A SURVEY OF ROUTING PROTOCOLS IN WIRELESS AD-HOC NETWORK

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ABSTRACT : This paper focus on the study of Wireless Ad Hoc networks and its routing protocols, As we know this is an emerging field which places lot of contribution in networking field.. In Ad Hoc networks nodes are moving from one place to another place, within this network any node can join the network and can leave the network at any time. An ad-hoc routing protocol is a convention, that controls how nodes decide which way to route packets between computing devices in wireless ad hoc network . In ad-hoc networks, nodes are not familiar with the topology of their networks. Instead, they have to discover it. In this paper we concentrate on two types of wireless Ad-hoc networks namely Mobile Ad-hoc Network and Wireless Sensor Network.
KEYWORDS - AODV, AD-HOC Network, DSR , DSDV MANET, WSN, ZRP

1. INTRODUCTION

Wireless networks can be classified in two types: - infrastructure network and infrastructure-less (ad hoc) networks. Infrastructure network consists of a network with fixed and wired gateways. In contrast to infrastructure based networks, in ad hoc networks all nodes are mobile or may be sensor nodes and can be connected dynamically in an arbitrary manner. All nodes of these networks behave as routers and take part in discovery and maintenance of routes to other nodes in the network.

Ad hoc networks have been proposed as an appealing communication technology to deal with the unexpected conditions emerged during and/or after a disaster. Communications among victims and crewmembers involved in rescue operations are crucial in order to alleviate the disaster consequences and save lives. Now a days people mostly communicate with each other by using mobile phones, smartphones in the majority of cases, making calls or sending text messages through Internet and via applications such as Whatsapp, Facebook, and Line among others. However, cellular-based communications may not be possible after a disaster due to the damages in the telecommunication System. Routing protocols are used to find route for transmission of packets. Routing is the most fundamental research issue in ad hoc networking . The merit of a routing protocol can be analyzed through metrics-both qualitative and quantitative with which to measure its suitability and performance.

2. WIRELESS AD HOC NETWORKS

Wireless ad hoc network is a special structure of the wireless communication network, whose communication relies on their cooperation among the nodes and achieves it in the manner of wireless multi-hop. and has the properties of self-organizing and self-managing. In wireless network the ad hoc network is a key factor. The ad hoc network is made up of multiple nodes connected by links since link can be connection as well as disconnected at any time. A wireless ad-hoc network is a decentralized type of wireless network. The network is ad hoc because it does not rely on a preexisting infrastructure, such as routers in wired networks or access points in managed (infrastructure) wireless networks. Instead, each node participates in routing by forwarding data for other nodes, and so the determination of which nodes forward data is made dynamically based on the network connectivity. In addition to the classic routing, ad hoc networks can use flooding for forwarding the data. An ad hoc network typically refers to any set of networks where all devices have equal status on a network and are free to associate with any other ad hoc network devices in link range. Very often, ad hoc network refers to a mode of operation of IEEE 802.11 wireless networks.

According to their application types of Wireless ad hoc networks are classified into three types namely
Mobile ad-hoc Network, Wireless Sensor Network, Wireless Mesh Network. But in this paper we focus on only two- Mobile ad-hoc Network (MANET), Wireless Sensor Network (WSN).

2.1 Mobile ad-hoc Network (MANET)
The MANET is the one of the type of ad hoc network, is a infrastructure less wireless device that's why it move to anywhere in any direction. A mobile ad hoc network (MANET) consists of mobile hosts equipped with

wireless communication devices. The transmission of a mobile host is received by all hosts within its transmission range due to the broadcast nature of wireless communication and Omni-directional antennae. Mobile ad hoc network is a kind of wireless network, is self-configuring infrastructures less network devices are connected by wireless. The devices of MANET network is free to move independently in any direction that's why linking with any other devices is easily done. Each must forward traffic unrelated to its own use, and therefore be a router. The primary goal of Mobile ad hoc network is each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. The achievement of MANET is hug growth of laptops and wireless or Wi/Fi networking.

