OPTIMUM SAFETY MESSAGE BROADCASTING PROTOCOL FOR VEHICULAR NETWORKS

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Abstract: **VANET Vehicular safety applications depend on the rapid and reliable dissemination of safety messages to vehicles at risk. In order to allow sufficient reaction time for emergency events in adverse driving and road conditions, disseminating safety messages over multi-hop vehicles is often needed. In addition, there are a number of technical challenges to consider in designing protocols for emergency applications, adaptation to VANET specific network environments, such as high mobility, severe channel fading, and a wide range of vehicle density, including extremely high node-density owing to rush-hour traffic in metropolitan areas, are another important aspect to consider. An Intelligent Optimized Link State Routing (OLSR) algorithm is proposed to deliver mission-critical life safety messages over target geocast regions. The coordination problem and Opportunistic packets relay selection is solved by the novel concept of Circle of Trust (COT), combining with MAC as Standard Wireless Access in Vehicular Environments (WAVE) which defines the range of reliable local neighbour knowledge collection over a broader target area efficiently and reliably. This OLSR technique results in better performance and Quality of Service than the existing protocols.**

Index Terms— **Metaheuristics, optimization algorithms, Optimized Link State Routing (OLSR), Vehicular Ad Hoc Networks (VANET).**

1.INTRODUCTION

1.1 VEHICULAR AD-HOC NETWORK

A **Vehicular Ad-hoc Network (VANET)** are self-configuring networks, where the nodes are vehicles equipped with on-board computers, elements of roadside infrastructure, sensors, and pedestrian personal devices which is specifically designed and supportive for vehicular communication over different situations. In VANET, communication may takes place between the Vehicular nodes as well as Vehicles to the infrastructure. The main purpose of VANET is to provide the safety related information's to public and road network. Each node consists of processing capability (one or more microcontrollers, CPUs or DSP chips), may contain multiple types of memory (program, data and flash memories), have a RF transceiver (usually with a single Omni-directional antenna), and have a power source (e.g., batteries and solar cells). The nodes communicate wirelessly and often self-organize after being deployed in an ad hoc fashion. Systems of 1000s or even 10,000 nodes are anticipated. Such systems can revolutionize the way we live and work. VANET is embedded with a vehicular sensor which performs the operation of neighbour knowledge prediction. Wi-Fi technologies are used for deploying this kind of network. At present "Standard Wireless Access in Vehicular Environments" (WAVE) is specifically designed for VANET communication. This technology presents the opportunity to develop powerful car system capable of gathering, processing and distributing information. In VANET Wi-Fi Limitations in coverage and capacity of channel, the high mobility of nodes, and presence of obstacles generate packet loss, frequent topology changes, and network fragmentation. The main characteristics of a VANET include

(a) Frequent topology changes
(b) The high mobility of nodes
(c) Coverage and capacity of channel
(d) Presence of obstacles generate packet loss
(e) Several channel fading
(f) Wide range of Vehicle density

To avoid accidents by disseminating safety messages at intersections or highways is considered as a basic element for safety related applications in Vehicular Ad-hoc Networks.

2. EXISTING SYSTEM

Life safety message (LSM) broadcasting, used the Zero coordination opportunistic routing (ZCOR). The drivers could be informed of whether or not it would be safe to pass. Because of the geocast range of LSMs should be extended from several hundred meters up to a kilometer depending on vehicle speed. Even with the boosted signal strength that is allowed by current Wireless Access in Vehicular Environments (WAVE) standards, the necessary transmission ranges cannot be reliably obtained through single-hop communications. Existing Protocol pure link state protocol (LSP) by propagating topology information via selected nodes, called multipoint relays (MPRs), which facilitate efficient flooding of control messages in the network. Existing Protocol there is a link or node failure, the protocol takes some time to detect the failure and re-establish a consistent view of the new topology. During such a transient period, the data traffic forwarded along a path with a failed link/node will be dropped. Worse, routing loops may form because of inconsistency in routing tables and may lead to network congestion. The increase in packet transmissions imposes an added computation cost and power consumption and so could lead to a quicker depletion of the battery power on a mobile device. These possibilities need investigation in order to assess in detail the possible impacts. An optimal routing strategy that makes better use of resources is crucial to deploy efficient VANETs that actually work in volatile networks. Finding well-suited parameter configurations of existing mobile ad hoc network (MANET) protocols is a way of improving their performance, even making the difference between a network that does work or does not, e.g., networks with high routing load suffer from congestion and cannot ensure timely and reliable delivery of messages. An optimization problem is defined by a search space and a quality or fitness function. The search space restricts the possible configurations of a solution vector, which is associated with a numerical cost by the fitness function. Relay Selection in a link set keep track of the link status between the node and its neighbors. The impact of tuning the HELLO interval increases with increased node speed. When the network is relatively stable with less mobility, tuning HELLO interval has smaller impact than with high mobility. Evaluate the quality or fitness of the different OLSR configurations communication cost function in terms of three of the most commonly used QoS metrics in this area are

