Journal of Theoretical and Applied Information Technology

15th October 2023. Vol.101. No 19

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

WIRELESS SENSOR NETWORK ROUTING PROTOCOLS, CHALLENGING ISSUES AND PERFORMANCE COMPARISON

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ABSTRACT

Nowadays, Nowadays, Wireless Sensor Network (WSN) is viewed as one among the critical advancements in wireless communication. The going with difficulties limits the ongoing conventions for directing in impromptu organizations being explicitly utilized in WSNs. WSN faces the few difficulties because of remote correspondence impacts. In this paper work, the complete outline of sensors utilized in network setting is done for information trade and introduced network testing issues and examination of the directing conventions. The majority of the sensor hubs are detected information from a distance, more appreciated than real sensor hub. In this way, information driven steering methods is to consideration on the transmission of information determined through specific highlights as opposed to information assortment from the sensor hubs. Boundary service is involved to recover remaining energy levels for hubs and furthermore update the energy levels of hubs. To lessen utilization of energy, a legitimate group head determination is required. Concerning WSN, meddling convention is further developed significant flooding algorithms. Another WSN climate takes benefit of sensed data from currently prepared sensor hubs. It is introduced in real pivotal and hurt conditions generally. It also handles node failures, permits for tradeoffs among overhead and delivery metrics during the WSN performance. Use of MATLAB application tools to assess the aftereffects of WSN standard conventions like LEACH, TEEN, APTEEN etc. In the outcomes, we compared the challenging issues of WSN such as energy efficiency, complexity, scalability, delay, robustness, data transmission, sensor location etc. This exploration work will benefit for correspondence analyst and applications in research ground of WSN.

Keywords: *WSN, energy, cluster, protocols, LEACH, TEAN, APTEEN.*

1. INTRODUCTION

Wireless Sensor Networks (WSNs) can enable to seek after one of a definitive objective in data innovation, in particular surrounding information [1]. In the fundamental case, there is no central in remaining mindful of the affiliation topography or controlling assessment required. In flooding calculation, when information detected, bundles will be passed on to every single close by neighbor. The most notable way to deal with broadcasting of group won't stop until it appears at the objective or it appear at the best number of skip count of bundle showed up. The primary advantage of flooding procedure is not difficult to utilize and basic in execution. In WSN execution, meddling convention is further developed form of flooding convention. In WSN, nodes will get information parcel arbitrarily to the chose neighbor hub, another hub sends information. WSN can gathered

exorbitant arrangement of sensor hubs which thinks about by minuscule, little information transmission, reasonable cost, complete the knowledge or manages some actual peculiarity over intercommunication [2]. Resource allocation of WSN clarifications is implying higher adaptability and power than reiterative improvement frameworks. There is need for associations to diminish result quality to close energy scattering in the center concentrations as the energy gets depleted and complete construction life length is in this way extended and computational diverse nature. The gathering can likewise be in a type of a tree construction or bunches. These conventions additionally keep up with the different number of routing tables.

The association of the paper is as per the following. Section 2 examines on WSN design and its conventions. Section 3 highlights the routing tasks of WSN. Finally, Section 4 presents the evaluation of WSN protocols with important metrics and conclusion of the paper.

2. WIRELESS SENSOR NETWORK ARCHITECTURE AND ITS PROTOCOLS

The integration of improved computing and communication techniques have opened with many opportunities for development of WSN. Throughout the sequence of recent years, WSNs hav been drawing consideration from the exploration local area with expanding fame. Diverse software and hardware designs have come up with distinctive requirements in applications. Several design challenges in implementing and deploying of WSN applications have emerged [2], most of them are intrinsic to time dependent characteristics. Figure 1 presents the WSN architecture and its application areas.

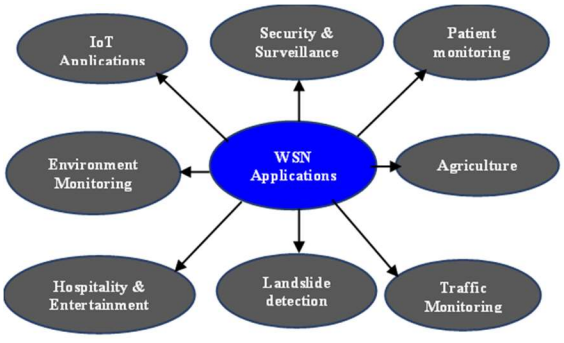

Figure 1: WSN architecture and its applications.

