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Performance Evaluation of Ad-Hoc Protocols in MANET and VANET

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Abstract: A mobile ad hoc network is a continuously self-configuring, infrastructure-less network of mobile devices connected without wires. They use wireless connections to connect to various networks.One new type of ad-hoc network in Vehicular Ad-Hoc Network in which vehicles constitute the mobile nodes in the network. The ad-hoc protocols in Mobile Ad-Hoc network is already is introduced earlier. But the pattern of working in VANET and MANET is quite different in nature even for multimedia data performance is quite different than ordinary data over scenario the simulator to simulate the given network. This paper provides insight into ad hoc routing protocols (DSDV, AOMDV) and their metrics (Throughput, end to end delay, Packet loss) using NS2. The performance differentials are analyzed using varying metrices. These simulations are carried out using the ns-2 network simulator. This paper presents comparison based on simulation of routing protocol of MANET and VANET.

Keywords: VANET, MANET, Ad-hoc network, Routing protocol, simulator.

I. INTRODUCTION

An ad-hoc network is a collection of wireless mobile hosts forming a temporary network without the assistance of any centralized administration or any stand-alone infrastructure. Its consists of mobile hosts equipped with wireless communication devices. The transmission of a mobile host is received by all hosts within its transmission range due to the broadcast nature of wireless communication and Omni-directional antennae. Vehicular Ad-Hoc Networks are shaping up as the next step to provide information and safety services to vehicles. it support a number of different types of applications, such as safety applications, efficiency applications and entertainment applications. Examples include traffic view systems safety message sharing cooperative collision avoidance and secure crash reporting. support the vehicle to vehicle communication and vehicle to infrastructure communication. This work addresses the vehicle to vehicle communication and focusses on the use of the network for non-safety critical applications. When exchanging messages between cars in a Vehicular Ad-hoc Network, [1]trusting the sending node (car) is crucial. Malicious nodes may insert bogus messages and distribute false information. Many approaches to establish trust in VANETs

II.RELETED WORK

A.VEHICULAR APPLICATIONS

Represent an opportunity to develop applications that improve the transportation sector and the traffic conditions through collaborative systems. The purpose of Intelligent Transport systems and its applications are the improvement of road safety and urban mobility through the management and monitoring of traffic flow with real time notifications. According to the functionality, the applications are classified in three primary categories which are safety application, efficiency applications and infotainment applications.

Table 2 shows the categories and vehicular applications classification for VANETs. The main goal of the safety applications is to increase public safety and protect the loss of life. The main characteristic of these applications is that the safety data should be delivered to the intended receivers (vehicles approaching the dangerous area) within a bounded time. Efficiency applications and infotainment applications are non- critical safety applications. [2]In this research intended to focus only on non-critical safety application.

A. MANETAPPLICATION Military Battle field

Military equipment now routinely contains some sort of computer equipment. Ad- hoc networking would allow the military to take advantage of commonplace network technology to maintain an information network between the soldiers, vehicles, military information headquarters.

B. Commercial Sector

Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Emergency rescue operations must take place where non-existing or damaged communications infrastructure and rapid deployment of a communication network is needed. Other commercial scenarios include e.g. ship-to-ship ad hoc mobile communication, law enforcement. Local Level Ad hoc networks can autonomously link an instant and temporary multimedia network using notebook computers or palmtop computers to spread and share information among participants at e.g. conference or classroom. Similarly in other civilian environments like taxicab, sports stadium, boat and small aircraft, mobile ad hoc communications will have many.

C. ROUTING PROTOCOLS

Ad-hoc routing protocol setup the path, exchange information and take decision of runtime path. In this paper we work on reactive routing(AODV,DSR) and

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Hybrid Routing (ADV) Proactive Routing Proactive routing protocols are based on shortest path algorithms. It maintains and update information on routing among all nodes of a given network at all times even if the paths are not currently being used. Thus, even if some paths are never used but updates regarding such paths are constantly broadcasted among nodes. Route updates are periodically performed regardless of network load, bandwidth constraints In this paper we work on reactive routing(AODV,DSR) and Hybrid Routing (ADV) There is three types of topology based routing

1. Proactive (table-driven) routing protocols
2. Reactive (on-demand) routing protocols
3. Hybrid routing protocols

There is three types of topology based routing the categorization of these routing protocols shown in Fig1.

