Review Paper on Reduction in Overhead Latency in Wireless Sensor Network

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Abstract - **Industrial application of wireless sensor networks require timelines in exchanging messages among nodes. IEEE 802.15.4 is a standard to address the need for low-rate low-power low-cost wireless networking. In wired connection , the components such as actuators or sensors provides high performance besides wired links consist of many mechanical problems. Hence to achieve low latency , high performance wireless links are used which resolves the mechanical problem of wired links.**

***Index terms* – IEEE 802.15.4 , Jennic Code –Blocks, latency, Wireshark.**

I. INTRODUCTION

The different areas where IEEE 802.15.4 standard used are home automation, medical monitoring, energy meter monitoring, cloud computing etc. The home automation is readily available now a days and even there are many vendors in market providing suitable protocols in low cost to which it would be difficult to be in competition. Hence a project can be developed for monitoring the latency of wireless sensor network. In a network, latency, a synonym for delay, is an expression of how much time it takes for a packet of data to get from one designated point to another. Previously in the network, the nodes were connected with its neighboring nodes and hence a network was formed. As it was a wired network, a delay was the constraint factor making system undesirable. Hence to minimize the overhead latency, the wired links are replaced by the wireless module. The wireless module that will be used are RS485 and in place of wired links ,RF modules are used. Wireshark is the world's foremost network protocol analyzer. It lets you see what's happening on your network at a microscopic level.

II. BASIC COMPONENTS IN COMMUNICATION NETWORK

1. RS485-MODBUS:

It is a protocol which defines structure of message that controllers will recognize type of network over which it communicates. It defines a process in which it includes how controller will request access to another device, how it will respond to requests from the other devices, and how errors will be detected and reported. RS 485 is a half duplex system which allows transmission up to 1.2 km. Communication on a MODBUS Network is initiated by a “Master” with a “query” to a “Slave”. The “Slave “ which is constantly monitoring the network for “Queries” will recognize only the “Queries” addressed to it and will respond either by performing an action or by returning a “response”. Only the Master can initiate a query. In the MODBUS protocol the master can address individual slaves, or, using a special “Broadcast” address, can initiate a broadcast message to all slaves. A MODBUS message has defined beginning and ending points. The receiving devices recognize the start of the message, read the “Slave Address” to determine if they are being addressed and know when the message is completed so that they can use the Error Check bytes to confirm the integrity of the query. Partial messages can be detected and discarded.

2. RF MODULE:

An RF i.e Radio Frequency module is used for transmission or reception of data between two or more devices. Radio Frequency communication allows to communicate wirelessly between the nodes. The corresponding frequency range varies between 30 kHz & 300 GHz.This **RF module** comprises of an **RF Transmitter** and an **RF Receiver**. The transmitter/receiver (Tx/Rx) pair operates at a frequency of **434 MHz**. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

3.WIRESHARK-NETWORK ANALYZER:

Wireshark is the network protocol analyzer. It allows to see what is happening on the network at a microscopic level. It is the standard used across many industries and educational institutions.

4.JN5139:

The JN5139 is a low power, low cost wireless microcontroller suitable for IEEE802.15.4 and ZigBee applications. To minimize this complexity, Jennic provides a series of software libraries and interfaces that control the transceiver and peripherals of the JN5139.

III OBJECTIVES

1. To analyze latency:

In a network, latency, a synonym for delay, is an expression of how much time it takes for a packet of data to get from one designated point to another. In some usages, latency is measured by sending a packet that is returned to the sender and the round-trip time is considered the latency. The latency assumption seems to be that data should be transmitted instantly between one point and another (that is, with no delay at all). The contributors to network latency include:

- **Propagation:** This is simply the time it takes for a packet to travel between one place and another at the speed of light.
- **Transmission:** The medium itself (whether optical fiber, wireless, or some other) introduces some delay. The size of the packet introduces delay in a round trip since a larger packet will take longer to receive and return than a short one.
- **Router and other processing:** Each gateway node takes time to examine and possibly change the header in a packet (for example, changing the hop count in the time-to-live field).