The field of WSN has turned into a focal point of concentrated research. It has drawn lots of consideration because of the likelihood of coupling the nodes with their environment. Well past their immediate utilize, for example, investigation and ecological observing, WSNs can enable to seek after one of a definitive objective in data innovation, in particular surrounding information. The classification of WSN protocols is presented in Figure 2.

2.1 Node Centric

Node centric protocol [3] is a destination driven and quantified about some numeric sensor node identifiers and it updates the routing information pro-actively. Example of node centric routing protocol is Low Energy Adaptive Clustering Hierarchy (LEACH) and Threshold-sensitive Energy Efficient sensor Network (TEEN). LEACH is the digital modulation (TDMA) and energy efficient protocol-based Media Access Control (MAC). The vital component of LEACH is to recuperate the lifetime of organization with less energy utilization and commonly portrayal of hybrid protocol. A TEEN is a reactive, edge touchy and energy effective convention. In case if the assuming edge is reached, user cannot control over the territory of WSN, it causes lacking for client's application which are expected from hindered information through WSN.

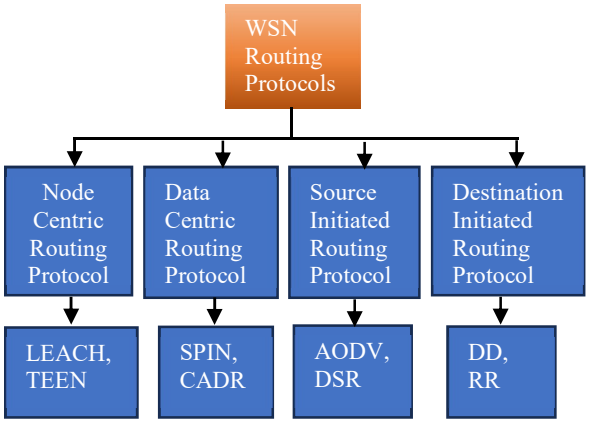

Figure 2: Classification of WSN routing protocols.

2.2 Data-Centric

The majority of the sensor hubs are detected information from a distance, more appreciated than real sensor hub. In this way, information driven steering methods [3] is to consideration on the transmission of information determined through specific highlights as opposed to information assortment from the sensor hubs. The information driven steering conventions are Sensor Protocols for Information via Negotiation (SPIN), Constrained Anisotropic Diffusion Routing

(CADR). SPIN protocol is prepared to do productively disperses data between sensor hubs of WSN and use to dispense with the lack like spilling over and gossipmongering, occurs in WSN. CADR is accomplished by empowering the sensors, near the specific occasion and powerfully update the directing way. The CADR is utilized to question sensors and steering data to amplify the throughput, limit the delay in WSN architecture.

2.3 Source Initiated Routing Protocols

The Source Initiated Routing Protocols [3] is a reactive protocol, which is utilized to track down a briefest way in WSN. The main pressing concern in this convention is the expense WSN architecture because of association breakages and customary varieties of network topology. Instances of this conventions are Ad-hoc Distance Vector (AODV) protocol and Dynamic Source Routing (DSR) conventions. Where in the event of AODV, the broadcast of the information and revelation process engaged with course to distinguish the neighbor hubs for upkeep of the route. The routing is performed in light of the course disclosure from source hub to its objective hub with assistance of directing table and the way upkeep methodologies for its next jump and the further multi-bounce that are involved to reach to its objective. The steering tables will be refreshed with its relating adjoining hub and subsequently refreshed its directing table. Hence, the information is handled effectively by reducing the delay.

The DSR protocol principally centers around the channel distinguishing proof and network upkeep activities. This protocol capabilities when there is need for course distinguishing proof and don't send regular commercial or channel status. The significant differentiator between these conventions is that, source steering is performed by DSR while AODV uses channel information saved inside hubs that are dynamic in course. DSR utilizes directing stores, permitting the hubs to respond in a split second when route failure happens.

2.4 Destination Initiated Routing Protocol

This type of protocol is always try to reach the sensor information to the end point of the node when the path initiates from end point (destination). Examples are Directed Diffusion (DD) and Rumor Routing (RR). DD is a data centric routing method for data gather and circulate among all the communicated sensor nodes.it is also called as energy efficient and saving protocol. This durability of communication design allow the DD protocol to absorb the good path among sources and sinks. Sinks create data request tasks, or benefits, which is diffuse over WSN [3].

