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A REVIEW OF AD-HOC NETWORK

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ABSTRACT *---- This paper focus on the study of Ad hoc network its protocols and different types of network in detail. In Latin, ad hoc means "for this" or "for this purpose". Recent advances in radio communication and computer technologies have led to the development of mobile computing environments. In mobile computing environments, user equipped with portable computers called mobile host, can change their locations while retaining network connections by utilizing wireless communication. As one of the research fields in mobile computing environments, there has been an increasing interest in ad hoc networks constructed by only mobile host. In ad hoc networks, every mobile host plays the role of a router, and communicates with each other. Even if the source and the destination are not in the communication range of the two mobile hosts, data packets are forwarded to the destination by relaying transmission through intermediate mobile hosts. Since no special infrastructures are required, many applications such as rescue affairs at disaster sites and inter-vehicle communication are expected to be developed in ad hoc networks. In ad hoc networks, since the network topology dynamically changes due to the movement of mobile hosts, different fundamental technologies from the conventional fixed networks are needed.*

Keyword --- Ad Hoc network, WMN, WSN, MANET.

1, INTRODUCTION

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 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 connectively. 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.

1.1 Ad hoc NETWORK ROUTING PROTOCOL

An Ad hoc routing protocol is a convention or standard that controls how nodes decide which way to route packets between computing devices in a mobile ad hoc network. In ad hoc networks, nodes are not familiar with the topology of their networks. Instead, it has to discover it. Typically, a new node announces its presence and listens for announcements broadcast by its neighbors. Each node learns about others nearby and how to reach them, and may announce that is too can reach them. Note that in a wider sense, ad hoc protocol can also be used literally, to mean an improvised and often impromptu protocol established for a specific purpose.

1.1.1 Table –driven (proactive) routing

This type of protocols maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the network. The main disadvantages of such algorithms are:

1. Respective amount of data for maintenance.
2. Slow reaction on restricting and failures.

Examples of proactive algorithms are:

- Optimized Link State Routing Protocol(OLSR)
- Destination Sequence Distance Vector(DSDV)

1.1.2 On –demand (reactive) routing

This type of protocol finds a route on demand by flooding the network with Route Request packets. The main disadvantages of such algorithms are:

1. High latency time in route finding.
2. Excessive flooding can lead to network clogging.

Examples of on-demand algorithms are:

- Ad hoc On-demand Distance Vector (AODV)
- Dynamic Source Routing
- Flow State in the Dynamic Source Routing

1.1.3 Hybrid (both proactive and reactive) routing

This type of protocol combines the advantages of proactive and reactive routing. The routing is initially established with come proactively prospected routes and the serves the demand from additionally activated nodes through reactive flooding. The main disadvantages of such algorithms are:

1. Advantage depends on number of other nodes activated.
2. Reaction to traffic demand depends on gradient of traffic volume.

Examples of hybrid algorithms are:

- Zone Routing Protocol(ZRP)

1.1.4 Hierarchical routing protocols

With this type of protocol the choice of proactive and of reactive routing depends on the hierarchic level in which a node resides. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding on the lower levels. The choice for one or the other method requires proper attribute for respective levels. The main advantages of such algorithms are:

1. Advantage depends on depends on depth of nesting and addressing scheme.
2. Reactive to traffic demand depends on meshing parameters.

Examples of hierarchical routing algorithms are:

- Cluster Based Routing Protocol(CBRP)
- Fisheye State Routing Protocol(FSR)

1.1.5 Flow oriented routing

This type of protocols finds a route on demand by following present flows. One option is to unicast consecutively when forwarding data while promoting a new link. The main disadvantages of such algorithms are:

1. Takes long time when exploring new routes without a prior knowledge.

2. May refer to entitative existing traffic to compensate for missing knowledge on routes.

1.1.6. Host specific routing protocol

This type of protocols requires through administration to tailor the routing to a certain network layout and distinct flow strategy. The main disadvantages of such algorithms are:

1. Advantages depend on quality of administration addressing scheme.
2. Proper reaction to changes in topology demands reconsidering all parametrizing .

1.1.7 Back pressure routing

This type of routing does not pre-compute paths. It chooses next-hops dynamically as a packet is in progress toward its destination. These decisions are based on congestion gradients of neighbor nodes.

1.1.8 Power-aware routing protocol

Energy required to transmit a signal is approximately proportional to dα, where d is the distance and α >=2 is the attenuation factor path loss exponent, which depends on the transmission medium. When α=2 (which is the optimal case), transmitting a signal half the distance requires one fourth of the energy and if there is a node in the middle willing to spend another fourth of its energy for the second half, data would be transmitted for half of the energy than through a direct transmission-a fact that follows directly from the inverse square law of physics.
The main advantages of such algorithms are:

1. This method induces a delay for each transmission.
2. No relevant for energy network powered transmission operated via sufficient repeater infrastructure.

1.2 CLASSIFICATION OF Ad Hoc NETWORK:

Wireless ad hoc networks can be further classified by their application:

1.2.1 Wireless Mesh Network (WMN)

A Wireless mesh network is a communication network made up of radio nodes organized in a mesh topology. It is also form of wireless ad hoc network. Wireless mesh networks often consist of mesh clients, mesh routes and gateways. The mesh clients are often laptops, cell phones and other wireless devices while the mesh routes forward traffic to and from the gateways which may, but need not, connect to the internet. The coverage area of the radio nodes working as single network is sometimes called a mesh cloud. Access to this mesh cloud is dependent on the radio nodes working in harmony with each other to create a radio network. A mesh network is reliable and offers redundancy. When one node can no longer operate, the rest of the nodes can still communicate with each other, directly or through one or more intermediate nodes. Wireless mesh networks can self form and self heal. Wireless mesh networks can be implemented with various wireless technology including 802.11, 802.15, 802.16, cellular technologies or combinations of more than one type.

