

# Wireless Sensor Networks – Scalability and Reliability Issues: A survey

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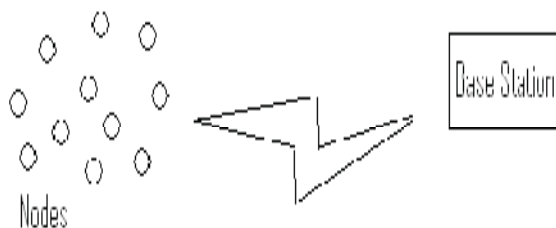
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**Abstract:** A Wireless sensor Network is a composed accumulation of countless hubs with a capacity of detecting, estimating and processing. These systems are generally utilized for following, observing and controlling. The WSNs gather data from unattended areas and spread data to a particular client relying upon the necessity. Information are steered among the hubs by utilizing a fitting directing system. Various elements influence the outline of the steering conventions. Adaptability one such vital factor which impact the directing conventions. Adaptability is that expansion in the quantity of hubs after the WSN was built up. Regardless of whether the WSN bolster the extension is a critical factor in the plan of the convention. The steering conventions consider the sensor hub qualities in the plan of the conventions. A steering convention is said to be great when it is versatile and versatile to the progressions made in the topology. The conventions must work flawless despite the fact that the extent of system develops and the workload is expanded.

**Keyword:** Scalability, Routing, Routing Protocol, Reliability

## I. Introduction:

A Wireless Sensor Network (WSN) is a remote framework including spatially appropriated independent devices using sensors to pleasingly screen physical or characteristic conditions, for instance, temperature, sound, vibration, weight, development or poisons, at different zones. A Wireless Sensor Network (WSN) involves base stations and different remote sensors (hubs).



**Fig 1: wireless sensor network**

These sensors work with each other to detect some physical marvel and after that the data assembled is handled to get significant outcomes. Remote sensor systems comprise of conventions and calculations with self-sorting out abilities. Remote sensor organizes predominantly utilize communicate correspondence. Not at all like specially appointed systems remote sensor systems are restricted by sensors constrained power, vitality and

computational capacity. The modes have low battery life and slightest handling ability and least data transmission and range. In WSNs detecting information and preparing are key highlights. The hubs are thickly conveyed and typically the correspondence is in closest neighbor mode. One detriment is that the hubs are more helpless for disappointment and worked on strict vitality limitations.

The information from countless is gathered for the most part by the base station. Consequently the information transmission is numerous to one against shared. The hubs are fueled through battery thus any task by the hub take it close to death. Keeping the significance of life time of the hubs, the hubs will be kept in rest mode when they are sit out of gear and the hubs secure information when it is essential and vital. The hubs get or transmit just when it is inescapable. A WSN should self arrange .

Scalability is very important and crucial issue in the design of routing protocols for WSNs. A routing protocol is considered to be good and effective if it is scalable to the changes in the topology of the network. The convention ought to withstand and perform well with changes that may happen now and again in the WSN. The WSN is said to be versatile in the event that it suit more hubs at a later stage after the outline. The conventions for WSNs ought to perform well even on the occasion of development in the quantity of hubs or the workload on the system increments. A study and survey on different conventions with regards to increment of the extent of the system uncovered that the Beacon Vector steering convention (BVR) demonstrated useful for the execution parameter achievement rate contrasted with PGR and flooding conventions over various system sizes. The BVR convention has demonstrated great throughput contrasted with Flooding and PGR conventions when the quantity of hubs in the WSN is expanded. With the expanding system estimate, when the execution parameter Latency rate is viewed as PGR convention gave a lower inactivity contrasted with flooding convention. At the point when the quantity of hubs in the system builds, the vitality utilization in BVR convention is the base contrasted with every single other convention.

A WBAN requests a high level of dependability as it specifically influences the nature of patient checking. Undetected perilous circumstances can prompt casualty. A principle prerequisite is that the social insurance experts

get the checked information accurately. Therefore, unwavering quality is a critical issue in WBAN. Dependability can be estimated by the nature of the connection or by the productivity of end-to-end correspondence. Keeping in mind the end goal to meet client desires and accomplish a solid system, there are three essential qualities that any system innovation, modified administration and convention needs to address: adaptation to non-critical failure, QoS and security. Outlining conventions for unanticipated issues is a fundamental component of WBAN plan since it is vital that the WBAN works persistently for clients who depend on it. This requires the engineering of a WBAN and its outline methods ought to be blame tolerant.

