Comparison of MANET and VANET Applications for 5G Technology– A Review

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Abstract : Mobile Ad Hoc Network (MANETs) is one of the reliable area for research and development of wireless network. It has now become the most vibrant and active area of communication and networks. While VANETs (Vehicular Ad-Hoc Networks) which is the sub category of MANETs. VANET provides the wireless communication between vehicles (V2V) and infrastructure access point (V2I). Occurrence of miss happening on daily basis, VANET is one of the momentous region for the acknowledgement of ITS (Intelligent Transportation System) that can be utilized to protect passengers for street safety. Providing the wireless communication to the network, it is necessary to analyze the routing protocols, applications, characteristics for MANETs and VANETs. Accordingly, in this work we have reviewed diverse types of applications in MANETs and VANETs along with its merits and demerits for wireless network.

IndexTerms - **MANET, VANET, Characteristics, V2I, V2V, Routing protocols, ITS.**

I. INTRODUCTION

Mobile Ad Hoc Network (MANETs) are infrastructure-less network of mobile devices which are continuously self-configuring and connected wirelessly throughout the network. WANET(Wireless ad hoc network) typically has a routable networking environment which is present at the top of a Link Layer ad-hoc network. It consist of self-forming network along with peer-to-peer forming network. Here nodes are connected to wireless links into channels in such a manner that every node acts as a host and as a router[2]. The nodes which are present here are free to move in any direction because of its rapid change in the Network topology. MANETs have different characteristics as-

1. Decentralized control
2. Multi-hopping
3. Dynamic environment change.
4. Bandwidth constrained links

In MANET, nodes can connect with one another in quick evolving condition. However, other challenges incorporates Routing, , lack of facilities of authorization, Speed issues, attacks related to trust vulnerability, Unicasting, Multicasting, System overhead [3].

The merit of MANET technology is that portable gadgets can be utilized each and every time[9].

Some of the applications of MANETs are as follows:

1. They are used for public transportation internet hot spot.
2. In Military applications.
3. In the area of Advertisement.

II. MANET ARCHITECTURE

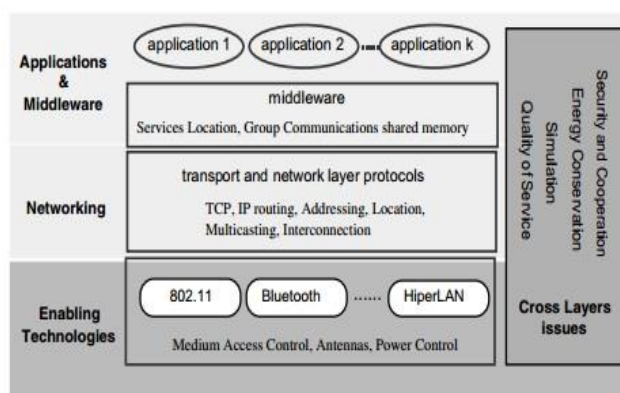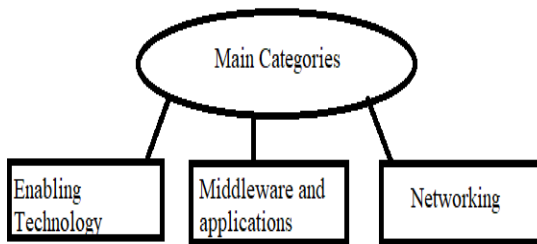THE DESIGN OF MANET IS APPEARED IN FIG. 1:-

Fig. 1. A simple MANET architecture.

The architecture of network is collectively grouped into three main categories [5]:-

A. *Enabling Technologies*

The technologies has been classified into several classes: coverage area: Metropolitan area network, Wide area network, Local area network and Personal area network.

B. *Networking*

Here, the fundamental functionalities of these Networking conventions should have been re-intended for dynamic, distributed, self-sorting out, volatile, Communication environment. The principal point of utilizing the protocols is used for the one-hop transmission conveyance for building end-to-end delivery services which takes place in between a sender to any one receiver provided by the enabling technologies.

C. *Middleware and applications*

For commercial business industry and standard community Mobile Ad-hoc Network has gained considerable attention and interest, along with the standards community. With the advent of new technologies such as the Bluetooth, Wi-Fi Hyper LAN, IEEE 802.11 and WiMAX significantly encourages the utilization of ad-hoc technology. These new ad-hoc networking applications are appeared mainly in well-focused fields such as , disaster recovery for savings lives, emergency services for the nation and environment monitoring [9].

III. MERITS OF MANET

The merits of MANET are given below:-
- They provide access to data and services geographically.
- Self-arranging network, nodes can act as Routers as well.
- Scalable: It allows the addition of new Nodes in the network.
- Enriched flexibility.
- Robust for decentralize administration.

IV. DEMERITS OF MANET

The demerits of MANET are given below:-

- Energy administration is procedure of dealing with the sources and buyers of vitality in hub or in the system all in all to improve the lifetime of the system.
- Lack of focal coordination and shared remote medium makes them more defenseless against assaults than wired system but Security in Mobile Ad hoc Network is imperative particularly in military applications.
- During placement of Ad hoc remote system includes activities which are unique in relation to the wired system. It needs great measure of arranging and estimation of future movement development.

