

Wireless Networks Past, Present and Future: A Technical Review

M. Robert Masilamani¹, N. Mohana Priya², S.A. Thirumala Rao³

Associate Professor¹, Assistant Professor², Professor³

Department of Computer Science and Engineering

Dhanalakshmi Srinivasan College of Engineering and Technology, Tamil Nadu, India

Abstract: Wireless Network offers transmission of facts over miles of distance except requiring wires, coaxial cables and fibres etc. It focuses on establishment of verbal exchange among devices. Such kind of communication can be completed via Single hop or Multi hop basis. In this attempt, brief introduction of wireless network is presented. In this paper, classification of wi-fi community is also mentioned based on special aspects and its types. Further, work also highlights Mobile Adhoc Networks alongside with its specialized new idea regarded as FANETs (Flying Adhoc Networks). In this attempt, graph problems for MAC protocol and evaluation between MANETs & FANETs is additionally discussed. This try is very tons really useful for novices of this domain.

Keywords – Wireless Networks, Classifications, MANETs, FANETs, WMN, WSN

I. INTRODUCTION

Communication comes from Latin phrase “Communi Care”. Its ability transformation of information send to the receiver need to be accurate as ship with the aid of sender. In today’s situation gain of communicating devices are growing hastily in Education System. Thus there is need to set up efficient gadget for communicating among devices which are placed at distant and will to send and receive take a look at in exceptional codecs (text, image, audio, video etc). Conventionally, Computer Network is the compilation of unified, impartial and self sufficient collection of nodes. In this network, communicating nodes takes the accountability to switch the records from sender node to receiver nodes. Such Communication can be performed via with or barring bodily media. Cables, Optical Fibers are properly regarded example to transfer the facts via physical media where as radio waves are used in absence of bodily media. In today’s scenario, clean communication is required to keep excellent connectivity amongst the nodes which are current in the community [1-3]. In these networks, good conversation is provided through: (i) Sharing of reachable assets (ii) Improved reliability of services and cost effectiveness. So, there is need of two essential aspects for fine verbal exchange among units which are residing at far away location: i) Distributed Applications ii) Network Infrastructure At one side, In Distributed Applications, nodes are positioned at exclusive corners and are communicated thru the Internet. On the different side, Network Infrastructure can be related thru wired or wireless. In this paper, Section I affords introduction Section 2 discusses short classification of Wireless Networks. Section 3 gives Air bone Adhoc Networks alongside with comparison of MANETS. Section 4 concludes the work.

II. TYPES OF WIRELESS NETWORKS

Wireless PAN

Wireless private location networks (WPANs) join devices within a exceedingly small area, that is typically within a person's reach. For instance, mutually Bluetooth radio and imperceptible infrared light provides a WPAN for interconnecting a headset to a laptop. ZigBee additionally supports WPAN applications.[6] Wi-Fi PANs are becoming not unusual (2010) as gear designers begin to combine Wi-Fi into a variety of purchaser digital devices. Intel "My WiFi" and Windows 7 "virtual Wi-Fi" competencies have made Wi-Fi PANs easier and less complicated to set up and configure.

Wireless LAN

Wireless LANs are regularly used for connecting to nearby sources and to the Internet. A wireless local region community (WLAN) hyperlinks two or extra devices over a short distance using a wireless distribution method, normally presenting a connection thru an get entry to factor for internet access. The use of spread-spectrum or OFDM technologies may allow users to cross round within a neighborhood coverage area, and nevertheless continue to be linked to the network. Products the use of the IEEE 802.11 WLAN standards are marketed under the Wi-Fi manufacturer name. Fixed wireless technological know-how implements point-to-point links between computer systems or networks at two far-off locations, often the use of devoted microwave or modulated laser light beams over line of sight paths. It is regularly used in cities to connect networks in two or extra buildings barring installing a wired link.

Wireless advert hoc network

A wireless ad hoc network, also acknowledged as a wi-fi mesh community or cellular advert hoc network (MANET), is a wi-fi community made up of radio nodes geared up in a mesh topology. Each node forwards messages on behalf of the different nodes and each node performs routing. Ad hoc networks can "self-heal", robotically re-routing around a node that has misplaced power. Various network layer protocols are wished to comprehend ad hoc cellular networks, such as Distance Sequenced Distance Vector routing, Associatively Based Routing, Ad hoc on-demand Distance Vector routing, and Dynamic supply routing.

