



MANet vs VANet- The Applications & Challenges

Mehreen Qamar, Fouzia Samiullah, Sowaiba Khan, Aqsa Iftikhar, Aneela Mehmood, Raena Touqir

Abstract:

Vehicular Ad hoc Networks (VANet) and Mobile Ad hoc Networks (MANet) have evolved into one of the very capable fields of research work in wireless networking. VANet is termed as a stimulating form of MANet owing to its highly erratic dynamic topology, frequently occurring disconnections and life-threatening issues. This paper is a comparative review of MANet, VANet and their applications along with challenges.

KEYWORDS: Wireless ad hoc network, Mobile Ad hoc network (MANet), Vehicular Ad-hoc Network (VANet).

1. INTRODUCTION

A wireless ad hoc network is a collection of wireless nodes that do not require any centralized management. In Ad-hoc approach, you can configure a wireless connection personally with another device (mainly computers) without being compelled to connect to Wi-Fi or a router.

These ad hoc networks, mostly comprising of laptops or other mobile nodes are self-monitored and are often set-up during adversity relief, emergency situations, distribution of data and military maneuvers for timely or on-going communication.

Since the last century, MANet has evolved into one of the main features of the revolutionary wireless communications. MANet holds a lot of things to focus on such as its dynamic topology, inadequate security surrounding its mobility, energy and power restrictions.

A type of MANet which provides communication amongst nearby vehicles and adjoining fixed roadside communication towers [1, 2] is a VANet. The key idea behind the setup of a VANet is to provide travelers with security and convenience services. Each vehicle is coupled with a VANet device capable of

accepting and communicating wireless communications including traffic data, highway blockages, parking, location tracking and weather stats [1, 3].

This paper is organized on the basic concepts of MANet and VANet, their functionalities in different areas and challenges along with a comparison between these two ad hoc networks.

2. BASIC CONCEPT

2.1. Basic Concept of MANet

An assembly of wireless nodes that are connected to each other and tend to dynamically arrange at anyplace or anytime form a Mobile Ad-hoc Network (MANet). Providing each device with the appropriate information for enabling secure routing, is the most challenging aspect in forming a MANet. MANet offer numerous compensations over conventional networks including reduced expenses for infrastructure, ease of setting up and fault tolerance, as routing is achieved independently by nodes using other transitional network nodes to forward packets, this multi-hopping diminishes the possibility of blockages, however the key feature of MANet that appeals to the population is better mobility in contrast with other wired solutions. The security

facilities such as validity, data reliability, safe communication amongst layers and confidentiality are tremendously compulsory for MANets. [4,5]

2.2. Basic Concept of VANet

The automobiles which are furnished with wireless technology and possess abilities to generate an on-the-fly network while moving along the road infrastructure, form a distinct instance of a Mobile Ad Hoc Network, known as a VANet. This wireless and direct communication between the cars makes information exchange possible without any fixed communication infrastructure.

The objective of VANet architecture is to overcome the communication barrier between nearby vehicles and between vehicles and fixed roadside equipment giving rise to the following three potentials [6]:

Vehicle-to-Vehicle (V2V) ad hoc network
Allows direct vehicle communication; does not rely on fixed infrastructure assistance and can be designated mostly for safety, security and broadcasting reasons.

Vehicle-to-Infrastructure (V2I) network allows a car to connect mainly for information and data assembly and collection purposes with the roadside configuration.

Hybrid architecture is a joint of both the above-mentioned networks. In this situation, a car can connect to the infrastructure on the road alone or multi-hop way, mostly relying on the distance, i.e., if it can or not directly access the roadside element.

VANet is primarily intended to provide safety associated information and certain traffic-related information. As the number of vehicles is mounting, the likelihood of accidents has also increased to a greater extent. It is vital to make our automobiles a bit intelligent in order to lessen the potentials of accidents [7].

3. APPLICATIONS:

3.1. Applications of MANet:

Some distinguishing applications of this network encompasses the following areas [8]:

For Military purposes: Ad-Hoc networking may allow armed forces to use the advantages of traditional network knowledge to preserve any data between cars, armed forces, and data headquarters.

For conference purposes: Ad-Hoc networks are readily connected to the instant short hyper-media network by means of laptop computers to distribute data to the participating candidates, such as in classrooms and conferences.

(PAN) and Bluetooth: A PAN is a neighborhood small range community; wherein gadgets normally belong to a particular character. restricted-range MANet inclusive of Bluetooth can make it even easy to trade facts amongst numerous transportable gadgets.

