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Survey on MANETs and WSNs: Difference, Features and Routing Protocols

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ABSTRACT:*A wireless channel laid the cellular ad-Hoc community (MANET) and wi-fi Sensor network (WSN)in an unlicensed spectrum that is at risk of obtrusion with the aid of other radio waves technologies working inside the same frequency. The goal of this examine is to expose that the WSN is a unique sort of ad hoc wi-fi community which can be used to provide a wireless communication infrastructure that lets in us to study, instrument and reply to herbal phenomena in any surroundings. Even that, the results show the essential variations among WSN and MANET inclusive of: WSN cognizance on surroundings interaction while MANET interplay closed to human, information rate in WSN is very low with huge variety of centralized node however so wealthy multimedia records can be carried in MANET with less wide variety of decentralized node, etc. From all preceding papers, this evaluation comparison indicates that the significance of both networks relies upon on the used software with unique aspect in WSN.*
Keywords: *Wireless Communication; Technologies; WSN; MANET;*

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I. INTRODUCTION

The process of data transmission among two points or extra that are not linked by means of an electrical conductor is referred to as a wireless conversation [1]. The most commonplace wireless technology use radio due to the fact radio waves distances can be brief, along with some meters for television or as a long way as hundreds or even tens of millions of kilometers for deep-area radio communications. It includes numerous kinds of constant, cell, and portable applications, consisting of "two-manner radios", "cellular phones", "non-public virtual assistants" (PDAs) and "wireless networking" [2]. A wireless community can be described as pc networks that aren't used the cables of any type. This attributes freedom of motion and the capacity to increase programs to extraordinary parts of a constructing, metropolis, or almost anywhere inside the world [3]. The organizations use a wireless network as a connection between exclusive device locations or to avoid the expensive technique of introducing cables into buildings. It lets in users to reap total pc portability and region independence [4]. wireless networks permit its users to have interaction with electronic mail or browse the net from any vicinity that customers decide upon. The wireless structures basically operate with radio waves, so its implementation takes vicinity at the bodily degree of community structure [5]. Gadgets have processors, reminiscence and a means of interfacing with a particular kind of network in order that the cells of conventional telephones don't fall in the definition of a laptop device. more modern phones or even audio headsets are starting to mix network adapters and computing power. ultimately, maximum electronics will display wireless network connections [6]. the main objective of this literature paper is to review the variations between WSN and MANET consisting of: routing protocol, quantity of nodes, node movement, interaction, capabilities, applications, network length and so on.

II. MOBILE AD-HOC NETWORKS (MANET)

On wireless networks, an ad-hoc network is instant network in which wireless devices are communicated directly with each other with self-configuration and short range. The mode of adhoc allows all wireless devices within the communication range to operate together [7]. Basically, MANET is designed for the establishment of a network anytime and anywhere, without specifications to infrastructure to support the mobility of the users in the network. In such an environment, networks are subject to severe blocking. Therefore, the performance of an ad hoc system relies on the stability of the network architecture [8,9]. Fig 1 gives overview of an ad-hoc network, where wireless mobile nodes have created a network, with one of mobile node so far to reach [10]. Wireless ad hoc networks only contain of nodes supported with transceiver. The nodes of MANET should be able to manage and arrange their own network due to the network is formed to be independent network from an infrastructure. Furthermore, the establishment of the networks should be in a

decentralized and distributed manner [11]. MANET has a complexity aspect with its node themselves where the nodes must be able to solve network's problem like the security and routing problems. Also, the node should be adaptable to changes of network topology because ad-hoc network can change their topology in unpredictably and quickly [12, 13].

