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SURVEY OF VEHICLE AD-HOC NETWORK

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Abstract - The communication is done in between cars that is based on the short range wireless technology. It become safety road and travel comfort using ad-hoc network. We see the different to communication mode in car network. Also we see the Geonetworking with car network. IPv6 is considered as the most appropriate technologies to support communication in VANET thanks to its extended address space, enhanced mobility support, ease of configuration and embedded security.

Keywords—Geocast , VANET, IPv6, cars communication.

I. INTRODUCTION

In car network enable the direct communication in ad-hoc network among the car and between the car and road side communication device. the ad hoc networking provides a spontaneous and direct communication of a car with other cars or with fixed road-side access points in its vicinity. The different communication mode is happen between the car we see in detail further in section . the most important concept used here is IPv6 that means to allocate the IP address to all the devices i.e On Board Unit , Road Side unit , application unit and so on. There are number of feature to using the IPv6 instead of IPv4. The 32-bit addresses of the IPv4 format are not sufficient to address the rapidly increasing users and domain ,and will soon be exhausted . IPv4 does not provide a sufficient amount of available IP addresses. In 1997, there were 600 millions of cars worldwide. This amount will be double at present trend. However, the IPv4 address is 32 bit long i.e 2³² approximate 4.3 billion. The IPv6 address have a length of 128 bits. The address exhausting problem completely resolving by IPv6 address space size of 2¹²⁸. Thanks to IPv6 extended address space, embedded security, enhance the mobility support and ease of configuration ,the most appropriate technology to support communication in VANET. Advantages of IPv6 are the provided auto-configuration capabilities and network mobility support. A Disadvantage of IPv6 no built in notion of geographical information.

Not like mobile network, they increase the coverage of the ad hoc network after forwarding data , send or receive application .e.g. detect some event related to road condition and to access the internet and so on ,these execute multitude function in car network. To meet the specific requirements of vehicular communication on support of highly mobile cars, frequent topology changes, and scalability with potentially very large number of nodes, the concept of geographical routing was applied and extended to vehicular environments. Geocast is an ad hoc routing

protocol utilizing geographical positions for data transfer. Geocast assumes that every node knows its geographical position and maintains a location table containing other nodes and their geographical positions as soft state. Geocast supports point-to-point and point-to-multipoint communication.

Geocast assumes that cars acquire information about their position (i.e. geodetic coordinates) via GPS or any other positioning system. Every cars periodically advertises this information to its neighboring cars and hence, a cars is informed about all other cars located within its direct communication range. If a cars intends to send data to a known target geographic location, it chooses another cars as message relay, which is located in the direction towards the target position.

II. COMMUNICATION TYPE

Communication system have the four subsystem i) The vehicle sub system ii) The roadside sub system iii) The control center(in charge of the providing the application and network services and other function to vehicle and roadside) , iv) The personal sub system(third party located in the internet and communicate through ITS). The IPv6 node located in subsystem or anywhere in the internet illustrate in figure 2.

IPv6 nodes located in the vehicle sub-system: The IPv6 Mobile Router (MR) and its attached IPv6 nodes (respectively, the On-Board Unit (OBU) and Application Units (AUs));

IPv6 nodes located in the roadside sub-system: the IPv6 access Router (AR) and its attached IPv6 nodes (respectively the Roadside Unit (RSU) and AUs);

IPv6 nodes located in the Internet: IPv6 nodes located in the central or personal sub-systems or anywhere in the Internet and corresponding with

vehicles and the roadside. These typically include ITS-dedicated servers, the Home Agent, nodes hosting other networking functions (e.g. DNS) and other third party

The Communication between the cars , roadside unit or device or anywhere in the internet these are the end point.

Vehicles are equipped with an OBU that has IPv6 GeoNetworking and an AU that contains regular IPv6 stack. For station-internal communication between AU and OBU, regular Ethernet is used. WLAN is used for station-external communication between OBU and other OBUs/RSUs. The client application consists of two main components and one support component: reporter, receiver, and HMI, respectively. The reporter automatically detects road traffic events and reports them to the disseminator via UDP unicast. The receiver receives messages from the disseminator via IPv6 multicast, which are encapsulated to GeoBroadcast packets, and then notify vehicle drivers. Thus AUs join an IPv6 multicast group. Both main components inform drivers of road traffic event detection and message reception through the GUI windows provided by the HMI.

