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An origination of Vehicular Ad Hoc Networks: Protocols and Security Challenges

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Abstract: - Vehicular Ad Hoc networks are a challenging and interesting research area recently used due to high reliability of networks, low cost, increasing functionality and capability to handle faults. Vanet networks are organised by themselves and a wireless medium used for exchanging data to one another. Nodes can be added or removed by the network automatically whenever used. This capability of Vanet networks increase the performance and make network reliable and easy to use. Vanet are recognizing communication between transport vehicles and stimulate safety on roads. Due to increasing transportation and vast technology rad safety is much more required to transmit data efficiently. Different types of protocols are renders in Vanet that ensures the end to end delivery of data and provides better mechanisms to transport data with proper security. Huge types of protocols are used like ad hoc, geocast, broadcast and multicast. When transferring data security issues arise. For this purpose various security tracts are implemented to deliver data with efficiently. In this paper various protocols and security mechanisms are renders.

Keywords: Vehicular ad hoc networks, Routing protocols, Security.

INTRODUCTION

VANET Networks are extended application of Mobile ad hoc networks (MANET).VANETS increases the functionality of MANETS by enhancing packet delivery ratio, fault handling, network service ability of data and decreases network burden by directly adding and removing networks whenever required. VANET use multi hop broadcasting technique and multi metric routing protocols and inducement contraption to stimulate the fabrication of information among different ad hoc vehicular nodes. Due to less infrastructure VANETS add responsibility to each vehicular node to operate themselves and mange networks by own and also reign the communications among network nodes and enhance the capability of nodes to handle faults and network issue by their own. Vehicular ad-hoc networks are responsible for effective communication among nodes and operate in certain environment. A vehicle can communicate by another vehicle directly called V2V (vehicle to vehicle) communication and vehicle can communicate with road side unit that are well known routers attached to vehicle, this type of communication called V2I (Vehicle to infrastructure). Another type of unit linked with vehicles that used applications given by provider for communication purpose.

WIRELESS TECHNIQUES IN VANET

There are various types of wireless techniques used that equip the communication among vehicles. The wireless technology assorted into three types- First is long range communication that uses cellular technologies like GSM(global system for mobiles),FDMA(frequency division multiple access),TDMA(time division multiple access or WI-MAX technologies that coves the huge area with reliable communication and high quality service that added video, audio and multimedia feature. Second type is medium range that supports DSRC (dedicated short range communication) that supports V2V type communication and WAVE. It is also use ITS (intelligent transport system) which is part of vehicle infrastructure. Third is short range communication that includes Bluetooth, Zigbee and infrared technologies.

CHARACTERISTICS OF VANET

- **Topologies: -** Position of node randomly changed time to time due to high mobility and speed of vehicles. As a result the topology of vehicular networks also changed.
- **Unlimited power and storage**:-Large number of nodes increases the chances of more energy and power consumption so that they can freely move and exchange information.
- **Varying network size**:-The size of networks increases because it spread worldwide.
- **High computational**: - Vehicular networks increases high computation facilities like memory, GPRS, storage, internet access etc.

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- **Provide safety**: - In Vanet communication between two devices takes place, so that warning massages arises that needs safety measurements.

VANET COMMUNICATION TYPE

Today in technical world and advancement in technologies various communication techniques are available. Vanet networks are communicated with each other. Vehicles can leave or join networks quickly due to frequent topology changes. Vanet communications types are as follows:

a. V2V
b. V2I
c. Hybrid architecture

a. Vehicle to vehicle

V2V communication allows vehicles to exchange their information with each other about their speed, location and safety. Various vehicular like buses, cars and trucks communicate with each other wirelessly. The vehicular devices can operate up to 300 meters and provide information about danger and give safety measures in hard conditions.

Fig 1: V2V ad hoc network

b. Vehicle to infrastructure

In this type of communication vehicles can communicate with their road side unit and gather information about other vehicles. Vehicles can communicate with other vehicles by OBU (on board unit) , OBU works as a routers .Vehicles communicate with road side units to enhance the range of communication for sending and receiving messages.

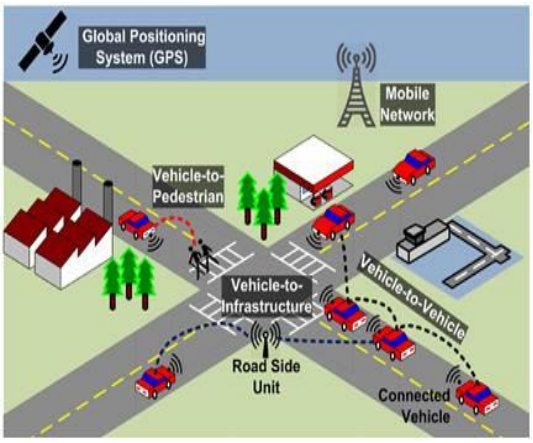

Fig 2: V2I ad hoc network

c. Hybrid infrastructure

This type of communication combines both V2V and V2I for better communication facility between vehicles. Vehicles can communicate with roadside units in multi hop manner and OBU can also communicate with radio networks like GPRS, WI MAX, GSM and UMTS etc.