Wireless MAN

Wireless metropolitan region networks are a type of wi-fi community that connects a number of wi-fi LANs. WiMAX is a type of Wireless MAN and is described by way of the IEEE 802.16 standard.

Wireless WAN

Wireless broad region networks are wi-fi networks that commonly cowl giant areas, such as between neighbouring cities and cities, or metropolis and suburb. These networks can be used to connect department offices of business or as a public Internet get right of entry to system. The wi-fi connections between get right of entry to factors are generally factor to factor microwave links using parabolic dishes on the 2.4 GHz band, rather than omnidirectional antennas used with smaller networks. A usual gadget includes base station gateways, get admission to factors and wi-fi bridging relays. Other configurations are mesh systems the place every get right of entry to factor acts as a relay also. When mixed with renewable electricity systems such as photovoltaic photo voltaic panels or wind systems they can be stand alone systems.

Cellular network

A cellular community or mobile community is a radio community allotted over land areas referred to as cells, each served by at least one fixed-location transceiver, known as a telephone web site or base station. In a mobile network, every mobile typically makes use of a extraordinary set of radio frequencies from all their instant neighbouring cells to keep away from any interference. When joined together these cells grant radio coverage over a large

geographic area. This permits a giant number of transportable transceivers (e.g., cellular phones, pagers, etc.) to talk with every other and with fixed transceivers and telephones somewhere in the network, through base stations, even if some of the transceivers are shifting thru greater than one phone all through transmission. Although originally supposed for cellphone phones, with the development of clever phones, cell cellphone networks robotically raise records in addition to phone conversations.

Global System for Mobile Communications (GSM):

The GSM community is divided into three important systems: the switching system, the base station system, and the operation and help system. The cellphone phone connects to the base device station which then connects to the operation and support station; it then connects to the switching station the place the call is transferred to the place it desires to go. GSM is the most frequent standard and is used for a majority of telephone phones.

Personal Communications Service (PCS):

PCS is a radio band that can be used by way of cellular phones in North America and South Asia. Sprint passed off to be the first provider to set up a PCS.

D-AMPS:

Digital Advanced Mobile Phone Service, an upgraded model of AMPS, is being phased out due to development in technology. The more recent GSM networks are changing the older system.

Global location network

A global place network (GAN) is a community used for supporting cell across an arbitrary quantity of wi-fi LANs, satellite insurance areas, etc. The key challenge in cell communications is handing off consumer communications from one local coverage region to the next. In IEEE Project 802, this includes a succession of terrestrial wireless LANs.

Space network

Space networks are networks used for communication between spacecraft, commonly in the vicinity of the Earth. The example of this is NASA's Space Network.

III. CLASSIFICATION OF WIRELESS NETWORKS

Wireless Networks are collection of nodes the place verbal exchange is achieved thru radio waves. Wireless gadgets having get entry to points are regarded as Infrastructure primarily based networks and gadgets having no get admission to factor are recognised as Infrastructure less Networks. In these networks, connectivity can be mounted either via single hop or multiple hop communication.

3.1 Single Hop Communication Networks: Single hop verbal exchange is mounted when two nodes are at once communicating to every different and multi hop communication keeps communication of nodes thru other nodes in between. Virtual Classrooms, Entertainment, Virtual Conferencing are examples of these type of networks. In Such networks, verbal exchange can be set up both via infra shape community or infrastructure less. In Single Hop Concept, Wi Fi(Wireless Fidelity), WLAN(Wireless Local Area Network), Wi-Max and Cellular Networks are examples of Infrastructure primarily based Single Hop Wireless Networks and Bluetooth, Adhoc LANs, Wi Fi Hot Spots and so on are examples of Infrastructure much less Single hop Wireless Networks.

