PERFORMANCE EVALUATION OF SINGLE-HOP PERIODIC SAFETY BEACONING FOR VEHICLE-TO-VEHICLE COMMUNICATION IN VANET

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ABSTRACT

Saving human lives on road has become the prime objective of Vehicular Ad hoc Network (VANET). In order to achieve safety, vehicles maintain neighborhood awareness with the help of safety messages. Providing an efficient safety messaging mechanism is a challenging task in VANET, due to particular characteristics of VANET, i.e. high mobility, limited channel bandwidth, very short communication duration, and highly dynamic topology. In most of the safety messaging schemes proposed so far, Periodic Safety Beacons (PSBs) are generally considered dispensable in comparison with event-driven messages. However in reality, vehicle-to-vehicle (V2V) PSBs are used to collect critical information required by all the safety messaging schemes and cannot be dispensed. Thus, ensuring optimum QoS for V2V single-hop PSBs is essential for achieving acceptable level of safety. However, thorough performance evaluation of V2V single-hop PSBs is yet to be carried out.

This research comprehensively investigates V2V single-hop periodic safety beaconing in the light of tunable parameters i.e. Beacon Generation Interval (BGI), Safety Beacon Size (SBS), and Communication Range (CR) that govern their behavior. Results from exhaustive simulations show that adjusting tunable parameters solely or combined does not fully satisfy the strict QoS criterion required for safety applications. Overall, an acceptable level of end-to-end delay can be achieved by dynamically adjusting tunable parameters with BGI $>$ 100ms, but lower BGI is not suitable with larger SBS. In dense traffic conditions strict PDR criterion of 99% is never achieved beyond 100m target CR. An exclusive comparison between tunable parameters shows that solely adjusting BGI can attain relatively higher PDR than other tunable parameters while SBS remains the least effective parameter. It is also validated that dynamic adjustment of CR and BGI is necessary for optimal output in terms of PDR. Furthermore, optimal combinations of tunable parameters for different highway service levels with respect to safety application requirements are also presented.