MULTIPATH ROUTING FOR DATA INTEGRITY AND DELAY DIFFERENTIATED SERVICES IN WIRELESS SENSOR NETWORKS USING COLD SPOT TECHNIQUE

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Abstract: Each application have different Qos (quality of service) in same platform on wireless sensor network. We are proposing coldspots technique and multi path relay algorithm using coldspots technique. It improve the data fidelity and end to end delay of the sensitive to overcome problems like delay minimization and high data integrity and data fidelity. By applying a virtual hybrid potential field IDDR separates packets based on their weight. And the packets are forwarded to the destination through different path applications. Data fidelity can be improved by collecting idle buffer space or under loaded paths to cache excessive packets. For prioritizing packets transmission we are using lyapunov drift technique. IDDR also provide good energy efficiency and scalability. Cold spot technique is proposed to identify the idle buffer space under loaded paths and fill those paths by the efficient packets.

Keywords : **Wireless Sensor Networks, IDDR, Data intergrity, Potential field, Coldspot technique**

I. INTRODUCTION

A wireless sensor network (WSN) (sometimes called a wireless sensor and actuator network (WSAN)).The more modern networks are bi-directional, also enabling control of sensor activity. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. A sensor node might vary in size from that of a shoebox down to the size of a grain of dust, although functioning "motes" of genuine microscopic dimensions have yet to be created. The cost of sensor nodes is similarly variable, ranging from a few to hundreds of dollars, depending on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources such as energy, memory, computational speed and communications bandwidth. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. In computer science and telecommunications, wireless sensor networks are an active research area with numerous workshops and conferences arranged each year. One major challenge in a WSN is to produce low cost and tiny sensor nodes. There are an increasing number of small companies producing WSN hardware and the commercial situation can be compared to home computing in the 1970s. Many of the nodes are still in the research and development stage, particularly their software. Also inherent to sensor network adoption is the use of very low power methods for radio communication and data acquisition. In many applications, a WSN communicates with a Local Area Network or Wide Area Network through a gateway. The Gateway acts as a bridge between the WSN and the other network. This enables data to be stored and processed by devices with more resources, for example, in a remotely located server. It is therefore possible to use embedded operating systems such as eCos or uC/OS for sensor networks. However, such operating systems are often designed with real-time properties. TinyOS is perhaps the first operating system specifically designed for wireless sensor networks. TinyOS is based on an event-driven programming model instead of multithreading. TinyOS programs are composed of event handlers and tasks with run-to-completion semantics. When an external event occurs, such as an incoming data packet or a sensor reading, TinyOS signals the appropriate event handler to handle the event. Event handlers can post tasks that are scheduled by the TinyOS kernel some time later. LiteOS is a newly developed OS for wireless sensor networks, which provides UNIX-like abstraction and support for the C programming language. Contiki is an OS which uses a simpler programming style in C while providing advances such as 6LoWPAN and Protothreads. Online collaborative sensor data management platforms are on-line database services that allow sensor owners to register and connect their devices to feed data into an online database for storage and also allow developers to connect to the database and build their own applications based on that data. Examples include Xively and the Wikisensing platform. Such platforms simplify online collaboration between users over diverse data sets ranging from energy and environment data to that collected from transport services. Other services include allowing developers to embed real-time graphs & widgets in websites; analyse and process historical data pulled from the data feeds; send real-time alerts from any data stream to control scripts, devices and environments. The architecture of the Wiki sensing system describes the key components of such systems to include APIs and interfaces for online collaborators, a middleware containing the business logic needed for the sensor data management and processing and a storage model suitable for the efficient storage and retrieval of large volumes of data. Routing is the process of selecting best paths in a network. In the past, the term routing also meant forwarding network traffic among networks. However, that latter function is better described as forwarding. Routing is performed for many kinds of networks, including the telephone network (circuit switching), electronic data network (such as the Internet), and transportation networks. General-purpose computers can also forward packets and perform routing, though they are not specialized hardware and may suffer from limited performance. The routing process usually directs forwarding on the basis of routing tables, which maintain a record of the routes to various network destinations. Thus, constructing routing tables, which are held in the router's memory, is very important for efficient routing. Most routing algorithms use only one network path at a time. Multipath routing techniques enable the use of multiple alternative paths.

