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REVIEW PAPER ON ANALYSIS OF COMMUNICATION OVERHEAD IN WIRELESS SENSOR NETWORK

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ABSTRACT

Wireless Sensor Networking is a network of wireless sensor nodes deployed in an area. Wireless Sensor Network (WSN) system is built on an IEEE 802.15.4 wireless mesh network. The wireless sensor network consists of the sensor nodes. A wireless sensor network (WSN) is a wireless network using sensors to cooperatively monitor physical or environmental conditions such as humidity, pressure, temperature, sound, vibration. The reduction of energy overhead is a major challenge in wireless sensor networks. The idea of development of wireless sensor networks was initially motivated by military applications. A WSN provides a reliable, low maintenance, low power method for making measurements in applications where cabled sensors are impractical or otherwise undesirable. Wireless Sensor Networks are used for monitoring and collecting information from an unattended environment and for reporting events to the user. The communication overhead in cluster based protocol is much less than the Broadcast based method (BBM) based protocol as the velocity of nodes increases. The energy loss can be minimizing by reducing the communication overhead but it may lead to information loss during the transient behavior of WSN. We present work; the comparative evaluation of communication overhead for the wireless sensor network based of on clustering technique is carried out. Simulation a result indicates that cluster based protocol has low communication overheads compared with the BBM based protocol when sink mobility is high. The communication overheads can be reduced by increasing update time.

Keyword: WSN, BBM, Clustering etc.

I. INTRODUCTION

WSN have many restrictions compared to Ad-Hoc network in terms of its sensor nodes capability of memory storage, processing and the available energy source. The NI Recent advancements in micro electronics, wireless communication, and low-cost sensor technologies have enabled the emergence and evolution of WSN as a new paradigm of computer networking [1]. A wireless sensor network WSN is a network of spatially distributed sensor nodes that communicate wirelessly to cooperatively monitor physical conditions such as pressure, vibration, temperature, or image of a target. In recent years, WSNs have been incorporated into many applications, such as environmental monitoring, structural monitoring, surveillance systems, and medical monitoring machine condition monitoring. The advantages of using WSNs over wired sensing systems include easy deployment and adaptable network topology, increased portability and network scalability no cable installation and maintenance costs. The concept of wireless sensor networks is based on a simple (Sensing + CPU + Radio = Thousands of potential applications). Figure 1 shows a typical NI Wireless Sensor Network, in which the three WSN measurement nodes are configured as end nodes.

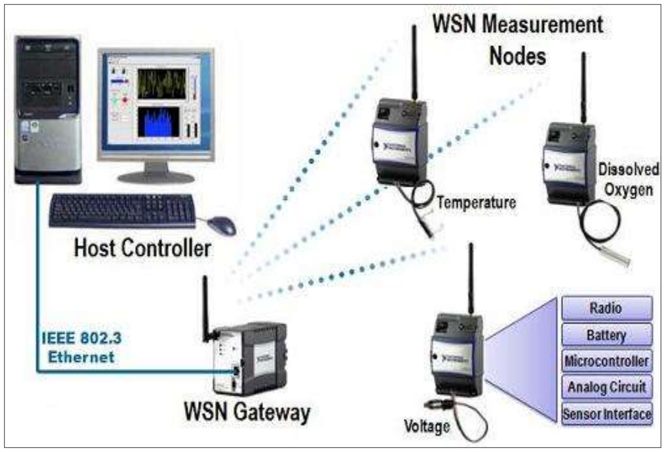

Fig.1: Basic WSN System with End Nodes, Ethernet Gateway, and Host PC

Recently, techniques of dynamic reconfiguration have attracted increasing attention from the research community. These techniques enable reconfiguration of the sensor network hardware at run time to adapt to external dynamics, providing an innovative approach to designing an energy-efficient WSN in a highly dynamic environment. Due to advances in hardware technology, several reconfiguration techniques have been developed on the sensor node level. These include Dynamic modulation scaling (DMS) (used to reconfigure modulation schemes in communication), dynamic voltage scaling (DVS) (used to reconfigure voltages and operating frequency of processors), adaptive sampling rate (used to change the sampling rate of sensors), and intelligent node activation (used to change sensor node status). The protocol design for WSNs in control applications encounters more challenges than traditional WSN applications, namely.

A. Reliability

Sensor readings must be sent to the sink of the network with a given probability of success, because missing sensor readings could prevent the correct execution of control actions or decisions. However, maximizing the reliability may increase the network energy consumption substantially [2] Hence, the network designers need to consider the tradeoff between reliability and energy consumption.