A fault-tolerant network is the one that limits the effect of a failure, so that the fewest number of network components are affected. It is additionally worked in a way that empowers snappy recuperation when such a disappointment happens. In any case, WBAN therapeutic applications make higher desires for the nature of the conveyed benefits with respect to such applications any consistent breaks, stops, postponements or bundle misfortune could be deadly particularly in crisis. Subsequently, QoS turns into a regularly expanding prerequisite of WBAN. Solid QoS could be gained by proposing all around planned conventions that would priorities be able to arrange movement. Dependable QoS additionally implies that that all bundles land on time and in their right request. This requires systems that keep away from or could oversee movement clog. System transfer speed measures the limit of the medium to convey information that is the measure of transmitted data through the channel amid a particular time

## II. Literature survey:

In the survey John D. Owens, et al., [2004] has explained his work using routing algorithm. Ongoing advances in sensor systems have created steering calculations and pressure and total plans that enable these systems to utilize their restricted assets, especially control, generally effectively. As sensor systems develop and sensor hubs end up less expensive, conveyed sensor systems will include more hubs. This work looks at the adaptability conduct of directing and pressure calculations as the quantity of hubs in a sensor organize increments. They show the more drawn out lifetimes of bunched directing calculations as they increment in estimate, the predominant spatial circulation of hub passages in progressive grouped and high-pressure multi jumps steering calculations.

Seung-Jong Park, et al., [2004] analyzed the problem of reliable sink-to-sensors data delivery. We first identify several fundamental challenges that need to be addressed, and are unique to a wireless sensor network environment. They proposed an adaptable system for solid downstream information conveyance that is particularly intended to both address and use the attributes of a remote sensor organize, while accomplishing the unwavering quality in a proficient way. Through ns2 based recreations, we assess the proposed system.

Eiko Yoneki and Jean Bacon, et al., [2005] examined about the ongoing patterns in remote sensor arrange explore including a diagram of the different classes of WSN, an overview of WSN advancements and a dialog of existing examination models and industry applications. We center around middleware innovation, and portray subtle elements of some current research models, at that point address difficulties and future viewpoints on the middleware. This examination features that middleware needs to give a typical interface to different utilitarian parts of WSN: recognition and information accumulation, flag preparing, information collection, and notice. By coordinating detecting, flag handling, and correspondence works, a WSN gives a characteristic stage to various leveled data preparing.

Arash Nasiri Eghbali, et al., [2007] proposed SLTP, a Scalable Lightweight Time-synchronization Protocol for wireless sensor networks. By utilizing latent grouping and straight relapse SLTP can diminish the vitality utilization of system hubs and furthermore diminish the overhead of making and keeping up the bunches. Besides SLTP utilizes straight relapse to process the time. Thusly, it can figure the clock skew and balance between every hub and its group head with a specific end goal to evaluate the neighborhood time of remote hubs later on or the past. By this they can increase impressive enhancements in control utilization, exactness and versatility in contrast with comparative calculations.

Lubna K. Alazzawi, et al., [2008] discussed about Scalability of directing conventions utilized as a part of remote sensor systems (WSNs) is a basic issue because of the greatly high hub numbers and moderately high hub thickness. A decent steering convention must be versatile and versatile to the adjustments in the system topology. Accordingly conventions must perform well as the system becomes bigger or as the workload increments. In this paper, we played out a scientific check and the assessment for proposed adaptable property of a given WSN has been figured. This calculation demonstrated the impediment and capacity of the WSN adaptability and particularly to flood and SPIN convention.

Ameesh Pandya, et al., [2008] analyzed the present scalability of wireless sensor network. Individual nodes will have some combination of sensing, signal processing and communications capability and may self-organize for a variety of cooperative sensing and communication tasks, subject to resource constraints such as energy and bandwidth. They consider the circumstances under which sensor networks can be scalable. The key attribute is a localization of the source destination distribution, achievable through localized processing. They demonstrate that exceptionally straightforward techniques, viz., choice of the nearest sensor or gathering of sensors, are adequate to accomplish versatility when contortion is allowed for point sources. At the point when spatial contortion is allowed, systems are additionally versatile when detecting conveyed marvels.