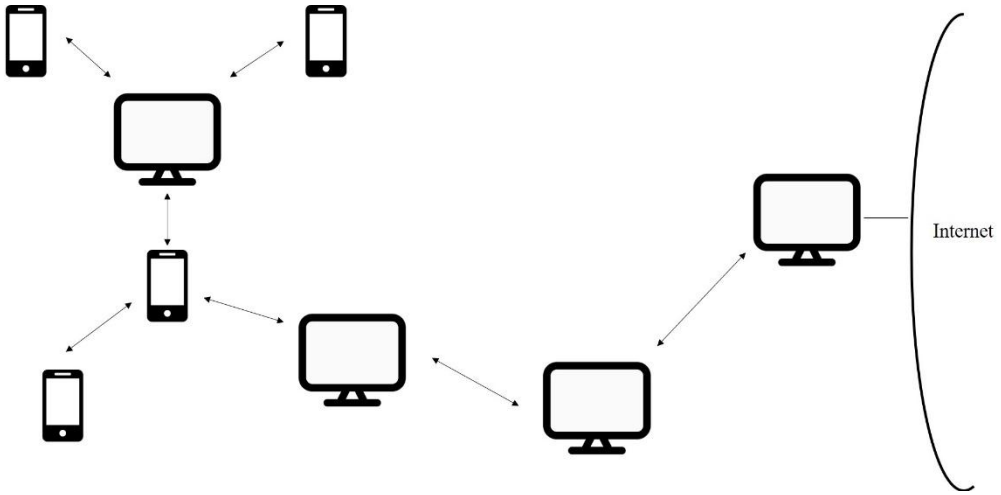

Fig. 1 Ad-Hoc Network

The devices of MANET combine the communication that based on Wi-Fi to allow them to interact with each other using wireless (one hop) and mobile (multi-hop) networks so that any physical scenario supporting the communication services on the move to its users as potential collaboration arena [14].Unfortunately no work that has been done to support QoS for Internet and other network architecture is suitable directly in MANET environment. To support QoS, the link state information such as bandwidth, delay, error rate and loss rate in the network must be available and manageable. However, the mobility, resource limitations, random joining and leaving of network nodes make the managing and getting this link state information is so difficult [15].

A. Mobile Ad-Hoc Networks Features

- **Dynamic topologies:** nodes are unfastened to move arbitrarily; for this reason the community topology can be changed randomly and unpredictably and often includes bidirectional links. In some instances in which the transmission electricity of two nodes is special, a unidirectional hyperlink may additionally exist.
- **Bandwidth-constrained and variable capacity links:** wireless links hold to have appreciably decrease ability than infrastructure networks.
- **Energy-constrained operation:** some or all the MSs in a MANET may additionally rely on batteries or other exhaustible means for his or her electricity. For these nodes or gadgets, the most critical gadget design optimization standards can be energy conservation.
- **Limited physical security:** MANETs are generally extra vulnerable to bodily protection threats than cord line networks. The extended possibility of eavesdropping, spoofing, and denial of services (DoS) attacks should be considered cautiously. To reduce protection threats, many present hyperlink protection strategies are frequently implemented within wireless networks.

B. Applications of MANET

- **Defense applications:** Many defense applications require on the fly communications set-up, and ad hoc/sensor networks are excellent candidates for use in battlefield management.
- **Crisis management applications:** These arise, for example, as a result of natural disasters in which the entire communication infrastructure is in disarray. Restoring communications quickly is essential.
- **Telemedicine:** The paramedic assisting the victim of a traffic accident in a remote location must access medical records (e.g. X-rays) and may need video conference assistance from a surgeon for an emergency intervention. In fact, the paramedic may need to instantaneously relay back to the hospital the victim's X-rays and other diagnostic tests from the site of the accident.

- **Tele-geoprocessing application:** The combination of GPS, GIS (Geographical Information Systems), and high-capacity wireless mobile systems enables a new type of application referred to as tele- geo processing.
- **Virtual Navigation:** A remote database contains the graphical representation of building, streets, and physical characteristics of a large metropolis. They may also "virtually" see the internal layout of buildings, including an emergency rescue plan, or find possible points of interest.
- **Education via the internet:** Educational opportunities available on the internet or remote areas because of the economic infeasibility of providing expensive last-mile wire line internet access in these areas to all subscribers.
- **Vehicular area network:** This a growing and very useful application of adhoc network in providing emergency services and other information. This is equally effective in both urban and rural setup. The basic and exchange necessary data that is beneficial in a given situation.

C. Routing Protocols in MANET

Routing is the process of moving of the information from a source (host) to a destination (another host) in the network. Where, at least one intermediate node within the network is forwarded. Routing can be find the end-to-end paths, minimize overhead, find loop free and do the route maintenance [16]. Routing protocol for ad-hoc network can be categorized in two strategies *Flat* and *Hierarchical architec*ture as shown in table I.

Hierarchical	**Flat**		
	Reactive	**Proactive**	**Hybrid**
Zone Based Hierarchical Link State (ZHLS)	• Ad Hoc on-demand distance Vector Routing (AODV) • Dynamic Source Routing (DSR) • Location Aided Routing (LAR) • Temporally Ordered Routing Algorithm (TORA)	• Global State Routing (GSR) • Hierarchical State Routing (HSR) • Destination Sequenced Distance Vector (DSDV)	Zone Based Routing Protocol (ZRP)

