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OVERVIEW ON ROUTING PROTOCOLS IN VANET

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Abstract - Vehicular ad-hoc network (VANET) is special class of the MANET that consists of vehicle to vehicle communication and vehicle to roadside communication. Vehicular Ad-hoc network (VANET) requires trusted vehicles to vehicles communication. In this paper, there is survey of different ad-hoc routing protocols to provide secure routing process by build up the trust among different nodes in VANETs. Many protocols initially developed for MANETs then adopted by VANETs.

Key Words: *VANET, Routing Protocols, Categorization Of Routing Protocols*

1. INTRODUCTION

Vehicular Ad hoc Networks (VANETs) are special type of Mobile Ad hoc Network (MANETs). In VANET each vehicle which consider as node behaves like a router to exchange data between different nodes in the network. VANETs are designed to provide communication of vehicles.

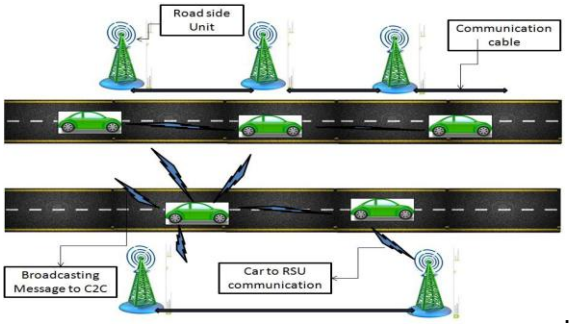

Fig.1. VANET Architecture [2]

In VANETs two types of communications are possible i.e. vehicle-to-vehicle (V2V) and roadside to vehicle communication (R2V) communication. In VANET there are fixed network nodes which are used in the form of roadside units (RSU). [1]

These types of networks are designed to provide safety on roads, to handle the heavy traffic on roads, driver guidance and location based services. In VANETs there is no limit for storage capability and power consumption and the position of the nodes can be determined by using Global Positing System (GPS). Vehicular Ad hoc Networks (VANETs) allow vehicles to form a self-organized network which does not require any predesigned infrastructure. For each vehicle's wireless network there is restricted coverage range that exists from 100 to near about 300 meters so end-to-end communication across a larger distance is possible. In VANET to transmit a message (data) form a source node to destination node requires messages to deliver through several nodes. Vehicles communicate with another vehicle directly if there is wireless connection available, it is called as single hop vehicle to vehicle (V2V) communication. If there is less possibility of direct connection between them then, forward data one vehicle to other vehicle until it reaches proper destination it is called as multi-hop vehicle to vehicle (V2V) communication. Vehicles also communicate with Road Site Unit (RSU) that increases range of network for communicating vehicles to RSU for sending, forwarding and receiving data with them. [3]

2. ROUTING PROTOCOLS IN VANET

Paragraph The main motivation behind of routing protocols in ad-hoc network is to create a path which has minimum number of hops between source and destination with least amount of overhead and minimum bandwidth utilization so that packets are delivered in a prescribed time. There are special classification frameworks that have been used to explain routing protocols for VANET.

2.1 CLASSIFICATION OF ROUTING PROTOCOLS:- Classification of routing protocols in VANET can be done into two types as shown in Fig 2 :

a) Topology based routing protocols

b) Position based routing protocols

2.2 TOPOLOGY BASED ROUTING PROTOCOLS

The IP addresses are used to identify the nodes and to setup the routes, using this information about the links that existing in the network to identify the best route to forward data. Topology-based routing protocols can be reactive, proactive and hybrid. The hybrid protocol uses both reactive and proactive concepts. [4]

2.2.1 PROACTIVE PROTOCOLS

In proactive routing the routing information such as the next forwarding hop is maintained in the background despite the consequences of communication requests. Control packets are continuously broadcast and flooded among all nodes to maintain the paths or the link states between any pair of nodes although some of paths are never used. Then a table is constructed within a node such that all entry in the table indicates the next hop node toward a definite destination. In the proactive protocols, every node sends periodical information about its routing tables. These routing tables tend to have the information about its surrounding nodes. It also conveys information about the one-hop if it exists in their path.