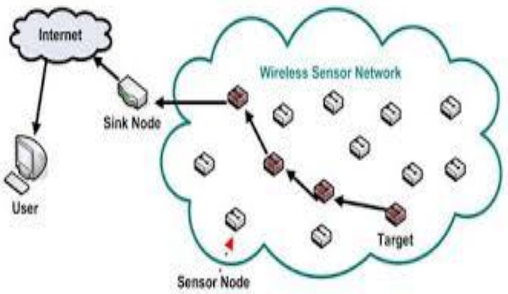


Figure 1: Wireless Sensor Network

II.RELATED WORK

[1] In this paper they have proposed gradient routing with two-hop information for industrial wireless sensor networks to enhance real-time performance with energy efficiency. Two-hop information routing is adopted from the two-hop velocity-based routing, and the proposed routing algorithm is based on the number of hops to the sink instead of distance. Additionally, an acknowledgment control scheme reduces energy consumption and computational complexity. The simulation results show a reduction in end-to-end delay and enhanced energy efficiency. The routing algorithm is a major research area in wireless sensor networks. The Internet Engineering Task Force (IETF) workgroup on routing over low power and lossy networks (ROLL) recently standardized a gradient routing for data collection in WSNs. In gradient routing was implemented in constrained WSNs with topological changes. To enhance real-time properties of IWSNs, researchers have proposed various routing schemes. Recently, Jung *et al.* On-demand multi hop look-ahead-based real-time routing protocol (OMLRP) affording on-demand acquisition of neighbourhood information around data-forwarding paths, allowing a lighter message exchange overhead than with THVR. However, neither THVR nor OMLRP optimizes the number of hops needed to relay the packet to the sink, thus resulting in greater energy consumption and delay. By combining THVR and a gradient-based network, the optimal path is archived in terms of the number of hops and reduces energy consumption. Multichannel access cannot be combined.

[2] A new localized quality of service (QoS) routing protocol for wireless sensor networks (WSN) is proposed in this paper. The proposed protocol targets WSN's applications having different types of data traffic. It is based on differentiating QoS requirements according to the data type, which enables to provide several and customized QoS metrics for each traffic category. With each packet, the protocol attempts to fulfil the required data-related QoS metric(s) while considering power efficiency. It is modular and uses geographical information, which eliminates the need of propagating routing information. For link quality estimation, the protocol employs distributed, memory and computation efficient mechanisms. It uses a multi sink single-path approach to increase reliability. To our knowledge, this protocol is the first that makes use of the diversity in data traffic while considering latency, reliability, residual energy in sensor nodes, and transmission power between nodes to cast QoS metrics as a multi objective problem. The proposed protocol can operate with any medium access control (MAC) protocol, provided that it employs an acknowledgment (ACK) mechanism. Extensive simulation study with scenarios of 900 nodes shows the proposed protocol outperforms all comparable state-of-the-art QoS and localized routing protocols. Moreover, the protocol has been implemented on sensor motes and tested in a sensor network testbed.

[3] Sensor networks that carry heterogeneous traffics and are responsible for reporting very time-critical important events necessitate an efficient and robust data dissemination framework. Designing such a framework, that can achieve both the reliability and delay guarantee while preserving the energy efficiency, namely multi-constrained QoS (MCQoS), is

a challenging problem. Although there have been many research works on QoS routing for sensor networks, to the best of our knowledge, no one addresses the above three service parameters all together. In this paper, we propose a new aggregate routing model and a distributed aggregate routing algorithm (DARA) that implements the model for achieving MCQoS. DARA is designed for multi-sink, multipath and location aware network architecture. We develop probabilistic models for multipath reliability constraint, sojourn time of a packet at an intermediary node and node energy consumption. Delay-differentiated multi-speed packet forwarding and in node packet scheduling mechanisms are also incorporated with DARA. The results of the simulations demonstrate that DARA effectively improves the reliability, delay guarantee and energy efficiency.