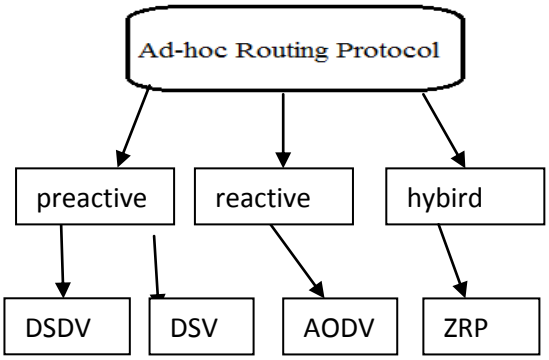

Fig 1: Categorization of Ad-hoc routing Protocols

Reactive Routing On demand or reactive routing protocols were designed to overcome the overhead problem, that was created by proactive routing protocols, by maintaining only those routes that are currently active.

These protocols implement route determination on a demand or need basis and maintain only the routes that are currently in use, thereby reducing the burden on the network when only a subset of available routes is in use at any time[2,3]AODV maintains and uses an efficient method of routing that reduces network load by broadcasting route discovery mechanism and by dynamically updating routing information at each intermediate node. Route discovery in AODV can be done by sending RREQ (Route Request) from a node when it requires a route to send the data to a particular destination.

After sending RREQ, node then waits for the RREP (Route Reply) and if it does not receive any RREP within a given time period, DSR, ADV and AODV can be compared and evaluated based on the packet delivery ratio, normalized MAC load, normalized routing load, and average end-to-end delay by altering the number of sources, speed, and pause time.

III.COMPARISON BETWEEN MANET AND VANET

Vehicular Ad Hoc Network is a special type of Mobile Ad Hoc Networks. VANETs are distributed self- organizing networks formed between moving vehicles equipped with wireless communication devices. This type of network is developed as part of the Intelligent Transportation Systems to bring significant improvement to the transportation systems performance. The main goals of the ITS is to improve safety on the roads, and reduce traffic congestion, waiting times, and fuel consumptions. The integration of the embedded computers, sensing devices, navigation systems (GPS), digital maps, and wireless communication devices along with intelligent algorithms will help to develop numerous types of applications for the ITS to improve safety on the roads. Comparison between MANET and VANET shown in Figure2.

COMPARISON BETWEEN MANET AND VANET

PARAMETERS	MANET	VANET
Change in network topology	Slow	Frequent and very fast
Mobility	Low	High
Node density	Sparse	Dence and frequently variable
Bandwidth	Hundred KPS	Thousand KPS
Range	Upto 100m	Upto 500m
Node lifetime	Depends on power resource	Depend on lifetime of vechicle
Reliability	Medium	High
Moving pattern of nodes	Random	Organized

FIG2

MANETs on the other hand, consist of mobile nodes with no existing pre-established infrastructure. They connect themselves in a decentralized, self-organizing manner and also establish multi-hop routes. If the mobile nodes are vehicles then this type of network is called One important property that distinguishes Mobile Ad-hoc networks and Vehicular Ad-hoc networks share many commonalities, but also a number of differences which are summarized in Table1. [4,5] Some trust approaches may be applicable have several properties that introduce particular security challenges, which are not a concern in mobile ad hoc networks.

IV.SECURITY ISSUES

Lack of infrastructure – Roadside infrastructure may be available, but it is unlikely that there is a permanent connection to this infrastructure. Infrastructure gateways are not always[6,7] within reach. Infrastructure gateways are deployed at specific points by roadside only, such as petrol stations and parking lots.

Dynamic topology - The characteristic of VANETs is that nodes move with high speed in respect to each other, which results[11] in a very high rate of topology changes. The highly dynamic topology may result in disconnections to occur between vehicles while exchanging information.

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Privacy - Services in a VANET are related to private data, such as profile, current location or current speed, which requires anonymity in order to protect a driver's privacy. On the other hand, other services require identification and traceability.

V.AD-HOC ROUTING AND ANALYSIS OF AODV FOR VANET

As mentioned earlier MANET and VANET share the same principles, thus most ad-hoc routing protocols are applicable such as AODV and DSR. however most of the studies have shown that both[8] these protocols suffer from highly dynamic nature of nodes i.e. they give low communication throughput.here we give detailed mechanism of AODV and after simulation studies and analysis present the results.

A. AODV Mechanism

Route Discovery-AODV performs route discovery by broadcasting RREQ to all its neighboring nodes.The broadcasted RREQ contains address of source ,destination their sequence numbers,broadcast id and a counter which counts how many times RREQ has been generated for a particular node.when a source broadcast a RREQ it acquires a[14] RREP from its neighbours or that neighbours rebroadcast RREQ to their neighbours by incrementing in the hop count.node drops repeated RREQ to make the communication loop free.

B. AODV Route Table management

AODV route table management is needed to avoid those entries of nodes that do not exists in the route from source to destination.Route table management is done with the help of destination sequence numbers.

C. AODV Route Maintenence

When a node detects that a route is not valid anymore for communication it deletes all the related entries from the routing table for those invalid routes.It then sends the RREP to current neighbouring nodes that route is not valid anymore.