2.2.2 REACTIVE PROTOCOLS

Reactive protocols only search the route to a destination when a node needs to start a session with that destination and there is no route available. Despite the type of strategy used to establish and update the routing tables so paths can be chosen. Reactive routing opens a route only when it is necessary for a node to communicate with another node. It maintains only that routes which are currently in use, thus reducing the load on the network.

2.2.3 HYBRID PROTOCOLS

Hybrid protocols are combination of proactive and reactive protocols. Hybrid protocols are used in accordance to ad-hoc network scenario. The objective of hybrid routing protocols is to minimize the overhead and speedup the packet delivery to destination by using of reactive protocol. Basically this protocol divides the network in many different zones. [5] The protocol is designed in a way such that as the location information of the vehicle degrades it automatically uses the reactive routing protocol.

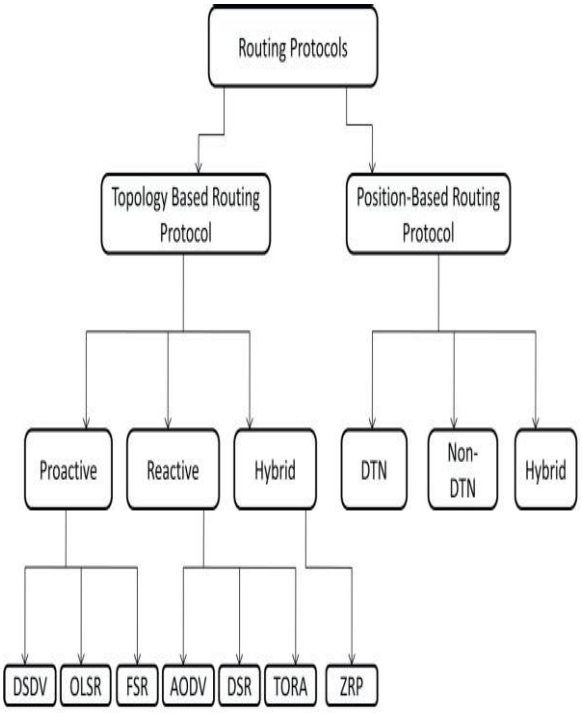

Fig. 2: Routing Protocols of VANET [3]

DESTINATION SEQUENCE DISTANCE VECTOR ROUTING (DSDV)

Destination Sequence Distance Vector Routing protocol is type of table driven protocol. DSDV provides loop free routing, minimizing the extra traffic by making the frequent updates in routing table. It also minimizes the routing overhead and chooses optimal path by the use of shortest path algorithm. In order to avoid the duplication entry into the routing table DSDV assign sequence number. DSDV does not provide multi path routing and they do not have any control over network congestion. [6] The availability of paths to all destinations in network always shows that less delay is required in the path set up process.

OPTIMIZED LINK STATE ROUTING PROTOCOLS

The OLSR is a table driven (proactive) protocol. As the name specifies, it uses the link-state scheme in an optimized way just to disseminate topological information throughout the network. In OLSR the protocol runs using the wireless multi-hop scheme, message flooding in OLSR is optimized to conserve available bandwidth. OLSR protocol is proactive protocol so its operation chiefly consists of updating and maintaining information in routing tables. The data in routing tables and other tables is based on received control traffic and control traffic. Thus it is clearly can be understand that OLSR does not route traffic. In any way OLSR is not

responsible for the actual process of routing traffic. OLSR could be considered as a route maintenance protocol in that it is responsible for maintaining the routing table used for route the packages. [7]

OLSR makes use of "Hello" messages to find its one hop neighbors and its more than one hop neighbors through their responses. The sender can then choose its multipoint relays (MPR) based on the one hop node that offers the best routes to more than one hop nodes. Each node has also an MPR selector set,that enumerates nodes which have selected it as an MPR node. OLSR uses topology control (TC) messages along with MPR forwarding to broadcast neighbor information over and done with the network. Host and network association (HNA) messages are used by OLSR to circulate network route advertisements in the same way TC messages advertise host routes.