3.2 Multi Hop Communication Networks: In Multi hop Concept, Communicating Nodes are not directly linked to every other. Intermediate nodes play an important position to set up communication between sender and receiver node. Wireless Mesh Network, Wireless Sensor Networks (WSN) are examples of Infrastructure much less networks and MANET, VANET

(Vehicular Adhoc Networks)[5], iVANET(Intelligent Vehicular Adhoc Networks) and FANET(Flying Adhoc Networks)as referred to in Fig.2.



Fig.1: Classification of Wireless Networks

In Single wi-fi hop networks, Wi-Fi is linked via Wi-Fi routers for organising the communication. In Cellular Networks, community is distributed over land zones call cells or base station. The base station presents mobile which is beneficial in transmission of facts (voice, records and others) from one cease to another. Each mobile may additionally have exceptional set of frequency which is used to overcome interference, noise and supply accurate offerings exceptional in each cellphone the place as in multi hop wireless network, there exist two kinds of Networks (i) Wireless Mesh Networks (ii) Wireless Sensor Networks(WSN).

- ❖ Wireless Sensor Networks are series of sensor nodes which are mixture of radio transceiver, microcontroller and strength source. Important aspects of this network are communicating part, processing section and its sensing capability like temperature, sound, strain etc. Size of networks may also differ from sand granules as minimal and shoe field measurement as maximum. These networks are more cost effective as in contrast to different networks, having constrained batteries, high density, and high redundancy, constrained like reminiscence and processing functionality and small transmission vary (3m30 m)[4].
- ❖ Wireless Mesh Networks are series of nodes. Such nodes are related via peer to peer units (like mesh client, mesh routers and mesh gateways) with the aid of forming mesh topology into network. In WMN, Nodes have restricted movement, so there are minimum chances of disconnection. However, in case of high mobility, if route fails due to disconnection between nodes then choice route can be fashioned without any delay[1].

iii) Mobile Adhoc Networks: In MANETs, nodes that enter with in radio range of every can without difficulty form except any need of pre configuration or human support. Mobile ad hoc network is an affiliation of mobile nodes having no any fixed support infrastructure. In this network, Connection and disconnection is managed with the aid of the parameter distance among nodes. Due to generic motion of nodes, connections are disconnected very frequently which will increase the trouble of general topology alternate in network. Nodes can effortlessly enter or leave the network except affecting the operation of other nodes. “Setting up constant community Infrastructure for verbal exchange amongst a crew of soldier in enemy territories may now not be possible.”

MANET vs. WSN

- Many commonalities: Self-organization, energy efficiency, (often) wireless multi-hop
- Many differences
 - **Applications, equipment:** MANETs more powerful (read: expensive) equipment assumed, often "human in the loop"-type applications, higher data rates, more resources
 - **Application-specific:** WSNs depend much stronger on application specifics; MANETs comparably uniform
 - **Environment interaction:** core of WSN, absent in MANET
 - **Scale:** WSN might be much larger (although contestable)
 - **Energy:** WSN tighter requirements, maintenance issues
 - **Dependability/QoS:** in WSN, individual node may be dispensable (network matters), QoS different because of different applications
 - **Data centric** vs. id-centric networking
 - **Mobility:** different mobility patterns like (in WSN, sinks might be mobile, usual nodes static)

Table 1: Comparison between WSN and MANETs

MANETs desires following parameters to set up reliable and robust communication: two

- Require Secure Communication
- Require Support of dependable and tightly closed multimedia
- Multicasting Support of Multicast routing

3.3 Applications of MANETs:

i. Tactical Operations

- Military
- Automated Battlefield

ii. Collaborative & Distributive Computing

- Conferences

iii. Emergency Operations

- Search & Rescue
- Crowd Control
- Disaster Scenario

iv. Sensor Based Applications

- Weather Monitoring v. Entertainment
- Games

3.4 Designing Issues of MAC Protocol in MANETs

- Mechanism need to attempt to minimize the delay.
- Ability to provide an equal or weighted share of the bandwidth to all computing nodes.
- Mechanism for throughput enhancement – Minimize the occurrence of collisions – Maximize Channel Utilization
- Minimizing Control Overhead
- Time sensitive visitors help
- Ability to measure resource availability of each node
- Mechanism to supply on hand bandwidth to each and every node.
- Good routing protocol ought to be capable to deal with
- Path breaks