The roadside only has a RSU that supports both Pv6 Geo Networking and regular IPv6 routing. The RSU encapsulates regular IPv6 multicast packets delivered from the Internet and Geo Broadcasts to OBUs via its wireless network interface. Even though a RSU does not cover the necessary range for delivering GeoBroadcast packets, the packets is forwarded by nearby vehicles thanks to the multihop communication mechanism in IPv6 over C2CNet.

ITS centre contains an AU connected to the Internet. In the AU, the server application has one main component and one support component: disseminator and HMI, respectively. The disseminator aggregates road traffic event reported by clients via regular UDP unicast, and propagates them to other receiver clients via IPv6 multicast. The disseminator also informs ITS operators of road traffic event detection through the GUI window of the HMI.

Application Unit (AU): An in-vehicle or road-side entity and runs applications that can utilize the OBU's or RSU's communication capabilities, respectively. Examples of AUs are i) a dedicated device for safety applications like hazard-warning, ii) a navigation system with communication capabilities, iii) a nomadic device such as a PDA that runs Internet applications.

OBU (On-Board Unit): a physical device located in a vehicle and responsible for Vehicle-to-Vehicle and Vehicle-to- Infrastructure communications. It also

provides communication services to AUs and forwards data on behalf of other OBUs in the GeoNet domain. A C2CNet OBU must implement C2CNet layer capabilities and is equipped with at least a network device for short range wireless communications based on IEEE 802.11p* radio technology. The C2CNet OBU acts as a VANET non-IP router

RSU (Road-Side Unit): a physical device located at fixed positions along roads and highways, or at dedicated locations such as gas station, parking places, and restaurants..



Figure 1. Example of OBU,AU

A C2CNet RSU must implement C2CNet layer capabilities and is equipped with at least a network device for short range wireless communications based on IEEE 802.11p* radio technology. A C2CNet RSU is likely equipped with other network devices in order to allow communications with an infrastructure network. The C2CNet RSU acts as a VANET non-IP router

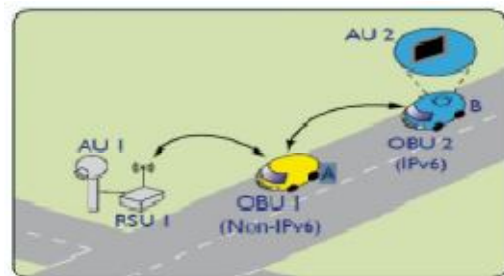


Figure 2. Example RSU

Ad hoc network : Communication network which is set up by the communication nodes (peer-to-peer) without any pre-installed fixed infrastructure. There are three type of communication i) Cars based communication ii) Roadside based communication iii) internet based communication.

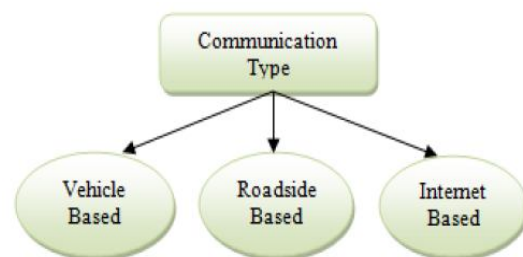


Figure 3. Communication Type

Cars Based Communication : The communication is done between two car without infrastructure support . Applications based on IPv6 as well as other applications not based on IP can be supported.

Roadside Based communication: The Communication is done between the car-to-roadside devices or roadside-to-car ,or cars to cars with infrastructure support.

Internet-based communication modes: This type of communication in between car and internet with infrastructure support

For all three communication type, Applications based on IPv6 as well as other applications not based on IP can be supported, but only IPv6-based communications are in the scope of GeoNet. This mostly concerns safety and traffic efficiency applications.

COMMUNICATION FLOW IN CAR NETWORK

IPv6 unicast: Communication between a single communication endpoint and at another single communication endpoint. A means of transmitting a message from one source to one specific destination.

IPv6 anycast: Communication between a single communication endpoint and a single arbitrary communication endpoint from a set of predefined devices. A means of transmitting a message from one source to one un-specified destination.

IPv6 multicast: Communication between a single communication endpoint and multiple communication endpoints. A means of transmitting a message from one source to several destinations.