[4] In this paper, they have presented a novel packet delivery mechanism called Multi-path and Multi-Speed Routing Protocol (MMSPEED) for probabilistic QoS guarantee in wireless sensor networks. The QoS provisioning is performed in two quality domains, namely, timeliness and reliability. Multiple QoS levels are provided in the timeliness domain by guaranteeing multiple packet delivery speed options. In the reliability domain, various reliability requirements are supported by probabilistic multipath forwarding. All these for QoS provisioning are realized in a localized way without global network information by employing localized geographic packet forwarding augmented with dynamic compensation, which compensates the local decision inaccuracy as a packet travels towards its destination. This way, MMSPEED can guarantee end-to-end requirements in a localized way, which is desirable for scalability and adaptability to large scale dynamic sensor networks. Simulation results show that MMSPEED provides QoS differentiation in both reliability and timeliness domains and, as a result, significantly improves the effective capacity of a sensor network in terms of number of flows that meet both reliability and timeliness requirements.

[5] Timely wireless communication is essential to allow real-time mobile applications, such as communication between mobile robots or inter-vehicle communication to be realized. The real-time event-based communication paradigm has been recognized as an appropriate high level communication scheme to connect autonomous components in large distributed control systems. In this work, they have presented an analysis of the impact of mobile ad hoc wireless networks on achieving real-time guarantees. They introduce an ongoing work on th e use of a proactive routing and resource reservation protocol using mobility awareness and prediction to reduce the unpredictability of a dynamic mobile ad hoc wireless network. With the increased research in ad hoc networks in recent years new application domains such as communication between mobile robots and inter-vehicle communication have evolved. Timely communication is essential to allow applications in these domains to be realized. The real-time event-based communication paradigm has been recognized as an appropriate high-level communication scheme to connect autonomous components in large distributed control systems. In this paper, the impact of mobile ad hoc wireless characteristics particularly dynamic mobility, dynamic connectivity and limited resource availability on real-time guarantees is analysed.

[6]A new packet scheduling policy called velocity monotonic scheduling that inherently accounts for both time and distance constraints. We show that this policy is particularly suitable for communication scheduling in sensor networks in which a large number of wireless devices are seamlessly integrated into a physical space to perform real-time monitoring and control. Detailed simulations of representative sensor network environments demonstrate that RAP significantly reduces the end-to-end deadline miss ratio in the sensor network. It is envisioned that sensor nodes will operate in groups, since individual nodes are too limited and unreliable to perform useful activities from the application's perspective. Group activities require coordination and communication among member nodes. Sensing results of groups need to be sent back to base stations through multi-hop communication. Thus, the main schedulable resource becomes the wireless communication channel. Progress of user-level activities and their ability to meet end-end deadlines are therefore determined by scheduling of the communication medium rather than scheduling of the processor. Towards that end, new real-time communication architectures are required for ad hoc wireless environments.

S.No	Paper Title	Limitation
1	Enhancing real-time delivery of gradient routing for industrial wireless sensor networks	Multichannel access cannot be combined
2	Traffic-differentiation-based modular Qos localized routing for wireless sensor networks	Multiqueing can be implemented only at lower layers of network
3	Multi-constrained QoS geographic routing for heterogeneous traffic in sensor networks	It has different computational power,
4	MMSPEED: Multipath multi-speed protocol for QoS guarantee of reliability and timeliness in wireless sensor networks	Balancing power consumption is not concentrated in this system.

5	Achieving real-time guarantees in mobile ad hoc wireless networks	Failed to evaluate the route latency.
6	RAP: A real-time communication architecture for large-scale wireless sensor networks	Security and reliability aspects are not discussed.

Table 1: Limitations

III.EXISTING SYSTEM

In the existing system, they have used IDDR algorithm, a physics based technique. By constructing a virtual hybrid potential field, IDDR separates packets of applications with different QoS requirements according to the weight assigned to each packet, and routes them towards the sink through different paths to improve the data fidelity for integrity-sensitive applications as well as reduce the end-to-end delay for delay-sensitive ones. Simulation results demonstrate that IDDR provides data integrity. WSNs have two basic QoS requirements: low delay and high data integrity, leading to what are called delay sensitive applications and high-integrity applications, respectively. However, a heavily loaded network will suffer congestion, which increases the end-to-end delay. On the other hand, some applications require most of their packets to successfully arrive at the sink irrespective of when they arrive. For example, in habitat monitoring applications, the arrival of packets is allowed to have a delay, but the sink should receive most of the packets. To overcome these problems, Integrity and Delay Differentiated Routing Algorithm is been used.

