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Review Analysis of Optimised Routing In Wireless Sensor Network

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Abstract— This paper presents a literature review on WSN networks, in which the capacity of network nodes are limited with respect to energy supply, restricted computational capacity and communication bandwidth. To prolong the lifetime of these sensor nodes, designing efficient routing protocols are critical. Basically, the Routing protocols for wireless sensor networks are responsible for maintaining the routes in the network which ensures reliable multi-hop communication. Wireless sensor network consists of number of sensors, which collects the information and send to the sink node. Sensor node has limited energy storage and cannot be replaced in certain applications. This paper is analysed the physical relation between the power consumption and the link utilization of wireless sensor networks.

***Keywords-* Wireless Sensor Networks, IOT, Network Layer and Routing.**

***Index Terms*—About four key words or phrases in alphabetical order, separated by commas.**

I. Introduction

The protocol stack of the Sensor node consists of Physical Layer, Data Link Layer, Network Layer and Transport layer. It also has the three planes namely Power management, Mobility management and Task management [1]. The Physical layer takes care of modulation, encryption, signal detection and Frequency selection. Data link layer provides Medium access control and error control and synchronization. The network layer is responsible for routing the data; the transport layer does the multiplexing, splitting or segmenting. Application layer does login or password checking. The power management plane manages the power level of the node. The mobility management plane detects and registers the movement of the nodes. The task management plane balances and schedules the sensing task at the same time. These planes work together and for using the power efficiently. Routing protocols can be classified as Proactive, Reactive and Hybrid based on the mode of functioning and the type of target applications. Proponents of the Internet of Things (IoT) promise us a world in which we will be connected with literally every kind of thing we can think of: one in which we will access information about anything from anywhere at any time. A broad vision for the IoT is therefore for everything we might need, whether we currently know it or otherwise, to be individually accessible across the Internet. Figure 1.1 illustrates this vision as an Internet of three layers. The first layer, the core Internet, is the Internet backbone, made up of carrier infrastructure, routers and servers; these are usually the physical machines we are accessing all the way along the route that connects us to a website, including that website's endpoint. The second layer, the 'fringe' Internet, is the Internet we are most familiar with as individuals: the concept of workstation computers; personal desktop and laptop computers.

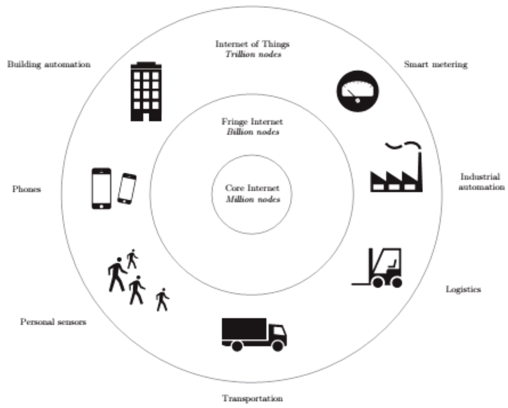

Figure 1: The Internet of Things Vision

Finally, the third layer is the Internet of Things, whose Things could almost literally be any kind of device, acting as either clients, servers or both and providing any number of services. However, the use of the IoT term often encompasses all three layers, due to the inherent connectedness of Things to devices at the inner layers. Conceptually, the IoT is all-encompassing in its simplicity. It is the extreme realisation of something we have actually already been slowly working towards: we have been integrating peripheral devices into our historically computer based networks for a long time—albeit obstructed by the limitations of the IPv4 address space—gradually bringing connectedness to printers, file storage, and more recently entertainment systems such as smart televisions.

II.ROUTING PROTOCOLS

A. Proactive, Reactive and hybrid routing protocols

Proactive protocols compute all the routes before they are really needed and then store these routes in a routing table in each node, Reactive protocols compute routes only when they

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are needed. Hybrid protocols use a combination of these two ideas [2].

A.1. Proactive protocols

In Proactive Networks, the sensors periodically transmit the value for the sensed attribute. At other times, sensors and transmitters are switched off to save energy. This type of network is most suitable for applications that require periodic examination, namely, monitor machinery for fault detection and diagnosis. The following are the few proactive routing protocols.

- LEACH (Low Energy Adaptive Clustering Hierarchy) [3], is a proactive routing protocol works in a homogenous network. This protocol uses clustering mechanism for routing in the network.
- SEP (Stable Election Protocol) [4] is proactive routing protocol works as heterogeneous-aware protocol to prolong the time interval before the death of the first node (we refer to as stability period), which is crucialfor many applications where the feedback from the sensor network must be reliable. SEP is based on weighted election probabilities of each node to become cluster head according to the remaining energy in each node.
- PEGASIS (power-efficient gathering in sensor information systems) is also a proactive protocol uses optimal chain-based protocol that is an improvement over LEACH. In PEGASIS, each node communicates only with a close neighbor and takes turns transmitting to the base station, thus reducing the amount of energy spent per round. Simulation results show that PEGASIS performs better than LEACH by about 100 to 300% when 1%, 20%, 50%, and 100% of nodes die for different network sizes and topologies [5].
- EDEEC(EDEEC- Enhanced Distributed Energy Efficient Clustering) is the extended version of SEP[6]. EDEEC protocol used three types of nodes i.e. normal, advanced and super nodes. These nodes have energies in increasing order i.e. normal, advanced and super respectively and the probabilities of getting elected as cluster head follow the reverse order i.e. super, advanced and normal respectively. Thus higher energy nodes will increase the epoch time for less energy node thus finally increase the stability period of the network. This follows the same procedure for cluster head election and sending of the data as of the LEACH.