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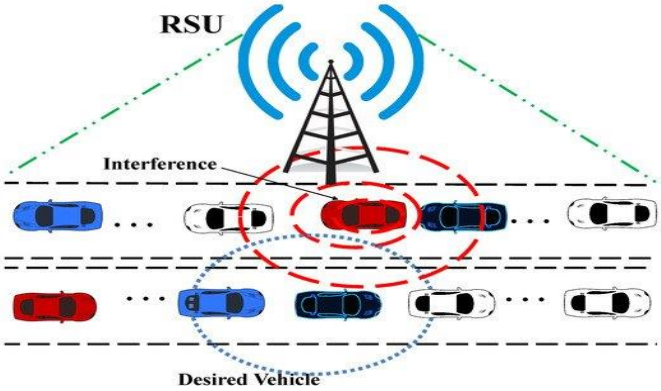

Fig 3 : Hybrid ad hoc network

VANET ROUTING PROTOCOLS

One of the most important and challenging criteria in ad hoc vehicular networks are routing protocols. Routing protocols are main concern to send data at destination by following correct location. Vanet routing is different from Manet routing because Vanet supports dynamic networks and adapted themselves as network topologies changes time to time. Sometimes delay occurs in networks so to reduce or omitted delays different Vanet protocols are associated to overcome the pitfalls of Manet protocols and to produce sufficient communication. Routing protocols in Vanet introduces into five categories:

- Ad hoc protocols
- Location based protocols
- Cluster based protocols
- Broadcast protocols
- Geocast protocols

1. **Ad hoc protocols**

In vague, Vanet are infrastructure less networks and used routing protocols that are depends on different routing protocols. Ad hoc routing protocols are used three different types of protocols that are- proactive, reactive and hybrid protocols. Proactive protocols are table driven protocols that can store routing information in tables and updating their routing table in ad hoc manners. Proactive protocols are DSDV, OLSR, and GSR etc. Other types of routing protocols are reactive protocols that can find out route when needed. It does not maintained routing table but its main responsibility to maintenance and discovers routes whenever required. These types of protocols are DSR and AODV that are mainly used in ad hoc networks. Third types of protocols are hybrid protocols that combine the functionality of both proactive and reactive protocols. The important protocol of hybrid is ZRP.

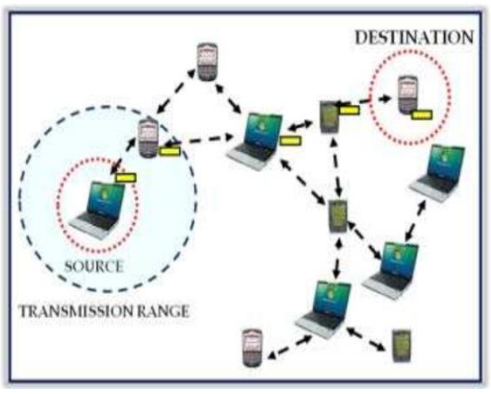

Fig 4: Ad hoc routing

2,Location based protocols

Today, a recent development in technologies increases the use of location based protocols because geographical information is much needed. So, location based protocols are used here to receive information about different vehicles from different locations. Location of vehicles is given from the sources like GPS and GPRS systems. These protocols do not need route maintenance; the route can get discover when needed. GPRS is the most important example of location based protocols because GPRS make use of circumference mode to increase the search of destination. Another

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important protocol of location based routing is LAR (location assisted routing) that can reduce the routing overheads. This type of protocol is used to find next hop, one depends on window side and distance variations.

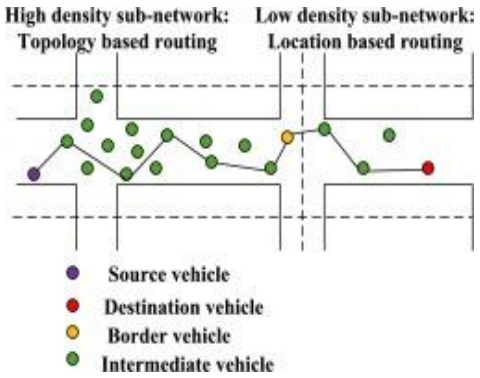

Fig 5: Ad hoc routing

3.Cluster based routing protocols

Due to large networks and vast geographic traffic of vehicles various problems arises in network. So to reduce the overhead the network is divided into clusters for smooth working and efficiently passing message over the networks. Cluster means the network vehicles are divided into smaller groups, the size of the cluster based on the number of vehicles on the networks and also depends on the routing algorithms. Cluster based routing enhances the stability of network. Cluster is changed vehicle to vehicle.