Business Sector: Ad-hoc network may be used for search and rescue functions and in offering a useful resource for the duration of emergency conditions as an instance, in flood, hearth or earthquake. Emergency saving measures typically vicinity wherein broken or even non-current transmissions structure exists and a quick dynamic transmission community is required.

Backup Services: Can provide certain recovery and back up services, disaster recovery, diagnosis or status or record handing in hospitals, etc.

Educational sector: Preparation of communication services for computer-generated classrooms or laboratories [9].

3.2. Applications of VANet:

The applications of this network mainly focus on the level of comfort and safety for travelers in addition to commercial utilization as:

Intelligent Transportation Functions: Intelligent Transport System(ITS) that characterize various functionalities which include global positioning system, visitor's inspection, evaluation of visitor's jam, administration of traffic device and alteration of routes which offer sustenance to the site visitors situation. [10].

Remote Vehicle Personalization/ Diagnostics: It assists in shifting customized automobile

settings or uploading of automobile diagnostics from/to any neighboring infrastructure.

Post-Crash Warning: An automobile within the midst of calamity would broadcast cautionary notes approximately its role to any pursuing automobiles that might be in its course; so that it may make choice with the quantity of time handy collectively with the highway patrol for tow away provision.

Road Hazard Control Notice: Automobiles informing different motors about road having catastrophic incidents along with landslide or records regarding surprising downhill and so forth.

Parking Accessibility: Notifications regarding availability of parking inside the big towns aids in finding the accessibility of slots in parking masses in any designated geological region [11].

4. CHALLENGES AND ISSUES:

4.1. Challenges in MANet:

Irrespective of the striking functionalities, the capabilities of MANet present numerous trials that need to be considered carefully before a huge marketable deployment of this network can be anticipated. these intricate regions include [12, 13]:

Routing: meanwhile the topology of this unique network modifications constantly, the problem of routing packets among any close by nodes converts right into a difficult venture. Routes among nodes may theoretically include more than one hop, which is more intricate than the communication through a singular hop as mentioned in Table 1. (MANet VS VANet).

Security and Reliability: The function of allotted operation necessitates diverse arrangements of authentication and key control. moreover, wireless hyperlink capabilities additionally resource in introducing reliability issues, because of its insufficient variety of wireless transmission, the broadcasting nature of the wireless channel, packet losses due to mobility, and records transmission faults can occur.

Quality of Service (QoS): Supplying diverse quality of service degrees in a continuously

moving surroundings could be a hectic challenge. An adjustable QoS ought to be employed over the customary aid reservation to offer sustenance to the multimedia associated offerings.

Inter-networking: Inter-networking among MANet and different fixed networks (especially IP primarily based networks) is frequently predicted in lots of eventualities. The coincidence of routing protocols is a take a look at for the properly-proportioned mobility management in this kind of cellular device.

Power depletion: For the majority of the light-weight cellular depots, the roles associated with verbal exchange must be adjusted for a fair utilization of power. renovation of electricity and energy-aware routing is a necessity to be idea upon [12-13].

4.2. Challenges in VANet:

Mobility: Moving nodes in this network connect by throwing their way with other cars that have never previously confronted each other, and this link remains for just a few seconds as each car moves in its own direction and may never meet again. Fortifying the job of mobility is, therefore, a difficult issue to manage. [14].

Security concerns: The purpose of authentication in these networks is to avert the Sybil Attack. In order to avoid this problematic situation, we can give an unambiguous identity to each vehicle, but this resolution is not appropriate for most drivers calling for their data to be kept private [14].

Network Supervision: The network topology and channel condition vary rapidly due to these elevated mobility. As a result, we cannot use data structures such as trees for this very purpose, which cannot be set up and maintained as quickly as the topology adapts to the fresh setting [15].

Congestion and collision Control: The unrestrained community length additionally produces a traumatic project to work with. The site visitors load is in the main low in rural components and at night in even urban zones .due to this purpose, the community walls happen commonly although in rush hours the traffic load is extremely high and henceforth

network is jammed and collision seems inside the community [16].