A.2. Reactive Networks

In Reactive networks sensor nodes continuously sense the environment and transmit the value as soon as the sensed parameter exceeds a user specified threshold value. This enables time critical data to reach the user almost instantaneously, making such a network most suitable for time critical applications. The following are the reactive network protocols.

- TEEN (Threshold sensitive Energy Efficient sensor Network protocol) is well suited for time critical applications and is also quite efficient in terms of energy consumption and response time [7-8]. Advantage of this scheme is that it is eminently suited for time critical data sensing application. Energy consumption in this scheme can be much less than in proactive network because data transmission consumes more energy than data sensing and in this scheme data transmission is done less frequently.
- TADEEC (Threshold Sensitive Advanced Distributed Energy Efficient Clustering) is made to work in a reactive mode in a heterogeneous network. So it basically used the best aspects of both reactive routing mechanism and heterogeneity of the network [9]. The performance analysis of proactive, reactive protocols show that TADEEC performed better with respect of life time and throughput [8].

A.3. Hybrid networks

Hybrid network is the combination of the above two to be used in applications in which the user wants time critical data and also wants to query the network for analysis of conditions other than collecting time critical data . The example of such hybrid network protocols are

- APTEEN (Adaptive Periodic Threshold-sensitive Energy Efficient sensor Network Protocol) [10], is an extension of TEEN and aims at both capturing periodic data collections and reacting to time critical events. The architecture is same as in TEEN. In APTEEN once the CHs are decided, in each cluster period, the cluster head broadcasts the parameter such as attributes, threshold, schedule and count time to all nodes[10].
- HEER is a Hybrid Energy Efficient Reactive protocol [11]. In HEER, Cluster Head(CH) selection is based on the ratio of residual energy of node and average energy of network. Moreover, to conserve more energy, we introduce Hard Threshold (HT) and Soft Threshold (ST).

III.LITERATURE SURVEY

Navneet Kaur et al. "A Review on Reactive and Proactive Wireless Sensor Networks Protocols'' In this paper, HEER (Hybrid Energy Efficient Reactive) Protocol has been proposed in which the Cluster Head (CH) selection is based on the ratio of residual energy of node and average energy of network. But HEER does not use the inter cluster data aggregation. To overcome this problem a deterministic approach will be proposed to enhance the cluster head selection. In this selection criteria will have deterministic decisions because node with highest first energy will become cluster head than the probability. It will increase the overall network lifetime.

Quan Le et al. "RPL-based multipath Routing Protocols for Internet of Things on Wireless Sensor Networks". This paper proposed three multipath schemes based on RPL (Energy Load Balancing-ELB, Fast Local Repair-FLR and theirs combination-ELB-FLR) and integrate them in a modified IPv6 communication stack for IoT. These schemes are implemented in OMNET++ simulator and the experiment outcomes show that the approaches have achieved better energy efficiency, better end-to-end delay, packet delivery rate and network load balance compared to traditional solution of RPL.

Sang-Hyun Park et al. "Energy-Efficient Probabilistic Routing Algorithm for Internet of Things" The EEPR algorithm has been proposed which employs both the residual energy of a node and the ETX value as the routing metrics, at the same time. The proposed EEPR algorithm stochastically controls the number of the RREQ packets using the residual energy and ETX value of a link on the path and thus facilitates energy-efficient route setup. Simulation results show that the proposed algorithm has longer network lifetime and consumes the residual energy of each node more evenly when compared with the typical AODV protocol while the routing setup delay is slightly increased and the routing success probability is slightly decreased

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HyungWon Kim et al. "Low power routing and channel allocation method of wireless video sensor networks for Internet of Things (IoT)" A new method of multichannel allocation and routing for wireless mesh networks is used where each node generates event-driven video sensor data. Battery powered video camera sensors are often connected wirelessly to cover a large area. Such wireless video sensor networks are considered as major applications of Internet of Things (IoT). Author analyzed the power consumption model for wireless video sensor network and proposed an algorithm to route the sensor nodes and allocate channels in a way that minimizes the overall power consumption while satisfying the required data transmission. A wireless video sensor network simulator is developed to prove the performance advantage of the proposed algorithm. Simulation results are provided with wireless sensor networks of various sizes.

IV. CHALLENGES & MOTIVATION

One of the main challenges to the IoT is the limitation of resources, including energy supply, processing power, memory capacities, wireless communication range, and wireless communication bandwidth. This limitation affects routing in many ways. The short wireless communication range dictates that routing must be done in a multihop fashion, i.e., the data packets must be forwarded by multiple relay nodes in order to reach to their destination. The low processing power and program memory require that the routing process running on the IoT devices must be highly optimized and light-weight. The small storage memory and scarce communication bandwidth may limit the size of the packets to be forwarded. The scarce energy source (either battery-supplied or harvested) make it difficult to decide which nodes should forward the data packs since wireless communication dominates the energy consumption of the IoT devices. Some challenges are listed below:

- Design and Deployment
- Localization
- Data Aggregation
- Sensor fusion
- Energy aware routing and clustering
- Scheduling
- Security
- Quality of service management etc.

In our work we try to provide the solution for this challenge in IOT so that lifetime of sensor nodes increase.

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