Ad-Hoc Network and Their Applications

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Abstract— *Today almost everyone carries gadgets like cellular phones, laptops, handheld PCs in the form of tablets, media players and many more for daily basis uses in their professional and private lives. Mostly all those gadgets are being used independently i.e they are used separately and their functions do not interact at the same time. Ad hoc networks are the visible networks of mobile computational nodes. Ad hoc broadcast interaction between the nodes sway be generally termed as a scheme, also called ad hoc networking that enables the gadgets to stabilize interaction at the requisite time and at any place externally the support of any centralized framework. Nowadays one more thing is coming in everyone's knowledge which is called vehicular ad-hoc network (VANET). VANET tends to be the distinct sort of MANET, where vehicles are considered to be the nodes. Speed of the vehicles is delimited by the swiftness indicators and moreover, nodes in the form of vehicles are required to comply with road traffic signals which is not alike in MANET. The following mentioned paper disseminates the notion of MANETs along with applications that can be envisioned plus paper also impersonates a concise study on VANET, its characteristics and its applications followed by a concise study of SPAN and its features.*

I. INTRODUCTION

Ad hoc channels are improved and renewed standard of wireless interaction for portable devices. In an ad hoc network, there occurs no defined base or infrastructure such as base stations or mobile switching centers. Nodes of these are in the radio range of each other and when these are reachable, information is passed directly via wireless links, on the other hand, nodes that are not easily reachable rely on intermediary devices to transmit information to routers. Observing the recent few years, we can say, utilization of wireless circuitry has become a hot and widespread topic. MANET is the other name of the wireless ad-hoc network. MANET is comprised of three words i.e MOBILE (movable), AD-HOC (temporary), NETWORKS (flexible data applications which use networks to pass information). Vehicular ad-hoc networks (VANETs) is the sub-division of Mobile ad hoc networks(MANETs). VANET is without any ambiguity is crucial aspect in the growth of Intelligent Transportation System (ITS) with a view to render protection and alleviation to the customers. VANET aids automobile drivers to organize amid themselves while driving to define any mishappening while driving the vehicle for example accidents, traffic jams etc. These type of networks can also be applied for law enforcement, emergency and rescue missions. These types of circuitry are also used at times the people and apparatus in independent military regiments are supposed to work collectively or mutually in any battle or conflict.

II. WIRELESS AD HOC NETWORKS OR MANET

MANET is the other name of the wireless ad-hoc network. It is a combination or group of two or more nodes or devices with wireless comm and networking join that communicate or transfer information to each other without use of any centralized computer system and also node or computer of the ad hoc network can dynamically created the network for exchanging of information. It is self-choice system in which the node can connected by wireless and also acts as the router. In the ad hoc wireless network all the nodes are acts as a router or host. In ad hoc network all nodes are change or modify with frespect to the time.And it is a self-governing system in which mobile hosts connected or united by wireless or broadcast links are free to be dynamic and sometimes acts as routers at the same time. All nodes or terminals in a wireless ad-hoc network act as a router and host, as well as network topology, is in dynamically, because the connectivity among the nodes may change or modify with time due to some of the existing node departures and new node arrivals. The unique traits of Mobile Ad-Hoc Network or MANET bring this technology great opportunity together with critical challenges. All the devices or nodes are qualified to establish or organize themselves.

Characteristics:-

With compare to the traditional wireless network an ad hoc network operated on the mobile node. Some of the characteristics of ad hoc network are as follows:-
1.) In MANETs each node in the network act as both router and host.
2.) MANETs is capable of supporting multi-hop routing.
3.) It provides distribution nature of the MANETs for security purpose so centralized firewall is absent in the MANETs.
4.) It makes network topology dynamic because any node can join or leave the network anytime.
5.) In MANETs the nodes are characterized by is less memory, power, and lightweight feature.
6.) It involves minimum human intervention in the configuration of the network.
7.) All nodes in the MANETs have similar features, therefore, it makes a systematical environment.