- Packet Collisions
- Transient Loops
- Difficulty in Resource Reservation
- Distribution of Network Load uniformly across the network.
- Quick operate Route reconfiguration due to unpredictable exchange in topology.
- Threats and vulnerabilities
- Support challenging and tender actual time traffic
- Use of Directional Antenna – Reduction in interference and Power Consumption

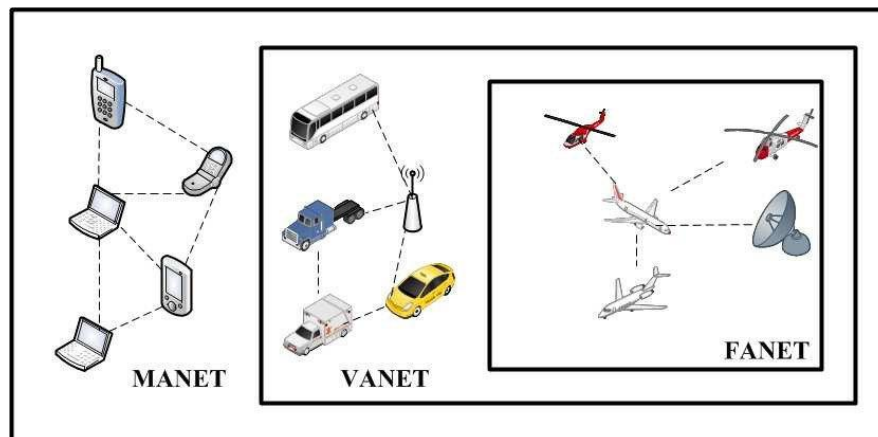


Fig.2 Pictorial view of MANETs, VANETs and FANETs

Movement sample and traffic sample are essential factor in these three networks. MANETs moves on positive terrain the place as VANETs moves on roads and Highways. Further, Specialized MANET recognized FANETs requires predetermined path. In these networks, Global path maintenance is an necessary factor. If route changes due to environmental factors then course would be recalculated. In FANETs, size of UAVs and coordination amongst UAVs are challenging troubles which are unsolved until the date. However, lookup is going to explore the possibilities for efficient communication except formation of pre present structure in the sky. (a) (b)

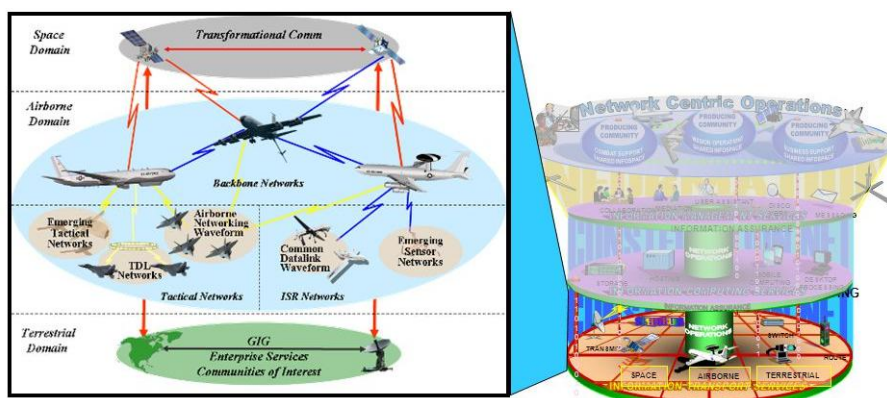


Fig.3 Formation of Air bone Adhoc Networks

Fig 3represents 7 UAVs in the Adhoc Network. UAV1 is linked to Ground Controller thru its transmission vary and work as base UAV for communication. Let say UAVy go out from transmission range of UAVx then Communication smash takes place network might also be divided into two parts. But due to presence of floor controller this type of disconnection will now not take place. Ground controller will send the target location to UAV so that it will return

to lower back to its authentic vicinity after receiving directions (As mentioned in Fig 3(b). FANETs faces problems associated to UAV measurement and environment friendly verbal exchange amongst them.