FISHEYE STATE ROUTING (FSR)

FSR is table driven protocol, to store and update routing table with latest information that it receive from neighbor nodes. The source transmits the packet to destination of different frequencies for neighbors by means of routing table. It maintains information from neighbor nodes for accurate routing. The link state information is broadcast in different frequencies for different entries depend on their hop distance to the current node. Entries that are away broadcast with lower frequency than ones those are closer. The reduction in broadcast overhead is traded for the indistinctness in routing. On the other hand, the indistinctness gets corrected as packets approach gradually closer to the destination. Poor performance is found if node is far or at large distance. If the neighbor node is closer then the performance of FSR found to be more accurate. It is not scalable in large network. [8]

AD-HOC ON DEMAND DISTANCE VECTOR (AODV)

It is a reactive routing protocol, in which it establishes to routes between nodes only as desired by source nodes. It maintains the routes as long as the routes are needed by the sources. [9] In AODV, the network is quiet until a connection is required. When the network node needs a connection then node broadcasts a request for connection. Other AODV nodes promote this message and record the node that they heard it from, creating a detonation of temporary routes back to the needy node. At that time, a node receives such a message and previously has a route to the preferred node, it sends a message backwards through a temporary route to the requesting node. Then the needy node begins using the route that has the least number of hops through other nodes. Unused node entries in the routing tables are cast-off after a time

DYNAMIC SOURCE ROUTING PROTOCOL

It is an on-demand routing protocol which searches for a route only when needed. In its cache, each node maintains the acknowledged routes. The route consists of the full source route, containing information of all the intermediate nodes in the path. New paths are discovered by a source by flooding route request messages in the network. When route request reaches at the destination, then route reply message send by the destination. That route reply sent by the destination gathered all the nodes through which the route reply message propagates. When the route reply reaches the source, it gets the source route to the destination from that route reply message. [1]

TEMPORALLY ORDERED ROUTING PROTOCOL

TORA is considered as distributed protocol, which is highly scalable, multi path and nonhierarchical. It minimizes the communication overhead by making the frequent changes in network. TORA uses directed acyclic graph (DAC) for communication instead of following the shortest path algorithm. The advantage of TORA is that it has available path for all nodes within network and minimize control message for broadcast [8] The key design concepts of TORA is localization of control messages to a very small set of nodes near the occurrence of a topological transform. To complete this, nodes need to maintain the routing information about neighboring nodes. The three basic functions are performed by the protocol as follows:

- Route creation
- Route maintenance
- Route erasure

During the route creation and maintenance functions, nodes use a height metric to set up a directed acyclic graph (DAG) rooted at destination. Subsequently links are assigned based on the relative height metric of neighboring nodes. When mobility the DAG is broken then route maintenance unit comes into picture to bring back a DAG routed at the destination. Timing is an important factor for TORA because

the height metric is dependent on the logical time of the link collapse. TORA's route erasure phase is basically involving flooding a forward clear packet (CLR) throughout the network to erase invalid routes.