- Packet delivery ratio
- Network routing load

3. PROPOSED SYSTEM

An Optimized Link State Routing (OLSR) algorithm for VANET to deliver mission-critical life safety messages over limited target geocast regions. Opportunistic packet relay chosen using the novel concept of Circle of Trust (CoT), and combining with MAC as Standard Wireless Access in Vehicular Environments (WAVE) which defines the range of reliable local neighbor knowledge collection over a broader target area efficiently and reliably. The coordination problem under dynamic and unstable vehicular channel conditions is solved by the novel concept of Circle of Trust (CoT). OLSR does not rely on a time-consuming pre-coordination process nor on extra overhead except for low-rate heartbeat packets with the help of WAVE. Also in OLSR reserving transmission slot time, latency-bounded transmissions for LSM packets are achieved. OLSR is a proactive link-state routing protocol designed for MANETs (VANETs), which show low bandwidth and high mobility. OLSR is a type of classical link-state routing protocol that relies on employing an efficient periodic flooding of control information using special nodes that act as multipoint relays (MPRs). The use of MPRs reduces the number of required transmissions. The OLSR parameters to define a solution vector of real variables, each one representing a given OLSR parameter. This way, the solution vector can automatically be fine-tuned by an optimization technique, with the aim of obtaining efficient OLSR parameter configurations for VANETs, of analytic comparisons of different OLSR configurations and their performances as those done in this paper can help the experts identify the main source of communication problems and assist them in the design of new routing protocols. Defining and solving an offline optimization problem to efficiently and automatically tune OLSR, with CoT and WAVE mechanism combination.

4. MODULE DESCRIPTION

4.1 OLSR PROTOCOL

OLSR is a proactive link-state routing protocol designed for MANETs (VANETs), which show low bandwidth and high mobility. OLSR is a type of classical link-state routing protocol that relies on employing an efficient periodic flooding of control information using special nodes that act as multipoint relays (MPRs). The use of MPRs reduces the number of required transmissions.

- HELLO messages are exchanged between neighbour nodes (one-hop distance). They are employed to accommodate link sensing, neighbourhood detection, and MPR selection signalling. These messages are generated periodically, containing information about the

neighbour nodes and about the links between their network interfaces.TC messages are generated periodically by MPRs to indicate which other nodes have selected it as their MPR. This information is stored in the topology information base of each network node, which is used for routing table calculations. Such messages are forwarded to the other nodes through the entire network. Since TC messages are broadcast periodically, a sequence number is used to distinguish between recent and old ones.MID messages are sent by the nodes to report information about their network interfaces employed to participate in the network. Such information is needed since the nodes may have multiple interfaces with distinct addresses participating in the communications.

4.2 OLSR PARAMETER TUNING

The OLSR parameters to define a solution vector of real variables, each one representing a given OLSR parameter. This way, the solution vector can automatically be fine-tuned by an optimization technique, with the aim of obtaining efficient OLSR parameter configurations for VANETs, of analytic comparisons of different OLSR configurations and their performances as those done in this paper can help the experts identify the main source of communication problems and assist them in the design of new routing protocols. Tuning parameters two other types of parameters are used in the design process: design parameters and noise parameters. Design parameters are those for which the designer selects values as a part of the design process. When the design is finished, exact nominal values are specified for design parameters. Noise parameters, on the other hand, confound the ability of the designer to specify nominal values for the design parameters. The quality or fitness of the different OLSR configurations (tentative solutions), we have defined a communication cost function in terms of three of the most commonly used QoS metrics in this area: The packet delivery ratio (PDR), which is the fraction of data packets originated by an application that is completely and correctly delivered. The network routing load (NRL), which is the ratio of administrative routing packet transmissions to data packets delivered, where each hop is counted separately. The end-to-end delay (E2ED), which is the difference between the times a data packet, is originated by an application and the time this packet is received at its destination.

4.3 OPTIMIZATION FRAMEWORK COMBINED WITH WAVE

The optimization strategy used to obtain automatically efficient OLSR parameter configurations is carried out by coupling two different stages:

- An optimization procedure.
- A simulation stage.