Application of wireless mesh network

Mesh network may involve either fixed or mobile devices. The solutions are as diverse as communication needs, for example in difficult environments such as emergency situations, tunnels, oil rigs, battlefield surveillance, high speed mobile video applications on board public transport or real time racing car telemetry. An

important possible application for wireless mesh networks is VoIP. By using a quality of service scheme, the wireless mesh may support local telephone calls to be routed the mesh. Some current applications:

- US military forces are now using wireless mesh networking to connect their computers, mainly ruggedized laptops, in field operations.
- Electric meters now being deployed on residences transfer their readings from one to another and eventually to the central office for billing without the need for human meter readers or the need to connect the meters with cables.
- The laptops in the one laptop per child program use wireless mesh networking to enable students to exchange files and get on the internet even though they lack wired or cell phone or other physical connections on their area.
- The 66-satellite iridum constellation operates as a mesh network, with wireless links between adjacent satellites. Calles between two satellite phones is routed through the mesh, from one satellite to another across the constellation, without having to go through an earth station. This makes for a smaller travel distance for the signal, reducing latency, and also allows for the constellation to operate with far fewer earth stations that would be required for 66 traditional communications satellites.

1.2.2 Wireless Sensor Network (WSN)

WSN sometimes called a Wireless Sensor and Actor Network of 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. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance; today such networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring and so on.

Application of wireless sensor Network:

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.

Health care monitoring

The medical applications can be two types: wearable and implanted. Wearable devices are used on the body surface of a human or just at close proximity of the user. The implantable medical devices are those that are inserted inside human body.

Natural disaster prevention

Wireless sensor networks can effectively act to prevent the consequences of natural disasters, like floods. Wireless nodes have successfully been deployed in rivers where changes of the water levels have to be monitored in real time.

1.2.3 Mobile ad hoc Network (MANET)

MANET is a continuously self-configuring, infrastructure-less network of mobile devices connected without wires. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping 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. It may contain one or multiple and different transceivers between nodes. This results in a highly dynamic, autonomous topology. Different protocols are then evaluated based on measures such as the packet drop rate, the overhead introduced by the routing protocol, end-to-end packet delays, network throughput, ability to scale etc.
The mobile ad hoc network has the following typical features

- Unreliability of wireless links between nodes.
- Constantly changing topology.

1.2.3.1 Types of MANET

Internet based Mobile Ad-hoc Networks (iMANET)

Internet based Mobile Ad-hoc Networks that link mobile nodes and fixed internet –gateway nodes. In such type of networks normal ad hoc algorithms don't apply directly. Wireless networks can generally be classified as wireless fixed networks and wireless, or mobile ad-hoc networks. MANET's are based on the idea of establishing a network without taking any support from a centralized structure. By nature these types of networks are suitable for situations where either no fixed infrastructure exists, or to deploy one is not possible.

Vehicular Ad-hoc Networks (VANETs)

VANETs are used for communication between vehicles and roadside equipment. It uses cars as mobile nodes in a MANET to create a mobile network. A VANET turns every participating car into a wireless router or nodes, allowing cars approximately 100 to 300 meters of each other to connect and, in turn, create a network with a wide range. As cars fall out of the signal range and drop out of the network, other cars cab join in, connecting vehicles to one another so that a mobile internet is created. It is estimated that the first systems that will integrate this technology are police and fire vehicles to communicate with each other for safety purpose. Automotive companies like general Motors, Toyota, Nissan, Daimlerchrysler, BMW and Ford promote this term.

Internet based mobile ad hoc networks (inVANET)

InVANET are a kind of artificial intelligence that helps vehicles to behave in intelligent manners during vehicle-to-vehicle collisions, accidents. It uses WIFI IEEE 802.11p and WiMAX IEEE 802.16 for easy and effective communication between vehicles with dynamic mobility. Effective measures such as media communication between vehicles can be enabled as well methods to track automotive vehicles. Automotive vehicular information can be viewed on electronic maps using the internet or specialized software. The advantage of WiFi based navigation system function is that it can effectively locate a vehicle which is inside big campuses like universities, airports, and tunnels. InVANET can be used as part of automotive electronics, which has to identify an optimally minimal path for navigation with minimal

traffic intensity. The system can also be used as a city guide to locate and identify landmarks in a new city. It can be viewed as component of the Intelligent Transportation Systems (ITS).

Smart Phone Ad hoc Network (SPAN)

SPAN leverage the existing hardware in commercially available smart phones to create peer-to-peer networks without relying on cellular carrier networks, wireless access points, or traditional network infrastructure. SPAN differ from traditional hub and spoke networks, such as Wi-Fi Direct, in that they support multi-hop relays and there is no notion of a group leader so peers can join leave at will without destroying the network.

CONCLUSION

In this paper, we study about Ad hoc networks, its different protocols, different types of network namely WMN, WSN, MANET and various features and advantages of these networks explained. Further types of MANET networks which explains the concept if moving nodes in networks also discussed in detail. So the study of this network will be helpful to understand Ad hoc networks and its various application areas. The future scope of this research paper is to concentrates on improving more accurate and effective communication of these different networks.

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