RR is a WSN routing protocol, low energy consumption than overflow the complete network based on query and number hops randomly through establishing pathway. It likewise handles hub disappointments, licenses for tradeoffs among above and conveyance measurements during the WSN execution.

2.5 Proactive Routing

These protocols depend on table driven routing conventions as they keep up with directing data in the routing table. Every single hub in the sensor network keeps up with data in its course of any remaining hubs in the directing table [4] and it is occasionally refreshed assuming it goes through any topological change in the network. These conventions additionally keep up with the different number of routing tables.

2.5.1 Destination Sequenced Distance Vector

Destination Sequenced Distance Vector (DSDV) is a proactive routing convention [5] explains the issues related with the organization issues by utilizing objective succession number like build up to endlessness issue and some more. In DSDV convention, every node promotes to all the continuing close by neighbors. Each hub saves for routing table as a result of which it extends the memory above at the sensor hub as size of the network increment strangely.

2.5.2 Optimized Link State Routing

Optimized Link State Routing (OLSR) is a proactive coordinating demonstration. Additionally evolved transformation of association state guiding where it diminishes the control bundles above expected for broadcast. The utilization of Multi Point Replying (MPR) algorithm, it diminishes the general switch clusters above concerning pure association state managerial. MPR is a one leap neighbor center [6] which will give the briefest way to objective while sending the bundles. It is more capable of association state coordinating estimation.

2.6 Reactive Routing Protocol

This type of protocol is center point, it searches the way on request or progressively. Subsequently, that sort of looking of the steering way [7] on request is called receptive directing convention. With the motivation behind send/get the association needs to lay out on request benefits.

2.6.1 Ad hoc On-demand Distance Vector

Ad hoc On-demand Distance Vector (AODV) is important for finding the paths utilizing on-request and return rundown of different paths and afterward acquire best path founded on channel quality. AODV service is accountable for finding the path utilizing briefest way [8], find different paths and best path founded on distance vector. DSDV is accountable for finding the route utilizing its algorithm [9]. Boundary service is involved to recover remaining energy levels for hubs and furthermore update the energy levels of hubs. In AODV, Routing topology service is utilized to recover position of hubs. IP Address Support [10] is liable for recovering the IP Address so the information bundles can be conveyed to such a node.

2.6.2 Dynamic Source Routing

Dynamic Source Routing (DSR)is a responsive convention which utilizations source directing request proposes and tries not to defeat AODV. It starts course revelation stage of RREQ and RREP messages. In any case, DSR convention just objective hub sends the course answer to the priority hubs as opposed to its hubs are all halfway reaction in its network [11]. While keeping up with the route stage remove the flooding routing technique to messages and thus utilizes the briefest course among source and destination.

2.6.3 Temporally Ordered Routing Algorithm

Temporally Ordered Routing Algorithm (TORA) is a responsive convention to design for correspondence networks, to further develop versatility by dividing network into various zones wherein hubs are gathered together. The gathering can likewise be in a type of a tree construction or bunches. Courses are kept up with proactively [12] inside one zone and found responsively across various zones to lessen directing overheads. The presentation of TORA convention is poor because of support of the way where brief circles [13] have been made which causes loss of packets.

2.7 Hybrid Protocol

The reactive and proactive qualities are shared to frame hybrid routing protocols. The hybrid protocol, means combination of reactive and proactive protocols nature. Getting most brief objective in the networks by appropriate alteration in the network topology is utilized. The Zone Routing Protocol (ZRP) is a mixture routing (reactive, proactive) strategy [14], it has both responsive and favorable to dynamic directing nature.

2.7.1 Zone Routing Protocol

In this kind of convention, the complete association is coordinated into zones, assuming correspondence is being finished inside the zone (Intra zone) the show utilizes proactive plan. While source and goal are in various zone then it utilizes responsive plan. This show works with the course establishment one small step at a time ease where in it checks in the event that goal is inside zone. If not, then, at that point, it will send the cutoff cast course deals and finds the objective through course answer and plays out the correspondence by the source with most limited way [15]. This show is studied in 5G correspondence network for switch the interference through best power broadcast course of action.

