A Survey on Real-Time Routing using Multichannel in Wireless Sensor Network

Chanchal Sahu
Department of Computer Science and Engineering
Bhilai Institute of Technology, Durg
neha24sahu@gmail.com

Ashok Kumar Behera
Department of Computer Science and Engineering
Bhilai Institute of Technology, Durg
ashokctc15@gmail.com

Shankha De
Department of Computer Science and Engineering
Bhilai Institute of Technology, Durg
Shankhada2009@gmail.com

Abstract

Wireless sensors nodes are made up of small electronic devices which are capable of sensing, computing and transmitting data from harsh physical environments like a surveillance field. These sensor nodes majorly depend on batteries for energy, which get depleted at a faster rate because of the computation and communication operations they have to perform. Communication protocols can be designed to make efficient utilization of energy resources of a sensor node and to obtain real time functionality. Due to the restricted communication range and has the ability to provide high performance by more rigorously countering interference, collisions and re-transmissions, packet forwarding in sensor networks is performed through multi-hop data transmission.

According to the aim of this survey paper at present time the fundamental concept of multichannel routing approach and their challenges, as well as the more utilization of this technique in wireless sensor networks. In addition we present the pros and cons of this technique, comparative analysis of various existing survey of real-time multichannel routing protocols and efficient transmission in wireless sensor networks and their various challenges for future research are presented.

Keywords: *Wireless Sensor Networks (WSNs), Real-Time Multichannel Routing Protocols (RTMPs), Sensor Nodes (SNs).*

1. Introduction

In Wireless Sensor Networks (WSNs), sensors gather information about the physical world and base station makes appropriate decision upon the environment. This technology enables users to effectively sense and monitor from a distance. WSN are slated to become very popular in the near future. It allows video/audio streaming to be transferred between sensor nodes in real-time. WSN can use real-time forwarding which means messages in the network are delivered according to their end-to-end deadlines (packet lifetime).WSN is a wireless ad hoc network that consists of very large number of sensor nodes which are densely deployed either inside an event area or in proximity. WSN enable reliable monitoring and analysis of a physical environment. It is very different from traditional networks; as it comprises of a large number of nodes that produce very large amount of

data. However, WSNs are not free of certain constrains, for example power, computational capacities, and memory. Due to these inherent properties, conventional management schemes are not appropriate to manage sensor networks and thus, a new management scheme is needed [1].

Real-time communication is necessary in many WSN applications. For example, in a fire fighting application, appropriate actions should be made in the event area immediately as delay may cause huge damages further. The sensor data collected and delivered must still be valid at the time of decision making since late delivery of data may endanger the fire fighter's life.

Real-time routing protocol work is based on link quality, packet velocity over one-hop and remaining power in the sensor devices. Real-time communication is necessary in many WSN applications. For example, in chemical plant, the chemical leakage should be informed in similarly, fire fighter should timely relay the temperature updates. Therefore, the safety measures may timely initiate. In this way, the WSNs may help to monitor and control the synchronous and asynchronous events that require real-time and reliable data delivery.

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In this survey paper focus on enhance the performance of packet switching to higher-energy level should be optimized for energy overhead reduction and we may follow the multichannel accessing mechanism with RTP routing which is investigated in this survey.

2. Comprehensive survey of related Articles

According to best of our knowledge and on the basis of brief literature survey we can analyze the conclusion and motivation based on empirical studies:-

Table I

Summary features and conclusions from documents in literature reviews:-

S.No.	Document	Authors Name	Focus/objective	Major Findings/Conclusion
1.	A survey of routing technique in WSN (June 2013)	Sandhya Rachmalla , Dr. Anitha sheela Kancharla	Comparative study of various real-time routing protocols and their important factors [10].	After these survey authors finding "The energy matrix is inversely proportional to the time domain in real time application systems [10].

2.	MCRT: Multi-channel Real-Time Communication in WSNs	Xiaorui Wang, Xiaodong Wang, Xing Fu and Guoliang Xing	MCRT can effectively utilize multiple channels to reduce the number of deadlines missed in end-to-end communications [11].	A multi-channel real-time communication protocol that uti-lizes both multiple channels and transmission power adaptation to achieve real-time communications in WSNs[11].
3.	A Comprehensive Survey on Multichannel Routing in Wireless Sensor Networks (July 2017)	Waqas Rehan, Stefan Fischer, Maaz Rehan and Mubashir Hussain Rehmani	Comprehensive survey of multichannel routing Strategies for WSNs, discuss current issues and recent applications [12].	In this survey authors finding the idea of increasing the bandwidth utilization, best effort of data transmission in real time communication [12].
4.	Multipath Routing in Wireless Sensor Networks: Survey and Research Challenges (June 2012)	Marjan Radi, Behnam Dezfouli, Kamalruln izam Abu Bakar and Malrey Lee	The main objectives of this survey, is study about the concept of multipath routing approaches and its fundamental challenges [13].	To improve the network capacity and resource utilization under heavy traffic conditions and also provide the Quality of service (QOS) for soft real-time routing in real-time communication [13].
5.	Distributed Routing and Channel Selection for Multi-Channel Wireless Sensor Networks (July 2017)	Amitangsh u Pal and Asis Nasipuri	Improving the lifetime of sensor nodes by reducing the energy consumed in overhearing and by dynamical balancing the lifetime of nodes [3].	Method for transmitting of a multi-channel data stream on a multi-transport tunnel, corresponding computer-readable storage means and tunnel end for guarantees –points [3].

6.	Routing protocols based on protocol operations for underwater wireless sensor network: A survey (July 2017)	Mukhtiar Ahmed, Mazleena Salleh, M.Ibrahim Channa	focuses the issues in designing of routing protocols based on protocol operations [14]	In this paper authors observe that in real-time protocol packets delivery ratio is better than other proposed routing protocols because the packet delivery is based on real time parameters [14].

3. Applications of Multichannel Real-Time Routing Protocol

The applications can be divided in three categories:-

1. Monitoring of objects:-
    - Environmental and Habitat Monitoring
    - Precision Agriculture
    - Indoor Climate Control
    - Military Surveillance
    - Treaty Verification
    - Intelligent Alarms
2. Monitoring of an area:-
    - Structural Monitoring
    - Eco-physiology
    - Condition-based Maintenance
    - Medical Diagnostics
    - Urban Terrain Mapping
3. Monitoring of both area and objects:-
    - Wildlife Habitats
    - Disaster Management
    - Emergency Response
    - Ubiquitous Computing
    - Asset Tracking
    - Health Care
    - Manufacturing Process Flows

4. Pros and Cons

Pros:-

- Improves throughput performance in the network by distributing traffic over time as well as over bandwidth.

Cons:-

- Increases hardware Complexity.

5. Conclusion

There are a number of challenges for using multiple channels in wireless sensor networks. Also there are several open problems that have opened up as a result of this research. By using multiple channels and multiple radios in WSNs; we can achieve a better support for applications which require high network throughput. To provide efficient communication, sinks and cluster heads need multiple radios so they can communicate with multiple nodes simultaneously. Also, they need sufficient power supply.

The use of multiple channels in WSNs allows parallel transmissions that improve the performance of the network, resulting in increased throughput, decreased collision probability, and thus better energy efficiency. Because WSNs are limited in terms of power and processing capabilities, developing simple algorithms that could be scaled to large networks is of major importance in improving the performance of such applications.

6. References

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