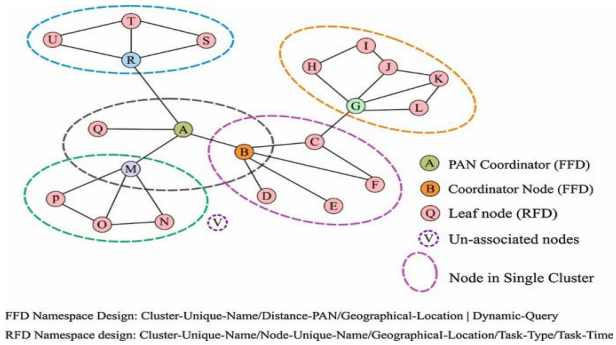

Fig 6: Cluster routing

4.Broadcast routing protocols

Broadcast routing is most important technique used mainly in vehicular networks. Broadcast networking in needed when vehicles are resides outside range so packets are transmitted using flooding that ensures that the packets are reached at destination with proper bandwidth. Broadcast protocols are used to send data and message effectively. In it routers generate data and send it to host one by one. Broadcast protocols enhance performance as sending messages and data effectively from one place o other. It also reduces the overhead burden and delays that are introduced during message transmission.

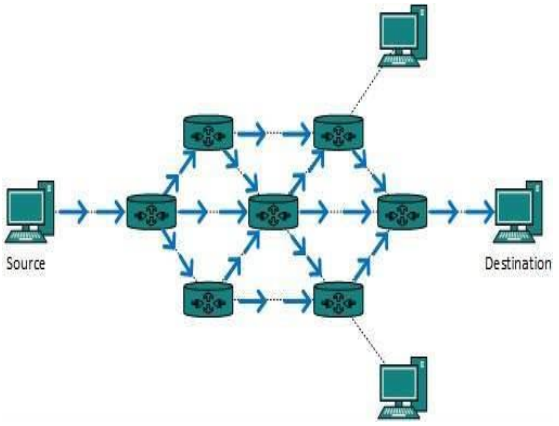

Fig 6: Broadcast routing

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5. Geocast Routing protocols

Geocast routing is most important technique used today. The basic use of geocasting is to reduce search for next node to transmit data. Next zone should be a ZOR (zone of relevance). It is used to imagine the prospect which if a vehicle gets intricate with a contretemps; it will automatically delineate the contretemps to the vesicles within that zone. Many authors involve algorithm in their research for geocasting is ROVER (Robust vehicular routing). The main approach behind this routing is to control flooded packet in network in terms too enhance efficiency and reliability of the routing.

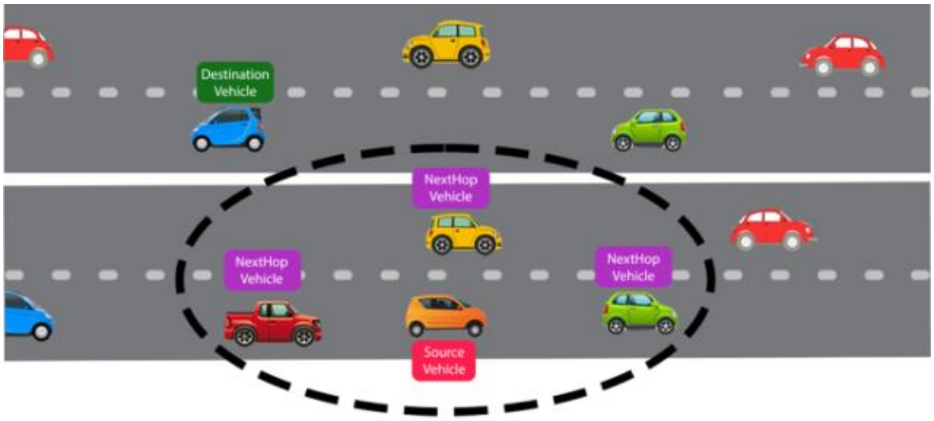

Fig 7: Broadcast routing

SECURITY IN VANET

The security issues are the most concern topic in vehicular ad hoc networks of research, so absolute solutions still needed to protect network from combatant and attacks. To protect networks there are many techniques are also available to reduce harass network. There are various types of attacks applied or faced by Vanet. These attacks make networks less secure and more burdens arise on network, which makes a network a problematic so data cannot reach at their correct location or data can be altered. Various types of attacks are-

- Network attacks
- Sybil attacks
- Denial of services
- Application attack
- Fabrications attack
- Alteration attack
- Tunnel attacks
- Monitoring attacks
- Eavesdropping