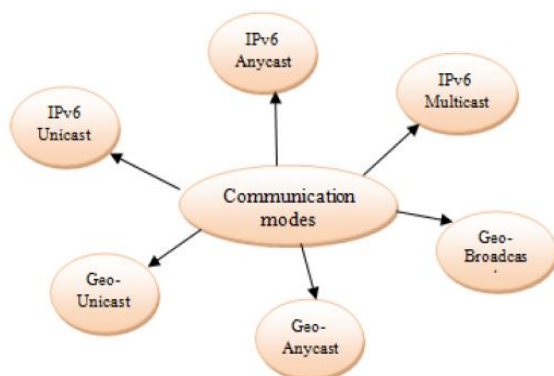


Figure 4. Communication Modes

GeoUnicast: Communication between a single communication endpoint and its identified counterparty located at a given geographical position. GeoUnicast provides packet delivery between two nodes via multiple wireless hops. When a node wishes to send a unicast packet, it first determines the

destination’s position and forwards the data packet to the node towards the destination, which in turn re-forwards the packet along the path until the packet reaches the destination.



Figure 5. GeoUnicast

GeoAnycast: Communication between a single communication endpoint and a single arbitrary communication endpoint from a set of predefined devices within a given geographical area. GeoAnycast is similar to Geo-Broadcast but addresses a single (i.e., any) node in a geographical area.

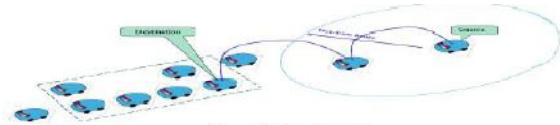


Figure 6. GeoAnycast

GeoBroadcast: Communication between a single communication endpoint and all communication endpoints within a given geographical area. GeoBroadcast distributes data packets by flooding, where nodes re-broadcast the packets if they are located in the geographical region determined by the packets. This simple flooding scheme is enhanced with techniques based on packet numbering to alleviate the effects of so-called broadcast storms that are a typical problem in wireless ad hoc networks. A means of transmitting a message to all nodes connected to a network. Normally, a special address, the broadcast address, is reserved to enable all the devices to determine that the message is a broadcast message.

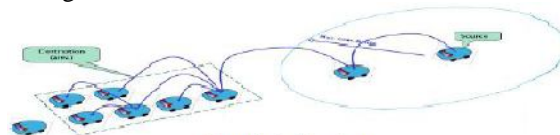


Figure 7. GeoBroadcast

Geocast: A means of transmitting a message to a designated geographical area. GeoBroadcast and GeoAnycast are geocast communication means.

1-Hop Broadcast: To send a data packet to all direct neighbours of a node. No further forwarding of that data packet is applied.

IPv6 vehicle-based anycast: Packets exchanged between two vehicles without infrastructure support. The end points are vehicle single vehicle endpoint identified by location (GeoAnycast). Event-driven low-latency query from a vehicle to an unknown neighbor vehicle heading in the opposite direction to report about traffic congestion. Example Traffic efficiency: Event-driven low-latency query from a

vehicle to an unknown neighbor vehicle heading in the opposite direction to report about traffic congestion

IPv6 vehicle-based multicast : Packets transmitted from a vehicle to multiple vehicles without infrastructure support the end points are vehicle. Multiple vehicle endpoints within a circle of specified radius around originator (GeoBroadcast).1

Road safety: Event-driven low-latency broadcast to multiple vehicles located within a geographical area in order to reliably and quickly disseminate safety information such as reporting about black ice. 2. Road safety: Event-driven delay-tolerant IPv6 application-bound broadcast to multiple vehicles located within a geographical area piggy-backed over a sequence of beacons in order to reliably disseminate safety information by attaching it to scheduled network signaling. 3. IPv6 signaling: Periodic broadcast from a vehicle announcing the IP address range it can be reached at.

IPv6 roadside-based unicast: Packets sent between the roadside and a vehicle at a specific location the end points are roadside originator and vehicle destination or vice-versa. Several of the communication endpoints and communication modes (e.g. Vehicle-Vehicle and Vehicle-Roadside).

