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# A Contemporary Of Routing Protocol In Wireless Sensor Networks (WSNs)

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**Abstract**

**The survey conducted recently reckons that by the year 2010 more than 10 billion wireless sensors have been deployed for various applications, as diverse as environmental monitoring, agricultural monitoring, machine health monitoring, surveillance, and medical monitoring. These networks connect the physical world with the digital world and provide us a better understanding of controlling our surroundings. Advances in wireless sensor network technology has lead to the availability of small and less cost sensor nodes which have the capability of sensing different types of physical and earthly conditions, data processing and wireless communications. Various sensing capabilities results in profusion of application area. Many routing, power management, and data dissemination protocols have been specifically designed for WSNs.**

**We would like to highlight the strengths and performance issues of each routing technique and conclude the paper by bringing to your notice the possible future research areas.**

**Keywords: Wireless Sensor Network, Routing protocols.**

## Introduction

Wireless Sensor Networks (WSNs) consist of small nodes with sensing, computation, and wireless communication capabilities. It is considered as one of the most important technologies. Our intent for conducting this research is to recognize people behind these technologies [2]. This paper provides you with the information on the survey conducted on routing protocols in wireless sensor networks.

Recently, both academia and industry have shown great interest in sensor networks. It then studies recent routing protocols for wireless sensor networks and presents a variety of classifications of them; it also contrasts and compares representative routing protocols. Several future open issues of the wireless sensor networks are put forward.[13]

In the past, a vigorous research that addresses the potential of collaboration among sensors in data gathering and management of the sensing activity were conducted. Routing in WSNs are challenging issues because of its inherent characteristics that differ these networks from other wireless network. Due to the recent studies, the manufacturing of low cost sensors has become economically feasible. The main objective is to recognize and draw attention to some of the amazing sensor applications that exist. Some of the applications are traffic monitor (strain gauge), satellite-borne imaging device, environmental monitor, stored sensor data, health monitor, industrial process monitor, webcam, airborne imaging device.

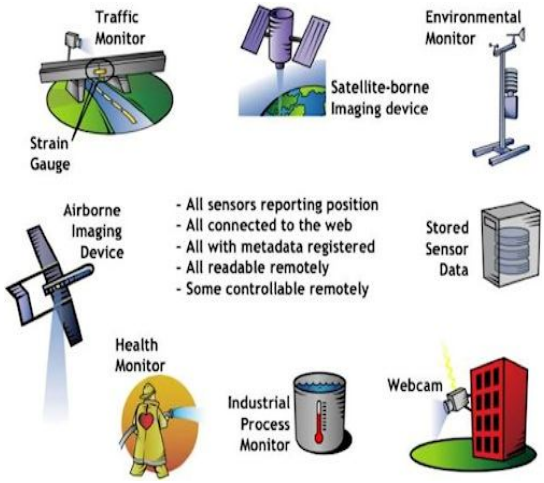


Fig 1: Applications of sensors

The dominant focus was on the routing protocols which may depend on the application and network architecture. Wireless sensor networks must be reliable and scalable to endure large number of unused wireless sensors. The routing paradigm provides the study of design trade between energy and communication. In WSN the sensor nodes have

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the required transmission range which has processing and storage capabilities. In this paper we will give you a survey of routing protocols for wireless sensor networks Due to the large number of sensor nodes, it is impossible to construct a global addressing scheme for deploying a large number of sensor nodes as the ID maintenance is high. Therefore, IP-based protocols may not be applied to WSNs.Since there is no practical application system of any indicative size exists, there can be important challenges in enhancing intelligent, distribution, collaborative and multimodal networks that would sense and act in huge areas in an unused manner. Thus, delivering of such large networks that function in a reliable manner would be a major challenge.

The sensor nodes interact over short distance through a wireless medium and collaborate to achieve a common task. These nodes must be able to systematize themselves into a wireless communication network. They are battery-powered and are expected to operate without existing for a long duration.When two sensors sense the same region and broadcast their sensed data at the same time, their neighboring sensors will receive duplicated packets. To overcome this technique called gossiping is used. In gossiping, instead receiving a packet, a sensor would select randomly one of its neighbors and send the packet to it. A large number of research activities have been carried out to explore and overcome the constraints of WSNs and solve design and application issues.