All these attacks reduce the quality of services. Attacks on Vanet categorised basically into three parts like authentication, confidentiality and availability. Authentication mean network provides an user id and password to user who uses the network so network can access an authorized user. Second is confidentiality which means user can send their data to other places with more security and correct information reaches at the destination without alteration of data so user can use key cryptography and other algorithms to protect their data. Last one is availability which means data can be available when to use with timeliness and reliability factor. Security is the most important concern in Vanet because Vanet nodes exchange information with each other all time, so they make sure that privacy information resides within nodes so better quality of services should be used. Security is main concern in Vanet so to make proper authentication and confidentially among nodes that make Vanet secure and data can efficiently reach at their destination, that makes more secure and reliable network. Various algorithms and techniques are applied to make network more secure.

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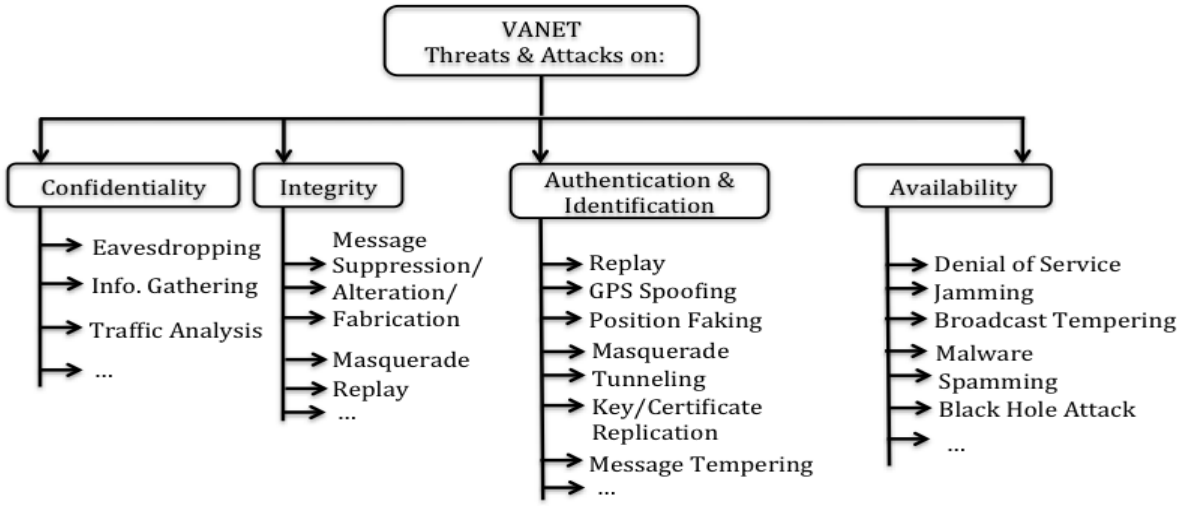

Fig 8: Threats and attacks on Vanet

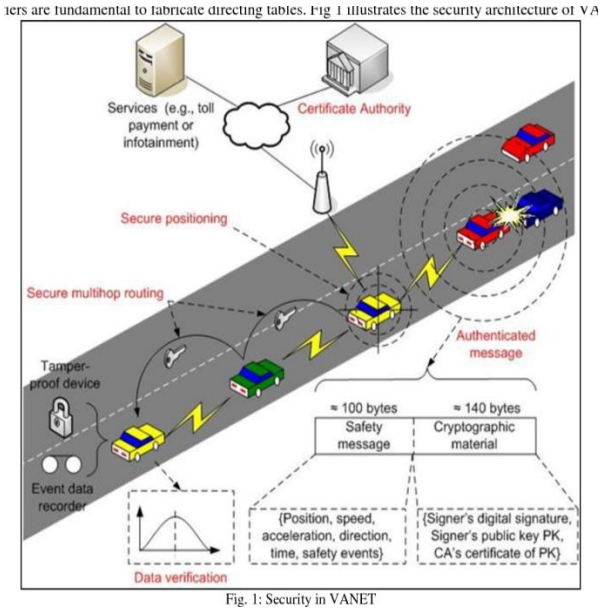

Fig. 1: Security in VANET

Fig 9: Security in Vanet

CONCLUSION

This paper presented about various issues on VANET. Various types of research challenges are created to concern and highlight the main context in Vanet. This paper represents review about Vanet challenges, protocols and security mechanisms. Various types of challenges faced by Vehicular ad hoc networks. A comparative study is made about types of routing protocols used in Vanet and analyse those protocols that has been presented in Vanet. That apex the different types of issues arises in routing algorithms. The other interested topic in concern about is security level issues. Different security issues represented in this paper and analyse different mechanisms to handle security level issues. This paper concludes some protocol that will be used in further research areas to overcome network issues. Finally, main research challenges and area interested in Vanet were discussed.

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