III. APPLICATIONS OF MANET

Mobile ad-hoc networks (MANETs) has been the focal point for various recent researches and boosting process. Till now, ad hoc packet radio networks were supposed to be used for military applications, where a decentralised network configuration is requisite or we can say, it is an operative advantage. In the commercial division, apparatus for wireless,

mobile computing has not been available at price appealing to large markets. However, the need for unlimited networking is presumed to rise due to the steady increase in potentiality of mobile computers. Mobile ad hoc networks can be applied as sensor networks. Sensor networks are composed of a large number of small sensors. We can apply these networks for detecting any number of properties of an area. Some of the basic examples are temperature, pollution pressure etc. Mobile ad hoc sensor networking can be a crucial part of upcoming homeland security. Ad hoc networks that link notebook or palmtop computers can be used to strew and have a hand in sharing information among the participants at a conference at a local level. They may also be considered to be effective when applied in home networks in cases where devices can directly and conviniently communicate to exchange information, such as audio/video, configuration updates and many more wireless communications. For all I know, the most extensive applications in this frame of reference are approximately self-sufficient networks of interconnected home robots that clean, do dishes, perform security surveillance and so on. Some people have even propounded ad hoc multi-hop networks (denoted sensor networks) for instance, for environmental surveillance, where the networks could be considered to be used to foresee water pollution or to provide prompt warning of forthcoming tsunami. Short-distance ad hoc networks can remove the complexities in intercommunication between various portable devices (such as a cellular phone and a Personal Digital Assistant like handheld PCs) by constituting or forming a unique ID of itself and thereby extinguish the use of cables. This might also result in extension of portability dispensed by the fixed network (i.e mobile IP address) to devices further out in an ad-hoc network domain. The bluetooth system is probably the most aspiring technology in the frame of reference of personal area networking.

1.) Ad-Hoc Street Light Network:-

In this application of ad hoc network is used to wireless control of the street light for the efficient use of energy. Many street lights combine together to form a wireless ad hoc network. A gateway device is used to control the street light. A single gateway device is used to control up to 500 lights. A gateway is used to turn OFF, ON and DIM them as well if find which individual light is faulty and need for maintenance.

2.) Ad-hoc Networked of Robots:-

Robots are the mechanical system that is used to perform the task that seems difficult for the man. It used star schema approach to coordinate the robot system. In this robot can talk to the controller central system but with the use of ad hoc network they can form wireless connection among them and talk each other directly. The robots can share local information and resolve difficult task effective and efficient way.

3.) Disaster Rescue Ad-Hoc Network:-

Another use of wireless ad hoc network is public safety. In the natural disaster like floods, storms, earthquakes, fire etc. a quick and instant wireless connection is important for communication. In case of an earthquake when radio towers are destroyed then the wireless network is used for communication.

4.) Hospital Ad-Hoc Network:-

In the hospital premises the ad hoc network also an advantage that it allows sensors, videos, and other instrument or devices are to be connected wirelessly for patient monitoring, doctor and nurses alert and it also saved many of the lives.

IV.   ROUTING IN MANETS

i) Proactive Routing Protocol:-

It is also called table-driven routing algorithm. In this protocol, each node has own routing table that helps them to share data among the different nodes in the network. It contains the information about the number of hops required to reach the destination. Every station or node can modify the table from time to time. When new node arrives it contains the information about that how many nodes are required to reach that new node. It is only useful for less number of nodes.
Examples of proactive algorithm are:-
Optimized link state routing protocol (OLSR)
Destination sequence distance vector (DSDV)
DREAM (Distance Routing Effect Algorithm for Mobility)
B.A.T.M.A.N (Better Approach to Mobile Adhoc Networking

ii) Reactive Algorithm:-

It is also called on-demand routing protocol. It works on on-demand since only when nodes are needed them. Routes in this algorithm are also available on-demand. Updation of route tables are not required constantly. It searches the route in on-demand and set the link for send and accept the data from the source node to destination node.
Examples of Reactive algorithm:-
Associativity-Based Routing (ABR)
Ad hoc On-demand Distance Vector (AODV)
Dynamic Source Routing.