**Necessity of routing protocols in wireless sensor networks:**

1. To keep sensors operating for as long as possible, thus extending the network lifetime.
2. Routing operating system a process of finding path or route between source and destination for data transmission.
3. WSN use network layer for is routing purpose.
4. Routing protocol is one of the most important factors for the communication stack.
5. Routing protocol is low power and can be scalable with number of nodes and fault tolerant to nodes that go up or down or move in and out of range. A more useful metric for routing protocol performance is network severability.
6. To ensure that connectivity is maintained for as long as possible and the energy status for entire network should be of same order.

**Network Characteristics and Design Objectives:**

**Network Characteristics:**

When compared to the wireless communication networks such as mobile ad hoc network (MANET) and cellular systems, WSN have the following unique characteristics and constraints [1] [3]

- Power consumption constraints for nodes using batteries or energy harvesting.
- Ability to cope with node failures
- Mobility of nodes
- Communication failures
- Heterogeneity of nodes
- Scalability to large scale of deployment
- Ability to withstand harsh environmental conditions
- Ease of use.

**Design Objectives:**
The major design objectives in WSN include:

a) They must last for extended periods of time using limited battery power.
b) They must be secure against outside attacks on the network and on data fidelity.
c) They must be accurate in providing required information while performing in-network processing to reduce data load and they must interface with existing networks.

**Routing protocols in WSN:**

**Protocol:**

When computers communicate with each other, there needs to be a common set of rules and instructions that each computer follows. A specific set of communication rules is called a protocol.

**Routing Protocol:**

A routing protocol specifies how routers communicate with each other, disseminating information that enables them to select routes between any two nodes on a computer network. Routing algorithms determine the specific choice of route. Each router has a priori knowledge only of networks attached to it directly. A routing protocol shares this information first among immediate neighbors, and then throughout the network. [9] This way, routers gain knowledge of the topology of the network.

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The major routing protocols proposed for WSNs are divided into following categories. A sample review in each routing protocol can be explained briefly as [4]

**Location based protocol:**

Location based service is a software application for an IP-capable mobile device that requires knowledge about where the mobile device is located. Location based service can be query based and provide the end user with useful information.
Representative protocols are MECN, SMECN, GAF, GEAR, Span, TBF, BVGF, GeRaF.

**Hierarchical based protocol:**

The communication between the computers in the internet is defined by the protocol. The main aim of hierarchical routing is to efficiently maintain the energy consumption of sensor nodes by involving them in multi-hop communication within a particular cluster and by performing data aggregation and fusion in order to decrease the number of transmitted messages to the sink. Cluster formation is typically based on the energy reserve of sensors and sensor's proximity to the cluster head [11] [12].The protocols TCP and IP build the basis of the communication in the internet. The combination of TCP and IP protocols is known as TCP/IP protocol that represents the standard system used in most large networks.
Representative protocols are LEACH, TEEN, APTEEN, HEED, and PEGASIS.

**Heterogeneity-based protocol:**

It is a network connecting computers and other devices with different operating systems and/or protocols.
Representative protocols are IDSQ, CADR, CHR.

**Quality of Service based protocols:**

It is the overall performance of a telephony or computer network, particularly the performance seen by the users of the network. It is particularly important for the transport of traffic with special requirements.
Representative protocols are SAR, SPEED, Energy-aware routing.