IV.PROPOSED SYSTEM

Each application has different Qos (quality of service) in same platform on wireless sensor network. This may lead to high delay and low integrity. By applying a virtual hybrid potential field IDDR separates packets based on their weight. And the packets are forwarded to the destination through different paths using multipath routing algorithm. Cold spot technique is proposed to identify the idle buffer space or under loaded paths and fill those paths by the efficient packets. In the proposed system along with IDDR, we have proposed Cold spot technique. IDDR separates the packet weight wise. IDDR follows the physics technique i.e. Potential field which provides the multipath for the easy delivery of packets to the sink. Cold spots are responsible for identifying the buffer space and under loaded paths and those paths are made into efficient way for delivery of packets. This tends to low end-to-end delay and high integrity of data.

V.IDDR AND POTENTIAL FIELD

DDR differentiate the packet using weight values in header of packets and then perform different actions. Potential Field whose shape looks like a bowl. All data packets are transmitted to the bottom along the surface like water. In WSNs with light traffic, IDDR works similar to the shortest path routing algorithm. But in WSNs with heavy load, large backlogs will form some bulges on the bowl surface. The bulges will block the paths and prevent packets from moving down to the bottom directly.

VI.ALGORITHM

WSN with different high-integrity or delay-sensitive applications. Let c be the identifier of different applications. In summary, the main procedure of the IDDR algorithm at node i works as follows:

1. If the queue at node i is not empty, then α' = α+ packet weight÷0xffis computed for packet p at the head of the queue.

2. Let Wi,b (t)={(Qi (t) +α(c) Di (t)) –(Qb (t) +α(c) Db (t))}Select the next hop b* =argmaxb belongs **Ω** i(t) ,Q j (t) ≠ 1 W i,b (t).

3. Node i send packet p to node b. Go to (1).

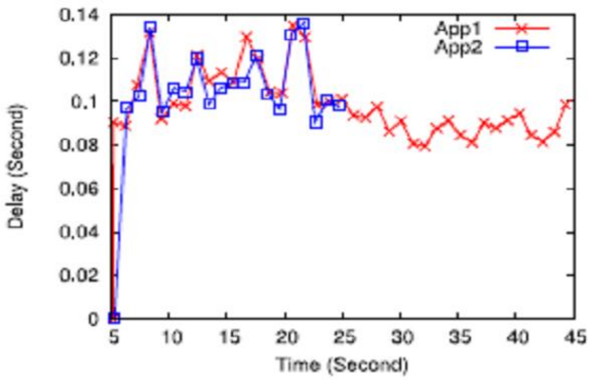
VII.DPLC MECHANISM

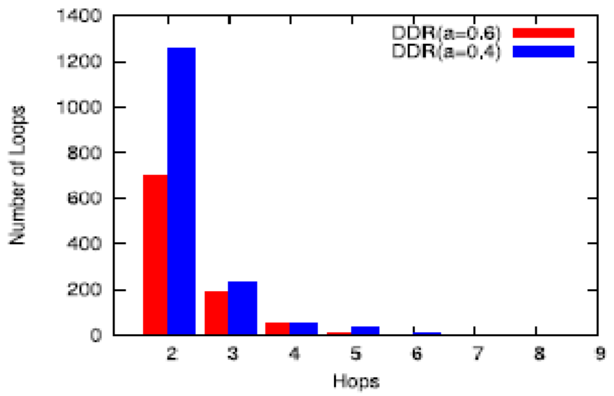
DPLC more efficient in terms of channel utilization, we incorporate a lightweight and accurate link estimation method that captures both physical channel conditions and interferences. We further provide two easy-to-use services, i.e., small message aggregation and large message fragmentation, to facilitate upper-layer application .The work of requires the sender to measure the channel availability period for adaptation. The fragmentation service is useful for bulk data transmission. Aggregation Service is useful for small data collection. Aggregation Service send the data to sink node.

Cold spot and Power aware metrics

Cold spot if the utilizations of all its resources are below a cold threshold. This indicates that the server is mostly idle and a potential candidate to turn off to save energy. Transmission power depends on distance between nodes and corresponding shortest power algorithm .power cost metrics based on combination of both nodes life time and distance based power metrics.

SIMULATION AND RESULTS





Evaluate the Priority Queue: End to End Delay

VIII.CONCLUSION

Concept of potential in in physics to satisfy the two different QoS requirements, high data fidelity and low end-to-end delay, over the same WSN simultaneously. IDDR provides good scalability.

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