TABLE I: Routing Protocols in MANET

III. WIRELESS SENSOR NETWORK (WSN)

A wireless sensor network (WSN) is a network of several smallest nodes called sensors that based on centralized communication with wireless signals. WSN is special network that spread to sense the area of interest [17]. The nodes in sensor network are limited with respect to energy supply, communication bandwidth and restricted computational capacity. It's expected that sensor nodes adjust and operate in changing environments and should be useable in large areas [18].The scale of traditional wireless networks is often orders of magnitude less than that of sensor networks, often thickly and deployed redundantly, additionally the nodes can be added to and deleted from the network dynamically without manual intervention by human and fundamentally use broadcast communication paradigms [19,20]. Failures are oversensitive in wireless sensor networks due to inhospitable, unstable environment and unattended deployment [21].In WSN, passing link failure are more repeated then perpetual failures particularly in presence of high dynamic of low-power wireless link. The effect of link faults channelizes to route vibration, emergent link employment of links on replacement paths, conflicting data flow over intercede router buffers [22]. Fig. 2 shows that sensor nodes are responsible for gathering the information of environment and sending it to a sink node, that able to manage and achieve all the communications between other nodes [23].

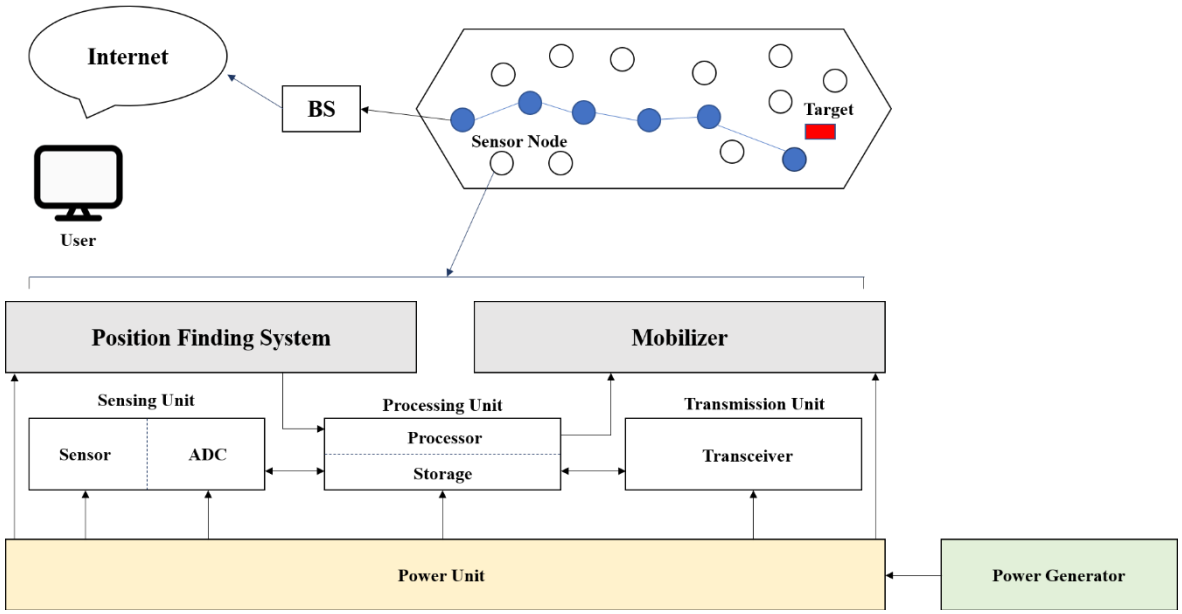

Fig.2 Wireless Sensor Network

Sink node (Base station) receives the collected information by the network from several sensor nodes and delivers it to the end user so the placement of a sink node has a big impact on lifetime and on energy consumption in WSNs. [24]. WSN supplies the following essential functionalities [25, 26]:

- Data acquisition and signal conditioning for different sensors.
- Provisional storage of the obtained data.
- Data processing.
- Analysis of the processed data for diagnosis and, potentially alert generation.
- Self-monitoring.
- Scheduling and implementation of the measurement tasks.
- Management the configuration of sensor node.
- Reception, transfer and forwarding of packets of data.
- Management and coordination the communications and networking.

A. Wireless Sensor Network Features

- Ability to cope with node failures (communication failure)
- Mobility of nodes
- Dynamic network topology
- Scalability to large scale of deployment
- Heterogeneity of nodes
- Ability to withstand harsh environmental conditions
- Unattended operation
- Ease of use and large-scale deployment
- Power consumption

B. Applications of WSN

- Physical security for military operations
- Habitat monitoring
- Environmental monitoring
- Seismic and structural monitoring
- Object tracking
- Industrial automation
- Field experiments
- Nuclear reactor control
- Bio-medical applications