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3. ROUTING CHALLENGES IN WSN

A sequence in conveying of information packets from the hub to objective hub in WSN go through many difficulties in network in the mean time the hub [14] is minuscule, battery functioned, energy utilization are important factors focused on for proficient steering, portrayed in the underneath segments. The advanced WSN climate takes the data from currently prepared sensor nodes. Resource allocation [16] of WSN clarifications is implying higher adaptability and power than reiterative improvement frameworks.

3.1 Node Deployment

Center point distribution of WSNs which reliant upon the sort application utilized and straightly affects the presentation of steering convention. The hubs can be conveyed in arbitrary way. The past predefined way for sending data in which the sensor are really kept and ways not absolutely forever spread out for information assembling in deterministic system [17]-[18]. At any rate in later one, sensors are angrily spread in unusual style plan and are particularly used for event prominent affirmation and doesn't have predefined way. Taking into account energy and move speed limit hindrances in WSN for conveying among focus fixations inside short transmission range, thus data necessities to visit with various leaps for dispersal from sensor spot to its base station.

3.2 Nature of the Nodes

In WSN, center points are coordinated into homogenous and heterogeneous focus focuses. In homogeneous, all of the center centers have same endpoints concerning control, limit limits and moreover for transmission range. Where in the later one, have different limits depending upon the sort of course. Guiding calculation needs to contemplate the

chance of the middle focuses during the steering [19].

3.3 Energy Consumption

In homogeneous, every one of the middle habitats have same endpoints concerning control, limit limits and additionally for transmission range. Where in the later one, have various cutoff points relying on the kind obviously. Directing estimation needs to consider the opportunity of the center concentrations during the controlling [19].

3.4 Fault Tolerability

The principal objective of fault-tolerant technique is to further develop strength and self-recuperating strength of complete WSN. Resource limitation area, detached arrangement and cruel checking circumstances routinely welcome the various types of shortcomings [20]. Sensor hubs might go through disappointment or impediment because of force nonappearance, actual mischief or of block in nature. The by and large work of sensor construction ought not be influenced by frustration of focus center interests. This ought to be conceivable by directing the data to the nearby sensor center point will have ideal energy to the base station. Hence, the controlling appraisal challenge is to manage the disappointment centers.

3.5 Quality of Service Levels

To measure QoS, data should be sent in a couple of utilizations, ought to be inside the particular timeframe, it is being perceived, in any case data goes pointless. Confined inactivity for passing on data is along these lines one more test for networks that are time obliged [20].

Table 1: Comparison of Routing Protocols Performance.

Routing Protocols	Mobility	Power usage	Scalability	Multi-path	QoS
LEACH	Possible	Very limited	Very Good	Yes	Good
TEEN	Possible	Limited	Very Good	Yes	Good
SPIN	Possible	Limited	Limited	No	Less
CADR	Limited	Limited	Limited	No	Less
AODV	Possible	Very limited	Very Good	Yes	Good
DSR	Possible	Very limited	Very Good	Yes	Good
DD	Limited	Limited	Limited	Yes	Less
RR	Very limited	Not applicable	Good	Yes	Less

There is need for associations to diminish result quality to close energy scattering in the center concentrations as the energy gets depleted and complete construction life length is in this way extended and computational diverse nature. To get this fundamental, subsequently the energy careful coordinating shows are required [21]. Table 1 presents the exhibition of the directing shows with different estimations.

4. CONCLUSION

In this paper, we investigated and introduced the WSN engineering plan, shows and its troublesome issues in correspondence networks. In WSN, each middle will convey information by identifying its continuous environment and endless the times the information made by sensors are overflow i.e., information made by more than one sensor will be essentially same everything thought about as opposed to moving same information from various sensors with different transmission information variety. The coordination of extra made figuring and correspondence technique have opened up different amazing doorways for improvement of WSN. Network geography is considered in WSN have centers are non-adaptable. In two or three commonplace applications, WSN requires both sensor places and base stations should be adaptable. Different programming and stuff plans have arranged explicit basics in applications. Several arrangement difficulties in executing and conveying of WSN applications have arisen, a huge piece of them are typical for time subordinate qualities. The changing constancy and controlling messages from or to flexible focus brings up goes to be more infuriating with the information transmission need and accordingly energy of the core interests, To have responsive mode activity static case seeing is seen as the framework and making traffic just while revealing. Irregular revealing is crucial for over-the-top applications including dynamic event and fundamental traffic is in this manner passed on to the base station is directed in WSN.

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