make available the finest performance to handle high traffic in WSNs.

III. LITERATURE SURVEY

Y. Sun, O. Gurewitz et al., For continuance communication Wise-MAC a contention-based method and procedures, relates"more-bit" data in the data packet header of messages. Receiver-initiated MAC RIMAC apply beacon as the ACK communication and subsequent progressing for uninterrupted transmission. Wise-MAC and RI-MAC have little throughput at high load for the reason that of collision amongst senders and receiver.

F. Osterlindet al [7] Z-MAC applies hybrid TDMA/CSMA method for static slot distribution and diminishes traffic overhead. In this system unoccupied slot can be applied by others. Because of static and fixed slot allocation the bandwidth is compact.

O. D. Incel et al [8],Strawman MAC diminishes the contention by applying additional collision data packets. The transmitter who has directed the lengthiest collision packet conquests the channel. But then the collision packets introduce an extensive quantity of disbursements to the network system. RCMAC improvements RI-MAC that designates the subsequent sender via ACK piggybacking to decrease collision. Conversely, how to assign bandwidth amongst senders is not indicated.

B. Nefzi et al.[9], CoSenS a suggested heavy burst protocol to make available traffic adaptation. It dynamically regulates the interval of its data accumulating time conferring to the assessed traffic load. The traffic assessment process is constructed on the weighted exponential average.

A. Dunkels et al [10].Contiki MAC proficiently incorporates numerous unique methods of other MACs WSNs, such as phase-lock, burst progressing, and data packet strobe. Conversely, Contiki MAC is mostly considered to handle little rate packets, it has no particular system to handle high traffic loads.

Shantanu et. al., Wireless Hart [11], the new IEEE802.15.4e and ISA100 standard are at present the utmost popular wireless solutions for industrialized applications. These standards make use of Time Slotted Channel Hopping (TSCH) method to make available deterministic robustness and transmissions. Conversely, at present, they nonexistence link setting up procedures which are critical for allocating frequency/slots resources in WSNs.

ShuguoZhuo et al.[12],Low duty cycle is all the time applied to increase the network lifespan in WSN. Its shortcoming is low throughput and long delay. It recommended combined TDMA/CSMA MAC protocol termed i Queue-MAC for bursty and dynamic traffic. In this method if less traffic in a system then i Queue-MAC practices a contention-based CSMA appliance that delivers low delay with disseminated transmissions if traffic is huge and load is dynamic that it uses i Queue-MAC alterations to a contention-free TDMA instrument assigning transmission slots. i Queue-MAC alleviates reduces packet delay, and packet buffering conjoining the best of CSMA as well as TDMA. i Queue method can be applied in both single channel and multi-channel mode. i Queue-MAC is capable to effectually use numerous channels, replicating its throughput when associated to on its own channel operation. It proposes a disseminated sub-channel selection procedure to allot distinctive sub-channels to routers system to organize the slotted communications in parallel. Compared to obtainable solutions, i Queue-MAC alleviate retransmission and contention by unstable concentrated senders into the TDMA slots epoch. The transmitters' queue-length info is piggybacked on message packet, accordingly that the time periods are allotted right upon queueing detection. The main step of i Queue-MAC is an effective closed loop control system that applies nodes' queue-length as the restrained output and applied adaptive time periods consignment as the control input to alleviate packets queueing. In circumstance, prior to i Queue-MAC, the analogous idea appeared into the FTT Flexible Time-Triggered prototype which is formerly recommended for Ethernet and CAN, i Queue-MAC makes it more suitable for WSNs.A research challenge in existing WSNs MAC protocols is to make available more throughput and little delay, although maintaining low power ingestion. Short duty cycle is all the time applied to expand the energy efficiency and network lifetime in WSN. The energy efficiency in WSN is key essential element for improved communication. The hardware condition is also good in WSN for better communication. If the channel utilization is more then throughput of the wireless sensor network reduces. Its drawback is extended delay and little throughput if traffic is more. The experimental conclusions signified the throughput of the WSN is improved by 6%. The WSN traffic can be reduced because of dynamic channel allocation. If energy efficiency and throughput improved then complete network performance also increased. The thesis suggested a method which improves lifetime, energy efficiency and duty cycle of WSN.

IV. CONCLUSION

WSN Medium Access Control protocols for energy efficiency come from the cost of limited throughput and extra packet delay, meanwhile a sender is permitted to transmit in the small active time slot, only. How to offer high throughput, short delay and a lesser amount of power consumption is leading problematic and investigation challenge in existing multichannel WSNs MAC protocols. The foremost WSN goals are better channel

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