B. Delay

Sensor information must reach the sink within some deadline. Time delay is a very important QoS measurement since it influences performance and stability of control systems. The delay jitter can be difficult to compensate for, especially if the delay variability is large. Hence, a probabilistic delay requirement must be considered instead of using average packet delay. Furthermore, the packet delay requirement is important since the retransmission of data packet to maximize the reliability may increase the delay. Outdated packets are generally not useful for control applications.

C. Energy Efficiency

The lack of battery replacement, which is essential for affordable WSN deployment, requires energy-efficient operations. Since high reliability and low delay may require significant energy consumption, the re requirements. Note that controllers can usually tolerate a certain degree of packet losses and delays. Hence, the maximization of the reliability and minimization of the delay are not the optimal design strategies since these strategies will significantly decrease the network lifetime.

D. Sensor Traffic Patterns

The type and amount of data to be transmitted is also important when considering control applications. Control signals can be divided into two categories: real-time and event based. For real-time control, signals must be received within a specified deadline for correct operation of the system. In order to support real-time control, networks must be able to guarantee the delay of a signal within a specified time deadline. Hence, heavy traffic may be generated if sensors send data very frequently. Event-based control signals are used by the controller to make decisions but do not have a time deadline. The decision is taken if the system receives a signal or a timeout is reached. We remark here that some of the proposed protocol for environmental monitoring application, such as XMAC and Fetch, operate in low traffic networks and cannot handle the higher traffic loads of many control applications.

E. Adaptation

The network operation should adapt to application requirement changes, time-varying wireless channels, and variations of the network topology. For instance, the set of application requirements may change dynamically and the communication protocol must adapt its parameters to satisfy the specific requests of the control actions. To support analytical model-based design instead of experience-based design, it is essential to have analytical models describing the relation between the protocol parameters and performance indicators (reliability, delay, energy consumption, etc).

F. Scalability

Since the processing resources on WSN nodes are limited, the calculations necessary to implement the protocol must be computationally light. These operations should be performed within the network, to avoid the burden of too much communication with a central coordinator. Therefore, the tradeoff between tractability and accuracy of the analytical model is very important. The protocol should also be able to adapt to variation in the network size, for example, size variations caused by the addition of new nodes.

I. WSN Topology

The possible topologies include star (single-hop), mesh (multi-hop) and hybrid (cluster-tree), presented in Fig. 2. The advantage of the star topology is energy efficiency and long lifetime, even if a node collapses. Namely, energy is not consumed on listening to network changes and relaying messages between the nodes, as in case of multi-hop architecture. As a disadvantage of the star topology, smaller number of nodes compared to the multi-hop network is allowed. However, this may not be a problem, if the coordinators use wired links. On the other hand, the multi-hop networks have a longer range and since all the nodes are identical, separate sink nodes are not necessarily needed. However, in addition to the aforementioned energy consumption, the network may suffer from increased latency. The hybrid architecture attempts to combine the low power and simplicity of the star topology as well as the longer range and self-healing of the mesh network. Also in this approach, nonetheless, the latency may still be a problem.

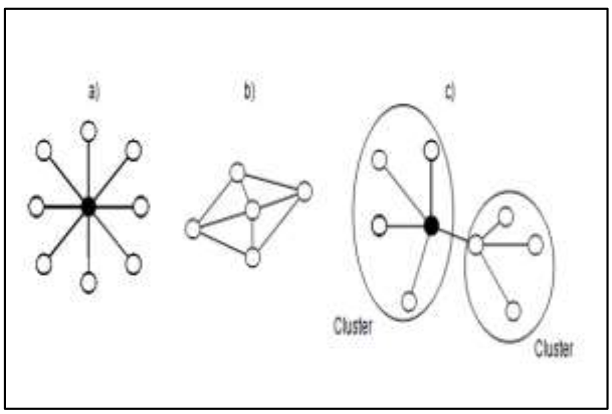

Fig. 2: WSN topologies. (a) Star, (b) mesh and (c) hybrid

II. PERFORMANCE MANAGEMENT IN WSN

Admission control needs to be seen in the context of other necessary functions, especially performance measurements and control. In this section we briefly present the performance management system that admission control is a part of. The performance manager consists of the following functions: a performance meter that collects measurement data; admission control that handles requests to join the network; and performance control that maintains the quality of service for the admitted sensor nodes. The performance meter provides feedback measurement data for admission control and performance control.