**Multimedia Streaming protocols:**

The multimedia data streaming through WSN has some challenges to the internetwork related to bandwidth and processing delays [5].

a) Signaling and control protocols-

Protocols conveying session setup information and VCR-like commands (play, pause, mute, setup, fast forward, backward etc.)
Ex: RTSP, SDP, SIP

b) Real-time transport protocols-

Protocols that convey the real-time data (audio, video or text)
Ex: RTP/RTCP

**RTP (Real-Time Transport Protocol):**

It is the transport protocol for real time data. It provides time stamp sequence number, and other means to handle timing issues in real time data transport. [8]

RTP characteristics:

1. It provides end-to-end delivery service for real-time data, in uni-cast and multicast sessions
2. It offers synchronization services (time stamping), packet identification and loss detection (sequence numbering) and delivery monitoring/feedback (through RTCP)
3. It does not provide in-order and reliable delivery of packets
4. It does not provide timely delivery of packets, nor QoS guarantees
5. It is independent of the transport protocol (TCP, UDP, DCCP, SCTP etc.)
6. A RTP session carries one multimedia stream; a RTP session is identified by a pair of triplets (IP address, RTP port, RTCP port) which are negotiated at setup using RTSP and SDP.

**RTCP (Real-Time Control Protocol):**

It is control part of RTP that helps with quality of service and membership management. [7]

1. It is described by the RTP RFC

It has 2 basic functions:

(a) Provides feedback statistics on the QoS parameters (like Round-Trip-Time, delay, jitter, packet losses etc.) for the participants to a RTP session.
(b) carries canonical end-point identifiers (CNAME) to all session participants as the source identifier (SSRC) may change in case of a conflict and many SSRC can correspond to the same CNAME (a SSRC is unique only within a RTP session) – to keep track of each participant.

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2. Uses as port the next highest odd-number following the even-number port of RTP.
3. The RTCP traffic must not be above 5% of the RTP traffic in a session.

**RTSP (Real-Time Streaming Protocol):**

It is the control protocol that initiates and directs delivery of streaming multimedia from media servers. [6]

1. It is a signaling and control protocol for multimedia streaming in Internet.
2. It is used to control the data delivery in a multimedia streaming session by conveying VCR-style commands (like play, mute) between communicating partners; it is typically used in conjunction with RTP which conveys the actual multimedia data.
3. It is a request-response protocol similar to HTTP, but stateless.
4. It is standardized by the Multiparty Multimedia Session Control Working Group (MMUSIC WG) of the IETF in 1998 in RFC 2326.
5. The default port is 554.

**Applications:**

The applications for WSN are many and varied. [10]

1. Sensor networks are widely used in the areas like

(a) Health Monitoring:

Sensors monitoring blood pressure, heart attack.

(b) Military Monitoring:

(i) Friendly forces, equipment and ammunition.

(ii) Battle field surveillance.

(c) Environment Monitoring:

Forest fire detection, blood detection, precision agriculture.

(d) Home and other commercial applications:

(i) Home automation and smart environment.

(ii) Vehicle tracking and detection.

Future Research:

Need for future research:

Sensor network need to become easier to setup, layer lifetime, greater flexibility, cheaper. In future, wide range of sensor network application will become an integral part of our lives. With all advances in sensor network from the hardware to network protocols to algorithms it is in some ways surprising that networks are still not main stream cycle internet, cell phones, Wi-Fi.

Implies much research is needed.

Sensor network research needs to become

(A) Easier to setup.

(b) Easier to maintain.

(c) Larger lifetime.

(d) Greater flexibility.

(e) Cheaper.

(A) Future Uses:

(i) Connected consumer electronics such as mobiles, video games, televisions, laptops.

(ii) Intelligent transport, industry and society, smart utilities in home, hospitals, vehicles, webcams, lock-key system.

(iii) In vehicles:

They receive live information from the road authority about the state of roads including traffic jams, accidents and weather. The car transmits information to road authority regarding speed, distance travelled, use of wind screen wipes etc.

**Conclusion**:

The rapid reproduction of these sensors has made these networks popular. WSN are used to collect data from environment. By the following survey of the routing protocols, the scalability, and the resources like energy, the reliability arises as the main limitations of WSNs. The usage of routing protocols in wireless sensor network provides us the life time of a network and it also decides the appropriate route by considering three factors i.e., battery availability, number of hops and link quality.

Technology to

(A) Blend and interconnect individual smart devices.

(B) Enable access to representation about real world.

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