L. Alazzawi and A. Elkateeb, et al., [2008] implemented in steering conventions for remote sensor systems are reenacted and their exhibitions are assessed to decide their

ability for supporting system adaptability. In this work, three WSN conventions, to be specific, BVR, PGR, and FP were recreated utilizing advance remote sensor test system. A few tests were done utilizing distinctive system parameters of WSNs. The execution of various directing conventions is estimated to decide the most effective one for the versatility. After evaluating several metrics which are throughput, latency, energy consumption,

Prasanna Sridhar, et al., [2009] clarified the property of scalability for a given system indicates the ability of a system or a subsystem to be modified with changing load on the system. For a sufficiently large complex system, there are several factors that influence the ability of the system to scale. It is necessary to incorporate solutions to these factors in the design for scalability of a given system. In this work, they discuss such design principles to handle the key factors that influence the scalability of large complex systems. Specifically, they explain the design and implementation of simple, innovative, and relatively less expensive methodology to guarantee that a large complex system such as network of sensors is scalable under varying load conditions.

J.V. Capella, et al., [2009] discussed the major problem for most of wireless sensor networks applications is the scalability. In this work they propose a new architecture called EDETA (Energy-efficient adaptive hierarchical and robust Architecture) optimized to save node's power. This design is scalable and appropriate for heterogeneous and homogeneous remote sensor systems, bolsters single or different sinks. The proposed protocol is able to auto configure, and it is based on two-levels hierarchical architecture. The lower level is based on cluster organization, while the upper one is formed as a dynamic tree of clusters heads to send the data to the sink.

In the survey Xiang Gao, et al., [2009] has explained his work using multi hop routing algorithm. Wireless sensor networks (WSN) including large quantity of small sensor nodes with low-power energy consumption can effectively extend its life-span. However, the performance of WSN is affected by the environment. In this work, they devise a new multi-hop routing algorithm clustering sensor nodes into groups to minimize the total energy consumption and improve scalability of the WSN. The proposed algorithm optimizes the intensity distribution of the cluster heads(CHs) when introducing the model of Verona-Structure trees.

Ali Peiravi, et al., [2009] discussed Ambulatory observing and social insurance utilizing remote sensor systems is a functioning region of connected research. The general system topology utilized for remote body territory systems is the star topology with the sensor hubs sending their information to a focal handling hub for information combination. Reliability of these networks is very important since they deal with human life. Reported applications have had performance and reliability problems. In this paper, a few announced uses of remote body region systems are explored and the unwavering quality of an example WBAN is figured.

Lejiang Guo, et al., [2010] analyzed the implementation and existing issues in LEACH. Particularly for hub vitality

and the system lifetime, it proposes a vitality productive directing calculation in view of cycle-exchanging group head. It enhances hub vitality productivity, adjusts vitality utilization of all sensor hubs, upgrades dependability of information transmission and delays arrange lifetime in contrast with LEACH. Additionally, the convention builds the adjust of vitality dispersal, versatility and unwavering quality of WSN.

Dhaval K. Patele, et al., [2011] discussed on the communication routing protocol which has impact on network lifetime and scalability. The sensor network lifetime is a function of energy. LEACH (Low-Energy Adaptive Clustering Hierarchy) as routing protocol of sensor network for energy conservation. Simulation shows the performance on node density and cluster-head percentage of LEACH protocol. Scalability and cluster variation improve the network lifetime by analyzing to the respect of alive node, simulation time, energy and data

Vijay Kumar, et al., [2011] examined a Markov model for reliability using different types of Sensors and spares that replace sensors in case failure occurs. The essential thought in this paper is to address and investigate the unwavering quality issues to gadget a dependable and adaptation to non-critical failure show for a sensor arrange framework. We analyzed the model in terms of reliability and MTTF (Mean-Time-To-Failure). Our exploration work center around the component for giving an option of an excess system by supplanting the broken sensor with the accessible extras.

Long Cheng, et al., [2011] evaluate in large-scale sensor networks, grouping sensor nodes into clusters has been considered as an effective way to achieve network scalability and robustness. Broadcasting over bunch heads (CHs) is frequently fundamental for directing conventions to set up courses in group based remote sensor systems (WSNs), e.g., scattering information to a portable sink or flooding information driven questions sent by a sink. In any case, between bunch correspondence between CHs has not been adequately explored in the current writing. In this work, they center around adaptable and vitality proficient telecom over CHs in multi bounce bunch based WSNs, where an immediate connection between CHs isn't really accessible. They display a disseminated heuristic convention, named BOCH, to enhance the versatility and vitality productivity of between bunch correspondence when playing out the telecom benefit over CHs.