ZONE ROUTING PROTOCOL

ZRP is developed for hybrid routing, which is the combination of proactive and reactive protocols. It distributes network in many different zones. In this protocol many factors are included like power transmission, strength of signals, speed and mobility. There are two types of routing schemes exist which can be divided as inner zone routing schemes with proactive protocols and outer zone routing schemes with reactive protocols. For routing it uses existing protocols of proactive and reactive protocols. Inner zone keeps the latest route information within inner zone in which source node uses cached routing table to provide a route to destination. In outer zone, where source node transmits a route request to last node of that network. Packet includes numeral of source address and the destination address. Last node of zone receives a route request packet, if it searches the destination node inside own zone then transmits route reply packets with sequence number of destination node to source node. [10]

2.3 POSITION BASED ROUTING PROTOCOLS

Instead of using the IP addresses, position- based routing relies on the information of the geographical position of the nodes to select the best route to forward data from a source to a destination. In the position-based routing each node must be able to determine its own location and the source node must be aware of the location of the destination node. [4] In position-based routing, the forwarding decision made by a node is mainly based on the position of a packet's destination and the position of the node's one-hop neighbor nodes. The position of destination is stored in the header of the packet by the source. The node's one-hop neighbors position is obtained by the beacons sent periodically with random jitter. The random jitter sent by node to prevent collision. Nodes which are within a node's radio range will become neighbors of that node. Position based routing assumes each node knows its location and the receiving node's location is known by the sending node.

2.3.1 POSITION BASED ROUTING PROTOCOL

Position based routing or geographic routing is based on information of positions of the nodes in routing process. It sends a packet to the destination node using geographic position of individual node for the utilization of source node. In this protocol every node is able to decide its position and its neighbor node through GPS (global positioning system). It stores position of destination node and attach it in packet header which help to forward packets to the destination without the requirement of route discovery, route maintenance. Position based routing protocols commonly classified in three sub categories: Delay Tolerant Network (DTN) protocols, Non Delay Tolerant Network (Non DTN) protocols, hybrid protocols. [8]

3. CONCLUSIONS

The management of the VANET network must be for secure routing over networking most crucial is to be established. It makes V2V (Vehicles to vehicles) and V2I (Vehicles to infrastructure) communication secure and maintain privacy during communication. For that, trust management is requirement to make the communication reliable. To evaluate the paper concern, we survey to describe the conventional routing protocols in brief. Most of the methods are described with direct and indirect trust which is used to calculate the trustworthiness value of node.

REFERENCES

[1]James Bernsen, D. Manivannan, Department of Computer Science, University of Kentucky, Pervasive and Mobile Computing 5 (2009) 1_18

[2] Zeadally, Sherali, Ray Hunt et al. ", Vehicular ad hoc networks (VANETS): status, results, and challenges." Telecommunication Systems 50, no- 4 pp- 217-241, Springer, 2012

[3] Nirav j. Patel, Rutvij H. Jhaveri department of computer engineering, 45 (2015) 592 – 601

[4] Antonio Fonseca n, Teresa Vazao Journal of Network and Computer Applications 36 (2013) 961–973

[5] Fonseca, Emanuel, and Andreas Festag, "A survey of existing approaches for secure ad hoc routing and their applicability to VANETS", NEC network laboratories 28 pp-1-28, 2006.

[6] Khaleel Ur Rahman Khan, A Venugopal Reddy, et al. "An Efficient DSDV Routing Protocol for Wireless Mobile Ad Hoc Networks and its Performance Comparison", Second UKSIM European Symposium on Computer Modeling and Simulation, 978-0-7695-3325-4/08, 2008 IEEE

[7] C Jeyalakshmi et al, Int. J. Computer Technology& Applications, Vol 3 (6), 1886-1893

[8] Omar Abdel Wahab, Hadi Otrok, Azzam Mourad Computer Communications 36 (2013) 1422–1435

[9] Liang Zhou, Baoyu Zheng et al. Computer Communications 31 (2008) 2870–2882

[10] Sweety Goyal, "ZONE ROUTING PROTOCOL (ZRP) IN AD-HOC NETWORKS", IJREAS, Volume 3, Issue 3 (2013), ISSN: 2249-3905.

[11] Hartenstein, Hannes, and Kenneth P. Laberteaux. ", A tutorial survey on vehicular ad hoc networks", Communications Magazine, IEEE 46, no- 6 pp- 164-171, IEEE, 2008

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