iii) Hybrid Routing Protocol:-

It combines the feature of both the algorithm i.e proactive and reactive algorithm. The choice of one or other method requires predetermination of typical cases. It depends on the number of active nodes.
Examples of Hybrid Routing Protocol:-
Zone Routing Protocol (ZRP)
Zone-Based Hierarchical Link State Routing Protocol (ZHSL)

iv) Hierarchal Routing Protocol:-

In hierarchical routing, routers are divided into groups or combinations known as regions. Each router has only the knowledge about the router in its own region and has no information about routers in other regions or groups. So the routers use to save only one record in his table.
Examples of Hierarchal Routing Protocol:-
1. Cluster-Based Routing Protocol (CBRP)
2. Fisheye State Routing Protocol (FSR)

v) Backpressure Routing Protocol:-

Backpressure algorithm is an algorithm for dynamically routing traffic over a multi-hop network by using congestion gradients.it applied to various wireless communication networks. It works on the time-slot. It applied where data from multiple nodes arrive and must be delivered to an appropriate destination. It is mainly applied where different packets may have the different destination. Its main advantage is that it leads to maximize network throughput.

vi) Host-Specific Routing Protocol:-

Host-specific routing means to first check if the destination address is on the same network as that of the source address. The information about the network of the destination address is obtained using ARP (Address Resolution Protocol). If they both are on the same network, the packet is forwarded directly, but if they are on the different network then a router is used to forward packets.

V. VANETS

It stands for the vehicular ad hoc network. It is generally created for the vehicle purpose. In this creation of wireless network instant. It was first used in 2001 under "car-to-car ad-hoc mobile communication and networking". It was created to show the vehicle-to-vehicle and vehicle-to-roadside communication. Intelligent transportation system (ITS) is also referred as VANETs. VANETs can use various wireless technology to created the networks are:-
WLAN (Wi-Fi or ZigBee)
LTE (Long Term Evolution)
Visible light communication (VLC)

Features of VANETS:-

Network topology:- As the nature of node is highly mobile and speed of vehicles is random, the position on node changes very fast or frequently. Topology of it is dynamic and unpredictable. Results, network topology tends to change frequently.
High mobility nodes:- As the nodes in VANETs moves usually moves at very high speed. Because of high speed it becomes harder to predict a node's position and make protection of node privacy fastly changing.
Network size:-The network size in VANET is geographically bounded. It can be implemented for several cities or even for countries.
Fastly exchange of information:- the wireless nature of VANET motivates the nodes to equipped the information from other vehicles and road site units. Results, the information exchange among nodes or terminals frequently.

Applications of VANETs:-

1. Traffic information system:- It provides the information about the traffic due to the vehicle satellite navigation system.
2. Road transportation emergency services:- Whenever there is accident happened VANET helps the communication faster to speed up the emergency rescue operations and save the lives of injured.

3. Electronic brake lights:- It allows the driver that how to react the situation when vehicles in front of you applied bake or it also help when they might be obscured by other vehicles.
4. Platooning:- It allows the vehicles too closely running and receive the information of acceleration and steering information of another vehicle by wireless communication.
5. On-the-road services:- It facilitates on the road services. With the help of this service the future transportation highway is "information-driven" and "wirelessly-enables". When driver drives on rod event helps the driver to search for the shops, gas station on that street. The driver also books a ticket on that cinema which is on the way on that highway that driver runs.

Smartphone Ad-Hoc Network (SPAN):

The smartphone is a device which connects with ad-hoc network technology and creates its own ad hoc network with other devices. It supports multi-hop routing and relays and there is no notion or perception of a group leader so peers can join and leave at will without destroying the network. It may be implemented on the network layer or data link layer. It includes optional gateway devices such as mobile hotspots.

Features:-

1.) It enables peer to peer communication without relying on traditional infrastructure approach.
2.) It also internet access through gateway devices likes mobile hotspots in the mesh.
3.) It is also an on-demand anytime user can join and leave them.
4.) It implements routing protocol at the network layer and link layer.
5.) It mainly uses the Bluetooth and Wi-Fi.

VI. CONCLUSION

As we all know that ad hoc network is still a raw area of research. In this paper, i have surveyed the envisioned applications of Ad Hoc network and a brief study of VANET. We also present The MANET, Its Protocol & Proactive and reactive Algorithm. Among all the protocol scalability is the most challenging Factor. In this, I had clarified what is VANET, SPAN, MANET for data Transmission we have discussed Routing Protocol in it. To solve all the Queries of MANET there is Reactive algorithm

As VANET is used in the direction of Direction. For the vehicle, the VANET is used nowadays. So after reading and comparing Many research paper. I say that the field of Mobile and vehicle ad hoc network is very vast. It represents ad hoc network in Portable Devices, so this network is going to have a Best use in the future.

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