2. To minimize the latency:

In a network, a predefined threshold is set, that is with which the data reaches destination without delay. If it finds that the rate at which data has reached is more than the threshold, then to minimize the latency is main objective.

3. Analysis of network-wireshark:

First, the network can be formed by having two nodes. A connection is established between these nodes. After the successful connection between the two nodes, network can be made larger by adding more nodes in the routing path. To analyze the network, Wireshark algorithm is used.

IV. LITERATURE REVIEW

[1] IEEE Transaction on "Guaranteeing Real-time services for Industrial Wireless Sensor Networks with IEEE 802.15.4,Seong-eun Yoo,Poh Kit Chong, Daeyoung kim,Yoonmee Doh,Minh-Long Pham,Eunchang Choi and Jaedoo Huh"

Concept of paper : Industrial wireless sensor networks require real-time data transmission. IEEE 802.15.4 provides GTS for real-time messages, but it has limitations. The scheduling algorithm can schedule a given periodic real-time message set, and the algorithm determines the appropriate standard specific parameters such as GTS descriptor to meet the timing constraints. In this paper, it had distance constraint too.
Proposed work: To minimize the delay , the master that requires data will only query the request to coordinator , others will be in sleep mode. Hence transmission time will be shortened.

[2] Marco Gribaudo,Dsniele Manini, Alessandro Nordio, Carla-Fabiana Chiasserini "Transient Analysis of IEEE 802.15.4 Sensor Networks", IEEE transactions on wireless communications, vol. 10, no. 4, april 2011.

Concept of paper: In this paper the transient analysis of the system was carried out when sensors detect the event and attempt to send their report to central controller. Both single and multi-hop networks were considered. But it had some time lag between nodes.
Proposed work: The IEEE 802.15.4 protocol can be combined stochastic model for checking specified time deadline and required reliability. In Real time applications, time is the basic content to be considered. The time lag may cause catastrophe. Once the data is lost, the recovery has to be done very instatantly. Hence this limitation is modified in the project.

[3] Haifeng Zheng, Shilin Xia, Xinbing Wang, Xiaohua Tian,"Energy and Latency Analysis for In-network Computation with Compressive Sensing in Wireless Sensor Networks",The 31st annual IEEE International Conference.

Concept of paper: In this paper, the application of compressive sensing for data gathering from the perspective of in-network computation in wireless sensor networks have been studied. Here,two protocols for computing such a function in centralized and distributed fashions, respectively have been designed. For these two computation protocols, the performance of in-network computation in terms of energy consumption and latency have been studied. But it failed to explain the delay for aggregation of data in wireless sensor network.
Proposed work: To overcome the delay problem, a coordinator is assembled with data logger so that instantaneous data can be passed on to requested master.

[4] Lijie Xu, Jiannong Cao, Shan Lin, Haipeng Dai, Xiaobing Wu and Guihai Chen, "Energy-efficient Broadcast Scheduling with Minimum Latency for Low-Duty-Cycle Wireless Sensor Networks", 2013 IEEE 10th International Conference on Mobile Ad Hoc and Sensor Systems.

Concept of paper: In this paper, randomized-rounding based method is used for reducing latency but it had redundant transmissions and unnecessary collisions.
Proposed Work: To overcome collision, reverse mechanism will be implemented. Previously whenever coordinator had data to send, it used to data to all masters resulting collision. Hence to imply a solution for this is by sending a request to data logger (coordinator) so that only the master who requested will receive the respected data.

V. CONCLUSION AND FUTURE WORK

To improve latency, minimize delay the system is having a data logger. Data logger stores reading or data remotely or locally to access any of the device in the network at any time. When any of the master amongst the network receives data, the neighboring masters are in sleep mode. Hence delay is minimized and latency is improved.

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VII. REFERENCES

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