VI.SIMULATIONENVIRONMENT PARAMETER

1) Throughput: Throughput is the average number of successfully delivered data packets on a communication network or network node. In other words throughput describes as the total number of received packets at the destination out of total transmitted packets [9,10]. Throughput is calculated in bytes/sec or data packets per second. The simulation result for throughput in NCTUns6.0 shows the total received packets at destination in KB/Sec, mathematically throughput is shown as follows:

Throughput (bytes/sec) = Total number of received packets at destination* packet size
----------kb/s
Total simulation time

2) Packet Drop: Packet drop shows total number of data packets that could not reach destination successfully. The reason for packet drop may arise due to congestion, faulty hardware and queue overflow etc. Packet drop affects the network performance by consuming time and more bandwidth to resend a packet. Lower packet drop rate shows higher protocol performance.

3) Collision The Collision of data packet is the number of packets collides to each other due to congestion. It affects the performance directly on the bandwidth[11]. Lower packet collision rate shows higher protocol performance.

A. Simulation experiments

We used standard simulator tool NS2 for simulation Network simulator (NS2) is an event driven simulator tool and designed specifically to study the dynamic nature of wireless communication networks[12]. A scenario is set up for simulation to evaluate the

Table 1 Acquired results of DSDV and AOMDV

Protocols	Metrics	50 nodes	75 nodes	100 nodes
AOMDV	Through put	538.80	715.26	535.52
	End to end delay	110.334	131.794	138.193
	Packet loss	120	104	128
DSDV	Through put	880.23	765.30	870.74
	End to end delay	120.476	103.677	136.552
	Packet loss	76	139	91

Three different simulation network parameters are performed to calculate the performance of these routing protocols. Throughput, End to End Delay and Packet Loss

These are calculated with AOMDV shown in chart.

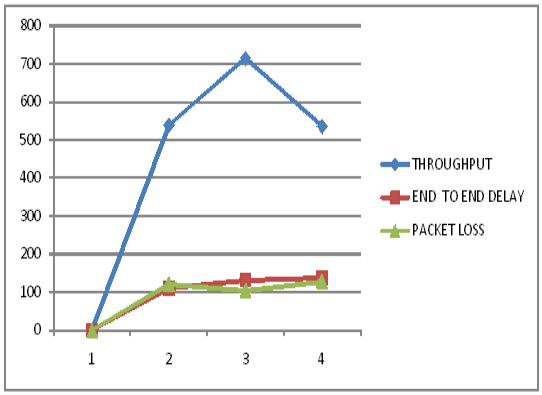

FIG3:AOMDV

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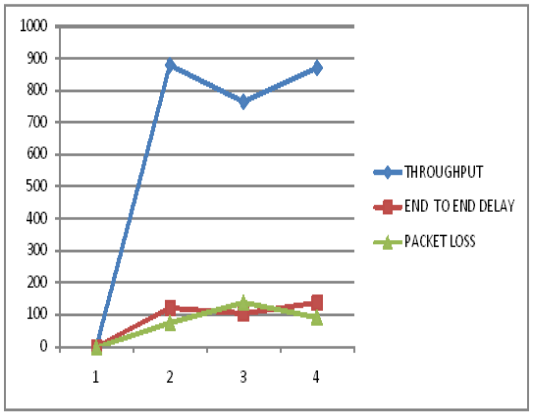

FIG4:DSDV

The ad-hoc on demand distance vector routing protocol (AODV) is based on flooding with the help of RREQ and RREP packet. [13]Dedicated short distance routing protocol (DSR) work best on table based data for static type structure. It always builds the table, based on that it transmits data. If structure destroyed, it rebuilds the table and start communication among them. Therefore DSR is table driven and AODV is on demand. The Adaptive Distance Vector (ADV) is a also a Distance Vector Routing algorithm. ADV is similar to other distance vector algorithms but it reduces the routing overhead by fluctuating the frequency and size of routing updates owing to variation in traffic and node mobility. It maintains routes[14,15] to active receivers only so that the number or entries advertised is reduced. It triggers partial and full updates so that periodic full updates are avoided like AODV.

VII. CONCLUSION

In this paper, Ad Hoc networks, comparative on MANET and VANET its different protocols, different types of network namely MANET and various features and advantage of these networks explained.

Further types of MANET networks which explain the concept if moving nodes in networks also discussed in detail [16]. So the study of this network will be helpful to understand Ad Hoc networks and its various application areas. Three different simulation network parameters are performed to calculate the performance of these routing protocols. Taking the three metrics for comparison we have concluded that in case of packet loss, End-to-End delay and throughput DSDV showed better results than AOMDV.

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