- Traffic monitoring
- Fire detection

C. Routing protocols in WSN

In a WSN environment, it's impractical to assign and maintain the hierarchical structures of the network because it's nodes can be spread in large quantities with randomly move also the topology of the network may vary according to energy efficiency decisionsor sensor failures. The message overhead for maintaining the routing tables and the memory space desired to save and store them is not available forresource constrained and the energy in WSNs. In a WSNs, routing protocols must be lightweight both memory footprint and processing power and should be require the minimal message overhead [25]. The routing protocols in WSNs can be classified as flat, hierarchical and Location based protocols as shown in tableII. In hierarchical protocols, the network organizes its nodes into many logical levels. This is typically done by a process called cluster formation. A cluster contains a set of geographically proximal sensor nodes; one of these nodes serves as a cluster head [21]. The cluster heads can be organized into moreover hierarchical levels. In flat routing protocols, the attempting to find good-quality routes from source to sink nodes can be implemented by some form of flooding. Since flooding operation is a so costly in resource famished networks and smart routing algorithms straiten the flooding to localized regions. So, to establish routing paths, some algorithms use probabilistic techniques depended on certain heuristics [27].

Reactive	**Proactive**	**Hybrid**
- Low Energy Adaptive Clustering Hierarchy (LEACH) - Power-Efficient Gathering in SensorInformation Systems (PEGASIS) - Threshold Sensitive Energy EfficientNetwork (TEEN) - Adaptive Periodic Threshold Sensitive Energy Efficient Sensor Network (APTEEN) - Minimum Energy CommunicationNetwo rk (MECN)	- Sensor Protocols for Information Via Negotiation (SPIN) - Direct Diffusion (DD) - Rumor Routing - Energy Aware Routing (EAR) - Sequential Assignment Routing (SAR) - Minimum Cost Forwarding Algorithm (MCFA) - Active Query forwarding in sensor network (ACQUIRE)	- Geographic and Energy Aware Routing (GEAR) - Sequential assignment Routing (SAR) - Ad-hocpositioningSystem(APS) - Geographicadaptivefidelity(GAP) - Greedyotheradaptive facerouting(GOAFR) - Geographic distance routing (GEDIR)

TABLE II. ROUTING PROTOCOLS in WSN

IV. CRITICAL DIFFERENCES BETWEEN WSNS AND MANETS

Both WSN & MANET networks use a wireless channel laid in an unlicensed spectrum that is susceptible to obtrusion by other radio waves technologies working in the same frequency. Although there are many significant similarities between WSNs and MANETs, there are also essential differences between them such as: energy critical, scalability, addressing, active networking etc. Table III summarizes the essential differences between WSN and MANET networks.

Issues	MANET	WSN
Standards	IEEE 802.11	IEEE 802.15.4
Number ofNodes	Less thanWSN	Very large
NodeMovement	Decentralized	Centralized
Node works	Nodes act bothas host &router	NodesSeparately
Interaction	"Closed" toHumans	WithEnvironment
Main purpose	DistributedComputing	InformationGathering
Application equipment	Moreexpensive	Less thanMANET
Application specific	ComparablyUniform	Much strongeron application Specifics
Scale	Larger	Much larger
Bandwidth	Deficient morethan WSN	SometimesDeficiency
Failure in nodes	Less thanWSN	prone to failure
Data rate	Designed tocarry richmultimediadata	Very low
DataRedundancy	No	Yes
Power	-	Limited
Population ofNodes	Sparsely	Densely
Deployed by	Severalunrelatedentities	Single owner
ApplicationNode	-	Stationarynodes
CommunicationMode	Point-to-Point	Broadcast
RoutingProtocols	Pro-active,Reactive,Hybrid	Flooding,Gossiping, FlatRouting, Hierarchical,Location based
MemoryConstrained	Less thanWSN	Very high
Network size	Depends onactive users	Depends onextension of theobserved area
Identification	Unique ID byits MACAddress	Not unique

TABLE III. FUNDAMENTAL DIFFERENCES BETWEEN WSN and MANET

V. CONCLUSION

The principle work, the main features, applications and thefundamental differences between WSN and MANET have beenpresented.The following conclusions can be summarized:

1. WSN is a special type of ad hoc networks; both areusing a wireless channel laid in an unlicensed spectrumthat is susceptible to obtrusion by other radio wavestechnologies working in the same frequency.
2. WSN focus on environment interaction whereasMANET interaction closed to human.
3. WSNis data centralized, but the control of the networkis published among the nodes in MANET, so it has no
4. background network for the central control of thenetwork operations.

5. In WSN, data rate is very low but so rich multimediadata can be carried in MANET.
6. Sensor network has very huge number of nodes thatusually spread once in their life time, while MANEThas a smaller number of nodes that usually move in an ad hocmanner.

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