5. COMPARISON BETWEEN MANet AND VANet:

Table 1: MANet vs VANet

S. No.	Parameter	MANets	VANets
1.	Cost of production	Cheap	Expensive
2.	Change to new topology	Slow	Frequent and very fast
3.	Mobility	Low	High
4.	Node Density	Sparse	Dense and Inequally variable
5.	Bandwidth	Bandwidth Edge	Thousand Kbps
6.	Range	Up to 100m	Up to 100m
7.	Node Lifetime	Depends on power resource	Depend on lifetime of vehicle
8.	Multi-hop Routing	Available	Weakly available
9.	Reliability	Medium	High
10.	Moving pattern of nodes	Random	Regular
11.	Addressing scheme	Attribute Based	Location based
12.	Position Acquisition	Using Ultrasonic	Using GPS, RADAR

6. CONCLUSION:

Ad hoc networks are one of the most addressed terms in relation to wi-fi technology which supply the spirit of “every time, anywhere” conversation. The present-day situation is more motivated towards VANet as a result of its unexpected rise of unfortunate safety matters when it comes to driving New programs take into account each factor of bandwidth and capability of the community via utilizing advanced frequency. This paper decided that safety concerns are amongst one of the stimulating responsibilities in ad hoc network, however in VANet it grew to become out to be extra existence-threatening where malicious information may also contribute to existence or demise choice. All these security apprehension and other thought-provoking problems will inspire researchers to provide in a lot of exhilarating research arenas in the near future.

References:

[1] Basagni, S., et al. (eds.): Mobile Ad Hoc Networking. IEEE Press, Los Alamitos (2003)

[2] Wu, J., Dai, F.: Broadcasting in Ad Hoc Networks: Based on Self-Pruning. In: Twenty Second Annual Joint Conferences of IEEE Computer and Communication Societies, IEEE INFOCOM (2003)

[3] Luo, J., Hubaux, J.-P.: A Survey of Inter-

Vehicle Communication Technical report (2004)

[4] R. Nandakumar K. Nirmala, 2016 “Security Challenges in Mobile Ad Hoc Networks - A Survey” Australian Journal of Basic and Applied Sciences, Vol. 10(1), pp. 654-659, January.

[5] Arun Kumar Yadav Karan Singh “Advanced Research in Computer Science and Software Engineering Evaluation of Security Threats and Solutions in MANet’S” International Journal Volume 6, Issue 2, February 2016.

[6] Felipe Cunha, Azzedine Boukerche, Leandro Villas, Aline Viana, Antonio A. F. Loureiro, ”. March 2014: “Data Communication in VANets: A Survey, Challenges and Applications.

[7] Bodhy Krishna. S: “Study of Ad hoc Networks with Reference to MANet, VANet, FANet”. Research Scholar, Department of Computer Science, Farook College, Calicut, Kerala, India.

[8] Naeem Raza, “Mobile Ad-Hoc Networks Applications and Its Challenges” Department of Computer Science and IT, University of Sargodha Lyallpur Campus, Faisalabad, Pakistan

[9] Chitkara, M. and Ahmad, M.W. (2014) Review on MANet: Characteristics, Challenges, Imperatives and Routing Protocols. International Journal of Computer Science and Mobile Computing, 3, 432-437.

[10] Divyalakshmi Dinesh, Manjusha Deshmukh “Challenges in Vehicle Ad Hoc Network (VANet)”. PIIT, New Panvel December 2014, Volume 2 Issue 7, ISSN 2349-4476

[11] Vishal Kumar , Shailendra Mishra , Narottam Chand: “Applications of VANets: Present & Future” Communications and Network, 2013, 5, 12-15

[12] Chlamtac, I., Conti, M., and Liu, J. J:

Mobile ad hoc networking: imperatives and challenges. *Ad Hoc Networks*, 1(1), 2003, pp. 13–6.

- [13] HaoYang, Haiyun & Fan Ye: “Security in mobile ad-hoc networks: Challenges and solutions”, Pg. 38-47, Vol 11, issue 1, Feb 2004.
- [14] Patrick I. Offor: Vehicle Ad Hoc Network (VANet): Safety Benefits and Security Challenges. Nova Southeastern University (po125@nova.edu). December 3, 2012.
- [15] Ghassan Samara, Wafaa A.H. Al-Salihy, R. Sures: Security Issues and Challenges of Vehicular Ad Hoc Networks (VANet). National Advanced IPv6 Center, Universiti Sains Malaysia Penang, Malaysia. June 28, 2010.
- [16] Komal Mehta, L. G. Malik, Preeti Bajaj: Security Challenges, Issues And Their Solutions For VANet. *International Journal of Network Security & Its Applications (IJNSA)*, Vol.5, No.5, September 2013. Ambedkar Institute of Advanced communication Technologies & Research Delhi, India.