A Mobile Adhoc Network is a collection of independent mobile nodes that can communicate to each other via radio waves as shown in fig 2.1. The mobile nodes that are in radio range of each other can directly communicate, whereas others needs the aid of intermediate nodes to route their packets. Each of the node has a wireless interface to communicate with each other. These networks are fully distributed, and can work at any place without the help of any fixed infrastructure as access points or base stations.
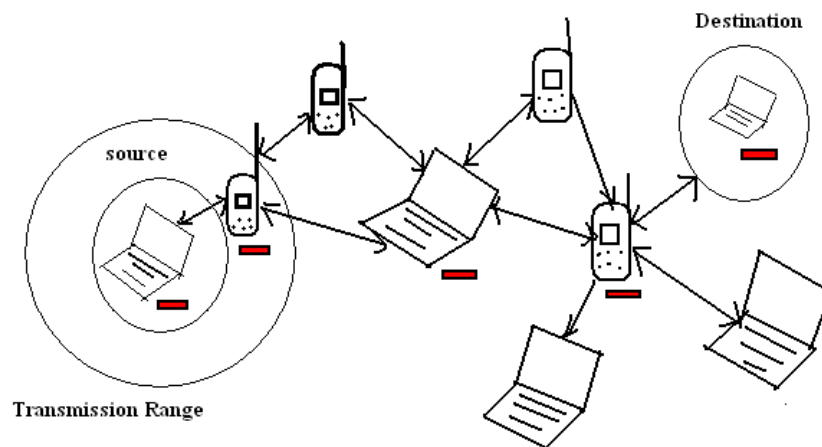

Figure 2.1: Mobile Ad Hoc Network

2.2 Wireless Sensor Network (WSN)
A wireless sensor network (WSN) sometimes called a wireless sensor and actor network (WSAN) are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location. The more modern networks are bi-directional, also enabling control of sensor activity. Sensor networks do not focus on human interaction but instead focus on interaction with the environment. Indeed, nodes in a sensor network are usually embedded in the environment to sense some phenomenon and possibly actuate upon it; this is why some people say that WSNs can be considered as a "macroscope".

The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts: a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller, an electronic circuit for interfacing with the sensors and an energy source, usually a battery. Wireless sensor networks are a key enabling technology for industrial monitoring applications where the use of wire- less infrastructure allows high adaptivity and low cost in terms of installation and retrofitting. To facilitate the move from the current wired designs to wireless designs, concerns regarding reliability must be satisfied. Current standarization efforts for industrial wireless systems lack specification on efficient routing protocols that mitigate reliability concerns.
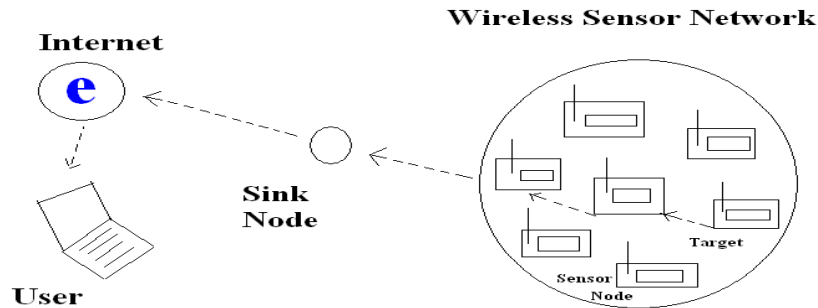
Figure 2.2: Wireless Sensor Network

3.   AD-HOC ROUTING PROTOCOLS

General classification of Routing Protocols in Wireless Ad Hoc Networks into three main classes: Proactive , Reactive and Hybrid protocols as shown in fig 3.1
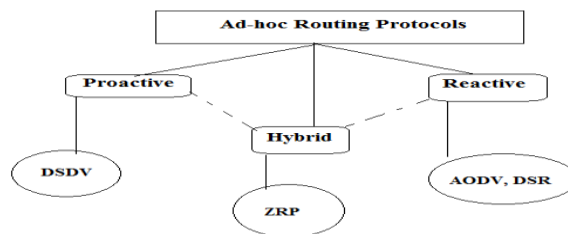

Figure 3.1 Classification of Ad-hoc Routing Protocols

3.1.1 Proactive protocols

Proactive MANET protocols are "Table-driven Routing Protocols" and will actively determine the layout of the network. However, a drawback to a proactive protocol for MANET is that the life span of a link is significantly short. In proactive protocols,   nodes continuously search for routing information within a network, so that when a route is needed, the route is already known.

- Destination-Sequenced Distance-Vector (DSDV)

DSDV protocol is a distance-vector protocol with extensions to make it suitable to MANET. Every mobile node maintains a routing table which lists all the available destinations, the metric and next hop to each destination and a sequence number generated by the destination node. Using such routing table stored in each mobile node, the packets are transmitted between the nodes of an ad hoc network. Each node of the ad hoc network updates the routing table with advertisement periodically or when significant new information is available to maintain the consistency of the routing table with the dynamically changing topology of the ad hoc network

3.1.2 Reactive protocols

Reactive routing protocols are designed to reduce the bandwidth and storage cost consumed in table driven protocols. Every node in the network obtains a route to a destination on a demand fashion. Reactive protocols do not maintain up-to-date routes to any destination in the network and do not generally exchange any periodic control messages. Reactive MANET protocols only find a route to the destination node when there is a need to send data. The source node will start by transmitting route requests throughout the network. The sender will then wait for the destination node or an intermediate node (that has a route to the destination) to respond with a list of intermediate nodes between the source and destination.