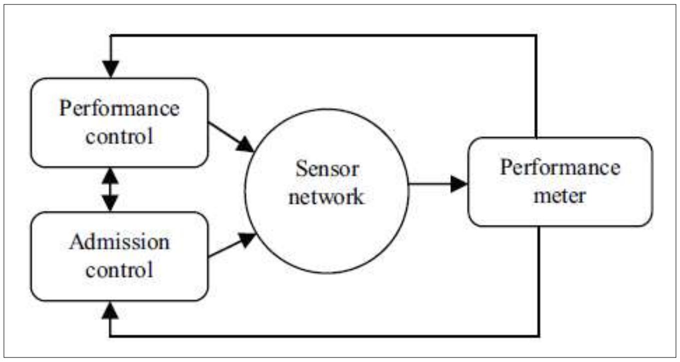

Fig. 3: The performance manager consists of admission control and performance control. The performance meter supports the manager with measurement data.

Figure 3 shows the relation ship between these functions. A request from a sensor node to join the network is handled by the admission control based on feedback from the meter. The performance control function is responsible for maintaining the desired quality of service once the sensors are allowed to use the wireless channel.

III. PERFORMANCE MONITORING AND CONTROL

Figure 4 shows a configuration with a set of sensor nodes (e.g.
a combination of wearable sensors such as ECGs, accelerometers and pulse-oximeters, and fixed environment sensor nodes), a coordinator, one or several intermediate nodes with routing and forwarding capabilities. The application program, running in the coordinator, processes sensor data from the sources and sends the information along with an estimate of the information quality to the remote end-user application or presentation and storage. The information quality can be expressed in terms of e.g. the statistical uncertainty of estimated parameters and the highest frequency component in a signal to be recovered by the receiver.

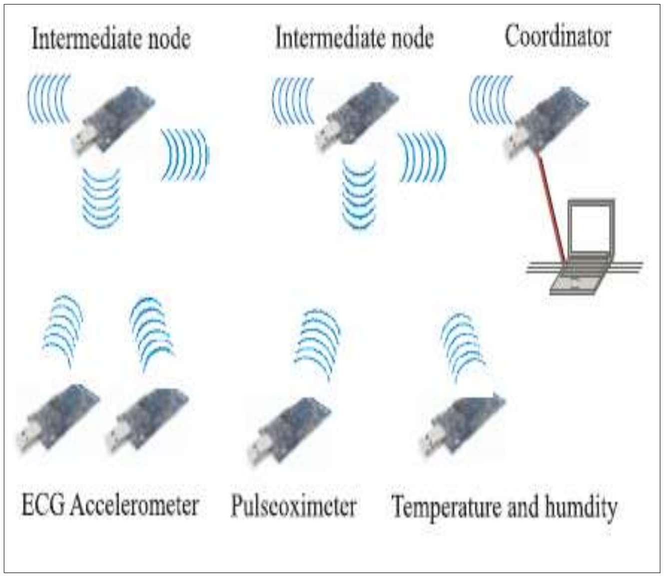

Fig.4: A scenario where performance control is implemented in the coordinator and source nodes.

Networked control, be it wired or wireless, set some new challenges for the design and performance of the control systems: (1) Real-time requirement, (2) Band-limited channels, (3) Network delay, (4) Data consistency (packet dropout), (5) Network architectures, (6) Multipath fading.

IV. CONCLUSION

A wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices using sensors to monitor physical or environmental conditions. The wireless protocol you select depends on your application requirements. Some of the available standards include 2.4 Hz radios based on either IEEE 802.15.4 or IEEE 802.11 (Wi-Fi) standards or proprietary radios, which are usually 900 MHz. Future research on WSN will be directed towards maximizing area throughput in clustered Wireless Sensor Networks designed for temporal or spatial random process estimation, accounting for radio channel, PHY, MAC and NET protocol layers and data aggregation techniques, simulation and experimental verification of lifetime-aware routing, sensing spatial coverage and the enhancement of the desired sensing spatial coverage evaluation methods with practical sensor model.

REFERENCES

I. Thomas Lindh, Ibrahim Orhan ***"Performance Monitoring and Control in Contention-Based Wireless Sensor Networks"*** .
II. Ibrahim Orhan, Thomas Lindh ***"Measurement-Based Admission Control in Wireless Sensor Networks"*** The Third International Conference on Sensor Technologies and Applications, Sensorcomm 2010 July 2010,
III. Shiv Prasad Kori1, Dr. R. K . *Baghel* ***"Evaluation of Communication Overheads in Wireless Sensor Networks"*** International Journal of Engineering Research (ISSN : 2319-6890) Volume No.2, Issue No.2, pp : 167-171.
IV. Prof. Arivanantham Thangavelu, Prof. Abha Pathak ***"Clustering Techniques to Analyze Communication Overhead in Wireless Sensor Network"*** *ISSN (e): 2250 – 3005,Vol, 04, Issue, 5,May – 201.*
V. Martin Enzinger ***"Energy-efficient communication in Wireless Sensor Networks"*** Seminar SN SS2012 doi: 10.2313/NET-2012-08-2_04 Network Architectures and Services, August 2012