The optimization block is carried out by a metaheuristic method, in this case one of those previously mentioned, i.e., PSO, DE, GA, and SA. These four methods were conceived to find optimal (or quasi-optimal) solutions in continuous search spaces. A simulation procedure for assigning a quantitative quality value (fitness) to the OLSR Performance of computed configurations in terms of communication cost. This procedure is carried out by means of the ns-2 network simulator widely used to simulate VANETs accurately. Ns-2 has been modified to interact automatically with the optimization procedure with the aim of accepting new routing parameters, opening the way for similar simulation procedure of the tentative OLSR configuration over the defined VANET scenario. Then, ns-2 is started and evaluates the VANET under the circumstances defined by the OLSR routing parameters generated by the optimization algorithm. This optimization strategy is used in this paper to find as fine-tuned as possible configuration parameters of the OLSR protocol, although it could directly be used also for a number of other routing protocols (AODV, PROAODV, GPSR, FSR, DSR, etc.).

4.4 MESSAGE BROADCASTING WITH OPTIMIZED ROUTING

Message Broadcasting uses State maintained and Soft State Optimized Link State Routing (OLSR) algorithm to deliver mission-critical life safety messages over target geocast regions. Opportunistic packets relay selection using the novel concept of Circle of Trust (CoT), and combining with MAC WAVE which defines the range of reliable local neighbor knowledge collection over a broader target area efficiently and reliably. Two of the OLSR Broadcasting methods are:

State Maintenance in OLSR

The topology information of the whole network in the presence of mobility and failure, an OLSR daemon needs to record and keep updated the following state information in its internal tables:

- Link tuples in a link set keep track of the link status between the node and its neighbors. There are two types of status: SYM link (e.g. bi-directional) and ASYM link (e.g. single-directional). Each link tuple contains the interface addresses of the local node and the neighbor node (e.g. the end points of a link), and the valid time during which the link is considered as valid and useable. Neighbor set contains neighbor tuples to keep track of a node's neighbor status, including willingness and valid time etc., while 2-hop neighbor set records a set of 2-hop tuples that describe symmetric links between its neighbors and the symmetric 2-hop neighborhood. MPR set maintains a set of neighbors that are selected as MPRs, while MPR selector set records a set of MPR-selector tuples and describes the neighbors that have been selected by this node as MPRs.

Soft state in OLSR

The soft state approach to signaling is used in OLSR. The routing state times out and is removed unless periodically refreshed by the receipt of routing updates. Soft-state signaling does not require explicit state removal or orphaned state removal when the state installer crashes since non-refreshed state wills finally time-out. Also refresh messages make the system robust to node failure, to loss/corruption of refresh messages and there is no requirement for guaranteed delivery of refresh message.

Soft state approaches have been widely implemented in numerous protocols, including RSVP, IGMP, SIP as well as OLSR. OLSR relies heavily on the soft state approach to maintain the consistency of topology information, and the consistency of routing tables amongst network nodes. So, apart from normal periodic messages, the protocol does not generate extra control traffic in response to link failure and node join/leave events.

5. RESULT AND DISCUSSION

The optimization methodology offers the possibility of automatically and efficiently customizing any protocol for any VANET scenario. The experts in this area with an optimization tool for the configuration of communication protocols are provided in the scope of VANETs. An Optimized Link State Routing (OLSR) algorithm for VANET to deliver mission-critical life safety messages over limited target geocast regions. Opportunistic packet relay chosen using the novel concept of Circle of Trust (CoT), and combining with MAC as Standard Wireless Access in Vehicular Environments (WAVE) which defines the range of reliable local neighbor knowledge collection over a broader target area efficiently and reliably

6. CONCLUSION AND FUTURE WORKS

The Optimized Link State Routing protocol by tuning soft state refreshes intervals. Through simulations we can see OLSR routing performance is more sensitive to the value of intervals. Although a smaller interval could speed up neighbour and link failure detection, the improvement is not linear with the decrease of the interval. So it may be possible to tune the operation of OLSR dynamically, during operation, by measuring metrics, the mechanism for performing such a dynamic tuning requires further investigation. It may also be possible to apply such analysis and tuning to other soft-state systems, in order to improve overall system performance. The effects of the increased packet overhead (e.g. in terms of network congestion and power consumption) also need to be assessed. The optimization methodology offers the possibility of automatically and efficiently customizing any protocol for any VANET scenario. The experts in this area with an optimization tool for the configuration of communication protocols are provided in the scope of VANETs

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