IV. DIFFERENCE BETWEEN FANETS MANETS

From the lookup findings, following troubles are identified [6-7]:

- ❖ Node Mobility: As in contrast to MANETs, FANETs have High Speed among UAVs
- ❖ Reliable Protocol: Both protocols are reliable alternatively FANETs presents superb results in case of time vital and emergency scenarios. • Mobility Model: In FANETs, Flight sketch is determined and at each step if there is trade then recalculation for the Map takes location and comparatively better than MANETs. Thus Random Way Point Mobility Model is no longer applicable.
- ❖ Node Density: In FANETs, there is Sparse Density with giant distances between UAVs the place as MANET can hold each i.e. Dense and Sparse.
- ❖ Network Topology: FANETs offers well-known smash and require higher pace as compared to MANET.
- ❖ Power Consumption and Network lifestyles time: Network existence time is an vital issue. Communication hardware used in FANETs is powered via UAV power itself which is now not used in MANETs. So FANETs have extra battery existence aid due to add on hardware configuration.
- ❖ Localization: In FANETs, It is mandatory to replace localization of every UAV facts with small interval of time where as in MANETs, it is not so. Further, In FANETs, Each UAV ought to be containing a GPS and Initial measurable unit(IMU) to broadcast his location to all UAV in the network at any time.
- ❖ Computational Power: In MANETs the nodes can act as routers. Due to size and restrained energy constraints, the nodes have only limited computational power. In FANETs, application particular units with excessive computational power can be used. Most of UAVs have sufficient computational strength due to use of Hardware Miniaturization Tendency. But nevertheless there is problem of dimension and weight in Mini UAV and have very restricted payload capacity.
- ❖ Bandwidth Requirement: In FANETs, the goal is to collect data of centered places (in shape of pics or videos) in surveillance and monitoring purposes which need to be relayed from UAV to the command control center with a strict extend sure and it requires high bandwidth. In addition to this, gathered facts have to have high resolution.

V. CONCLUSION

This work provides proliferation of wi-fi applied sciences in actual life purposes alongside with its current networks. Discussed work is labeled based on Single hop and Multi hop Communication. Research related plan problems are also mentioned into an account. Further, specialized MANET known as Air bone community (Flying Adhoc Networks (FANETs) is also briefed alongside with its working principles. It has been discovered that Flying (Specialized) Ad hoc networks are especially designed for emergency and touchy purposes where time is critical factor. Single UAV cannot shape FANETs. For formation of FANETs, there is need of multi UAVs for such networks.

REFERENCES

- [1] Kolla S.B., B.B.K. Prasad, "A Survey of Source Routing Protocols, Vulnerabilities and Security In Wireless Ad-hoc Networks", International Journal of Computer Sciences and Engineering, Vol.2, Issue.4, pp.20-25, 2014.
- [2] David Moursund, Introduction to Information and Communication Technology in Education, 2005.
- [3] Pranay Kujur and Kiran Gautam, "Smart Interaction of Object on Internet of Things", International Journal of Computer Sciences and Engineering, Vol.3, Issue.2, pp.15-19, 2015.
- [4] Pradeep Sharma, Shivilal Mewada and Aruna Bilavariya, "Group Rekeying Management Scheme for Mobile Ad-hoc Network", International Journal of Scientific Research in Network Security and Communication, Vol.1, Issue.5, pp.5-12, 2013.
- [5] Umang, Reddy B.V.R and Hoda M.N., "Study of Mobile Management Schemes in Mobile Adhoc Networks", International Journal of Computer Applications, March 2011, Vol. 17, Iss. 7, pp. 42-47, ISSN-0975-8887, DOI: 10.5120/2236-2605.
- [6] Pradeep Kumar Sharma, Shivilal Mewada and Pratiksha Nigam, "Investigation Based Performance of Black and Gray Hole Attack in Mobile Ad-Hoc Network", International Journal of Scientific Research in Network Security and Communication, Vol.1, Issue.4, pp.8-11, 2013.
- [7] Bekmezci İ., O. K. Sahingoz, and Ş. Temel, "Flying Ad-Hoc Networks (FANETs): A survey," Ad Hoc Networks, vol. 11, no. 3, pp. 1254–1270, May 2013.