IPv6 vehicle-based unicast: Packets exchanged between two vehicles without infrastructure support. The end points are vehicles. Single vehicle endpoint of known identity whose position and identity are known through received beacons and/or a location service (GeoUnicast). Examples are: Road safety: Event-driven low-latency transmission from a vehicle announcing to a peer vehicle behind that it is decreasing speed. Infotainment: Delay-tolerant gaming between two vehicles with known identities. Single endpoint at specified geographic area or direction (GeoUnicast). Example: Road safety: event-driven low-latency packets sent from the roadside to a vehicle at a specific location and lane. Traffic efficiency: vehicle requesting to the roadside an empty space in parking lot.

IPv6 roadside-based anycast: Packet sent from a roadside to a vehicle within the roadside's service area. The end points are roadside originator and vehicle destination. Single endpoint (GeoAnycast). Example: IPv6 signaling: IPv6 router advertisement and router solicitation sent between the vehicles and the roadside. ° Road safety: Dynamic speed limit notification from the roadside to all vehicles. Delivery of information to a vehicle at an unknown position (position request query flooding when the IPv6 access router has a message to deliver to a vehicle in its service area, but the vehicle's position is not known or delivery acknowledgement has timed

out, a position request query may be flooded within its service area. The target vehicle responds with its current position. This procedure may be restricted to messages above a certain priority class).

IPv6 Internet-based unicast: Bidirectional exchange between the vehicle and the Internet. Packets are first transmitted from the vehicle to the roadside and then from the roadside to the Internet, or vice versa. The end points are vehicle originator and Internet destination or vice versa. Single endpoints of known identity. Example: IPv6 signaling: IPv6 mobility management between vehicle and home agent. IPv6 application: traffic hazard (black ice, ghost driver) reported from the vehicle to some well-known server in the Internet.

IPv6 Internet-based multicast: Periodic delivery from the Internet to multiple vehicles within a designated area, transmitted from an Internet source to the roadside and then GeoBroadcast to the service area of the roadside. Packets may be multi-hopped between the roadside and the vehicle. The end points are Internet originator and vehicle destinations. : Multiple vehicle endpoints at specified geographic area (GeoBroadcast). Example Road safety: Central server reporting about black ice to all vehicles in a geographic area Characteristics: In the vehicular network the characteristics are Geographic position available, Mobility modeling and predication vehicle based networks will experience a high degree of mobility. The average speed of nodes will be very high, resulting in frequent topology changes and short average connection times. However, the high mobility can also be used to transport high-latency accepting information physically. High mobility and Rapid changing topology, Hard delay constraints, No power constraint

Applications: Applications based on vehicular communication range from simple exchange of vehicle status data to highly complex large-scale traffic management including infrastructure integration.1) Safety: Dangerous road for example curve warning for controlling the speed, small bridge warning, Road condition warning e.g. lane change warning traffic condition, black hole warning 2) Services : Emergency vehicle warning, Emergency vehicle signal preemption, Electronic license plate Electronic drivers license, Vehicle safety inspection, Enhance Driving Highway merge assistant, Map download/update, parking spot locator service.3) Entertainment software update/flashing, Fleet management, Toll collection, parking payment, voice email checking Security: 1) Information authenticity: receiving nodes can verify that the information contained in a received message is correct. 2) Message integrity and Source authentication: receiving nodes can verify that the messages have not been altered on their way and that

the sender is a valid source.3) Privacy: sending nodes cannot be tracked and the identity of the users is not revealed nor can it be linked to the identifiers used for communication. 4) Robustness: the system cannot be easily disturbed.5) Availability: Ensures the survivability of communication channel despite Denial-of-Service (DoS) attacks. In fact, since this network uses the wireless medium for communication, it is susceptible to malicious exploitation at different layers. One of these attacks is a kind of denial of service attack (DoS) that interferes with the radio transmission channel, this is also known as a jamming attack.

6) Non-repudiation: Ensures that the origin of a message cannot deny having sent the message such as accident messages.

Positive effects: No energy constraints, Known position and time, Limited physical access, Periodic maintenance, Secure computing platform.

Negative effects: Large number of nodes, No centralized infrastructure, High mobility, Privacy concerns, No user interaction.

CONCLUSION

In this paper we study the basic concept about different way of communication between the end point and the end points may be vehicle, roadside

units or internet . IPv6 in vehicular ad-hoc network (VANET) concept . Also show that communication between the end point using Geonetworking study all basic concepts related to the IPv6 using Geonetwork. The different way done the communication between the end points i.e. unicast multicast, Anycast, GeoBroadcast, GeoUnicast, GeoAnycast.

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