- Ad Hoc On-Demand Distance Vector Routing (AODV):

AODV uses bandwidth efficiently (by minimizing the network load for control and data traffic), is responsive to changes in topology, is scalable and ensures loop free routing. AODV uses traditional routing tables, one entry per destination. This is in contrast to DSR, which can maintain multiple route cache entries for each destination. Without source routing, AODV relies on routing table entries to propagate an RREP back to the source and,

subsequently, to route data packets to the destination. AODV uses sequence numbers maintained at each destination to determine freshness of routing information and to prevent routing loops. All routing packets carry these sequence numbers.

3.1.3 Hybrid protocols
Hybrid routing protocols developed by using both proactive and reactive routing protocols. These hybrid protocols can be used to find a balance between the proactive and reactive protocols. In Hybrid routing protocols network is divided network into Intra-region and Inter-region. Intra-region performs Reactive routing and Inter-region performs Proactive routing.
- Zone Routing Protocol (ZRP)

Zone Routing Protocol is a hybrid routing protocol that divides the network into zones. ZRP provides a hierarchical architecture where each node has to maintain additional topological information requiring extra memory.

4. APPLICATIONS OF WIRELESS AD HOC NETWORKS
4.1 Application of MANET
Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed. Some Applications areas of MANET are as follows-

4.1.1 Military battlefield
Ad-Hoc networking would allow the military to take advantage of commonplace network technology to maintain an information network between the soldiers, vehicles, and military information head quarter.

4.1.2 Collaborative work
For some business environments, the need for collaborative computing might be more important outside office environments than inside and where people do need to have outside meetings to cooperate and exchange information on a given project.

4.1.3 Local level
Ad-Hoc networks can autonomously link an instant and temporary multimedia network using notebook computers to spread and share information among participants at a e.g. conference or classroom. Another appropriate local level application might be in home networks where devices can communicate directly to exchange information.

4.1.4 Personal area network and bluetooth
A personal area network is a short range, localized network where nodes are usually associated with a given person. Short-range MANET such as Bluetooth can simplify the inter communication between various mobile devices such as a laptop, and a mobile phone.

4.1.5 Commercial Sector
Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed.

4.2 Application of WSN
4.2.1 Area monitoring
Area monitoring is a common application of WSNs. In area monitoring, the WSN is deployed over a region where some phenomenon is to be monitored. A military example is the use of sensors detect enemy intrusion; a civilian example is the geo-fencing of gas or oil pipelines.

4.2.2 Environmental/Earth monitoring
The term Environmental Sensor Networks has evolved to cover many applications of WSNs to earth science research. This includes sensing volcanoes, oceans, glaciers, forests, etc. Some of the major areas are listed below.

4.2.3 Air quality monitoring

The degree of pollution in the air has to be measured frequently in order to safeguard people and the environment from any kind of damages due to air pollution. In dangerous surroundings, real time monitoring of harmful gases is an important process because the weather can change rapidly changing key quality parameters.

4.2.4 Interior monitoring

Observing the gas levels at vulnerable areas needs the usage of high-end, sophisticated equipment, capable to satisfy industrial regulations. Wireless internal monitoring solutions facilitate keep tabs on large areas as well as ensure the precise gas concentration degree.

4.2.5 Exterior monitoring

External air quality monitoring needs the use of precise wireless sensors, rain & wind resistant solutions as well as energy reaping methods to assure extensive liberty to machine that will likely have tough access.

4.2.6 Forest fire detection

A network of Sensor Nodes can be installed in a forest to detect when a fire has started. The nodes can be equipped with sensors to measure temperature, humidity and gases which are produced by fire in the trees or vegetation. The early detection is crucial for a successful action of the firefighters; thanks to Wireless Sensor Networks, the fire brigade will be able to know when a fire is started and how it is spreading.

5. CONCLUSION

In this paper, we survey about Wireless Ad Hoc networks, its different protocols and different types of network namely MANET , WSN. So the survey of this paper will be helpful to understand Ad Hoc networks and its various application and various areas. The future scope of this paper is to concentrates on improving more accurate, effective and energy efficient communication of these different networks. A number of routing protocols for which are broadly categorized as proactive and reactive and Hybrid protocols. In the next generation of wireless communication systems, there will be a need for the rapid deployment of independent mobile users. Significant examples include establishing survivable, efficient, dynamic communication for emergency/rescue operations, disaster relief efforts, and military networks, area monitoring etc. We have seen a great development in the field of wireless ad hoc network.

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