Azlan Awang, et al., [2011] implemented a large scale single-sink WSNs, number of hops to reach the sink increases. This causes an issue to the scalability of access and routing protocol for WSNs which is affected by the topological changes and number of nodes in the network. Due to an increasing number of hops, nodes close to the sink deplete their energy quickly. As the network size grows, the length of multi hop paths increases and causes the above issues more defiant. Thusly, various sinks utilization shows up as an answer for expansive scale sensor systems. In this work, they propose to use node's minimum path loss and sinks 1-hop neighbours residual energy for guiding nodes to shuffle data packets among the sinks. Utilizing this system, hubs evade from sending

information bundles toward the 1-bounce neighbors that are going to drain their vitality and accordingly, enhancing the adaptability.

R.sudha ,et al., [2016] discussed the proposed scheme, a cluster-tree routing architecture for sensor nodes is created by using centralized and cluster based techniques. The proposed method utilizes K-NN to calculate the distances between the sensor nodes and account for the residual energy by selecting the appropriate CH nodes. The main reason is that the routing structure is improved by using KNN based clustering in the proposed scheme. The transmission distance between two nodes is reduced considerably. Hence, the transmission power is lowered. From the simulation results, it is clear that our proposed scheme not only achieves the appropriate performance level with respect to the energy consumption and network lifetime for the wireless body sensor networks but also is suitable for large-scale sensing and detecting environments.

Ahmed E.A.A. Abdulla, et al., [2011] dissected the versatility confinements of ordinary steering calculations and contrast them with those of our as of late proposed Hybrid Multi-jump directing (HYMN)

Hyung-Sin Kim, et al., [2012] discussed the design of network joining algorithms that can construct a large scale cluster-tree structured WSN with maximal node connectivity. A new node willing to join as a router selects its parent node among neighbour routers which are closer to the network coordinator than itself, reducing the waste of network depth. The parent hub chooses confined hubs first as its tyke switches, mitigating the systems administration predisposition issue.

Waqar Ahmed, et al., implemented a higher-order-logic formalization of series, parallel and parallel-series RBDs. These RBDs are then used to do the formal reliability analysis of the end-to-end (e2e) data transport mechanism, and the Event to Sink Reliable Transport (ESRT) and Reliable Multi-Segment Transport (RMST) data transport protocols.

Kashif Saleem, et al., [2015] analyzed the adaptability and steadiness of the ACO-based steering convention BIOSARP against the issues caused by gaps in WSNs. System test system 2 (ns-2) is used to play out the examination. Discoveries obviously exhibit that BIOSARP can productively keep up the information bundle steering over a WSN before any conceivable gaps issues, by changing information sending to the most ideal neighboring hub.

R.sudha et al[2016] discussed in this paper devised a new biometric fusion based trusted anonymous secured routing protocol which assures prevention against such attacks. More specifically, the route request packets were authenticated by an iris fused with DNA coding to generate a dynamic complex group signature and to secure beside possible active attacks exclusive of presenting the node identities. In addition this work also prevented revealing real destination to intermediate nodes by adapting key-encrypted pairing onion. Simulation results confirmed the efficacy of the projected BFTASR protocol with enhanced performance as evaluated with the existing protocols.

Muhammad AdeelMahmood, et al., [March 2015] this paper presents a survey on reliability protocols in WSNs. We review several reliability schemes based on retransmission and redundancy techniques using different combinations of packet or event reliability in terms of recovering the lost data using hop-by-hop or end-to-end mechanisms. We further analyze these schemes by investigating the most suitable combination of these techniques, methods and required reliability level in order to provide energy efficient reliability mechanism for resource constrained WSNs. This paper also proposes a 3D reference model for classifying research in WSN reliability, which will be used to perform in-depth analysis of the unexplored areas.

R.sudha et al [2017] analyzed this paper is proposed to generate a secure key by using retina biometric technique since retina is unique and reduces the duplication. A system designed to provide by means of verification BFTASR routing protocol is a more feasible and providing a high security than other techniques. The overall performance shows that proposed scheme achieves high throughput and packet delivery ratio is provided by authorized node of WBAN and decreases the average end to end delay.

## **VI. Conclusion:**

Scalability is one of the important concepts necessary in more effectively implementing and analyzing large, complex, independent, heterogeneous and autonomous systems working cooperatively. When systems interact (and often cooperate and coordinate) with each other to address the defined high level objectives, the performance of the entire combination of such systems could degrade due to optimization, autonomy, etc. Scalability is the key factor which assumes a vital part in planning the Wireless Sensor Network. The system ought to dependably be versatile to adjust to the recently entered hub in the system

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