A VANET addresses the wirelessly communication in between the vehicles and infrastructure access point. It is of high mobility, which includes rapidly changing in Network topology, which does not possess any power constraints. Routing of information in VANETs is difficult and challenging, hence stating the development for efficient routing protocols[1]. Routing protocols have different issues and challenges for computing the efficient route measures for the performance of the communication network. There are two kinds of VANET-
1. V2V – Here in this type, nodes of the networks starts communicating with each other in the absence of the set-up network. .
2. **V2RSU** - At the point when Road Side Units are being utilized for directing data trade with alternate vehicles.

VANETs have different characteristics as follows:
1. Unbounded network size
2. Network topology
3. High mobility
4. Change of information frequently

Due to high velocity at which vehicles move with high speed it creates problems for information exchange in the network which affects the performance of routing protocols. Ad-hoc On Demand Distance Vector, Optimized Link State Routing, Destination Sequenced Distance Vector and Dynamic Source Routing have been developed by the researchers[10]. But the protocols cannot be used directly into VANET due to of it's high speed, communication between number of variations in density nodes and due to existence of rapid variation in link connectivity [6]. It comes with the area of comfort and safety to the passengers while travelling. Some of the applications of MANETs are as follows:

1. It is used in TIS (Traffic Information System), gas station and WIS (Weather information system).
2. Cooperative Collision Warning.
3. Beneficial for Real Time Traffic

V. VANET ARCHITECTURE

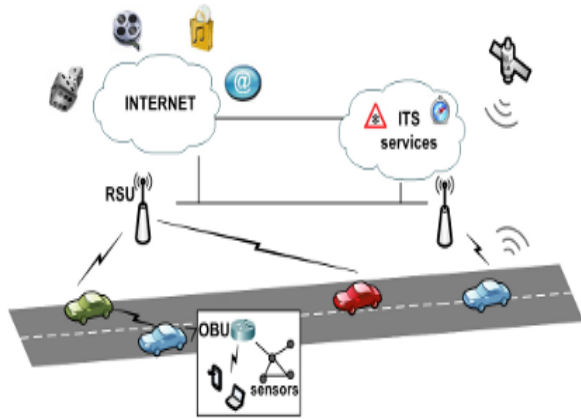The structural design of VANET is presented in fig. 2.

Fig. 2. A simple VANET architecture

The main component of the architecture of VANET are:

1. RSU(Road Side Unit)
2. OBU(On board Unit)
3. The backhaul Network

A. *Road Side Unit*

This infrastructure placed for sharing the desired information amongst the vehicles. It is used here to establish the communication in between the cars. [7].

B. **On Board Unit**

It is a device which is placed at the inner portion of the vehicles. It processes the data collection from the inside of the cars and give the conditions of the individual vehicles for the communication process with the present outside network.

VI. AVANTAGES OF VANET

1. It gives rapid web access in the vehicle.
2. It offers the time administration by using the congested road into profitable work time.
3. It likewise gives extra services, for example, Google talk between clients which helps in bringing down media transmission cost.
4. The traffic administration can be checked by the GPS system for users.

VII. DISADVANTAGES OF VANET

1. Here the excessive usage of internet seldom creates distraction.
2. The option of watching video or doing other activity in the internet may lead to an accident.
3. VANETs have more concern about the security threats.
4. In VANET high speed vehicles may get disconnected with the connectivity of internet service.

VIII. LITERATURE SURVEY

1. **"An Overview of MANET: Concepts, Architecture & Issues**" Here in this paper they emerged the new wave for MANET by improving the new technology for infrastructure less wireless network. The cell phones makes the new heading towards the web, which diminishes the expense.

2. **"Providing the simulation and analysis of routing protocols for VANET for end to end delay for establishing communication in between vehicles** " In this paper they checked case by employing Bellman ford routing protocol for V2V communication. They demonstrated that Bellman ford is much better for DSRC innovation when contrasted for AODV and DSR protocols and they discovered that AODV performs much better than DSR for end to end delay by doing all the possible arrangements of speed in QualNet.

3. **"Direct Device-to-Device (D2D) Communication in 5G Networks"** In this paper D2D communication belongs to the Machine to Machine communication technology where 3GPP technology tells about the interfaces by layering down the D2D communication[4]. Devices used for this technology are Node B, MME, etc. Here in the picture is exchanged by utilizing the D2D correspondence through which we became more acquainted with the progressions in existing directing system with that of MANET routing of AODV.

4. **"Hierarchical Architecture for 5G based Software which is well defined for Intelligent Transportation System".** ITS is an intelligent mobility service which is associated with ICT framework. The SDN (Software Defined Network)[8] brings the advancement in ITS. In SDN we can put a centralized entity through which its get connected to the network without losing any connectivity between the vehicles and SDN controller. In this 5G enhances the high data rates of transmission of the information which gets delivered in time.

IX. CONCLUSION

In this paper we surveyed about MANET, VANET along with its application, characteristics, advantages and disadvantages. Here we did the comparative analysis of MANET and VANET. Basically our literature survey focusses on the different types of protocols which are based upon the previous research work. 5G technology is proposed for the high data rate transmission, which creates a better performance for the high speed vehicles moving with rapidly changing of network topology.

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