

## ABSTRAK

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Judul : OH-AODV : Protokol Perutean Andal untuk Aplikasi Keselamatan di Jaringan Ad hoc Kendaraan  
Pembimbing : Prof. Dr. Eng. Wisnu Jatmiko, S.T., M.Kom.

Berdasarkan data *World Health Organization* (WHO) tahun 2019, kecelakaan lalu lintas mengakibatkan kematian 1,28 juta orang tiap tahunnya dan menjadi penyebab kematian tertinggi ke-12 di dunia. Di Indonesia, menurut Biro Pusat Statistik (BPS), pada tahun 2018 terjadi 29.472 kematian dan 143.886 cedera berat dan ringan akibat kecelakaan lalu lintas. Sejatinya, fatalitas kecelakaan lalu lintas tersebut dapat ditekan dan dicegah dengan menerapkan *road safety applications* (aplikasi keselamatan jalan) menggunakan *Intelligent Transportation Systems* (ITS) dengan teknologi telekomunikasi pendukungnya yaitu *Vehicular Ad hoc Networks* (VANETs) atau Jaringan Ad hoc Kendaraan. Karena VANET merupakan jaringan telekomunikasi nirkabel bergerak dengan banyak node, maka protokol perutean berperan sangat penting dalam transmisi pesan aplikasi keselamatan. Kondisi topologi VANET yang dinamis mengakibatkan degradasi kinerja jaringan, sehingga diperlukan protokol perutean andal yang memenuhi syarat aplikasi keselamatan dengan  $EED < 400$  ms,  $PDR > 95\%$ ,  $Reliability > 0.99$ . Namun demikian, protokol perutean saat ini pada umumnya belum memfokuskan EED kecil sebagai kriteria utamanya, oleh sebab itu dikembangkan protokol perutean usulan ini. Protokol perutean usulan dikembangkan dengan strategi *cross-layer* (kolaborasi *physical layer* dan *network layer*), penerapan *Received Signal Strength* dan node relai terjauh yang memenuhi nilai *threshold* untuk menemukan rute terbaik dengan latensi tersingkat dan jumlah *hop* paling optimal. Protokol perutean usulan dinamakan Optimasi *Hop AODV* (OH-AODV) yang dikembangkan berbasiskan protokol *Ad hoc On-demand Distance Vector* (AODV). Berdasarkan simulasi, protokol OH-AODV dapat mencapai  $EED < 400$  ms,  $PDR > 95\%$ , dan  $Reliability > 0.99$  secara mayoritas sehingga memenuhi syarat aplikasi keselamatan jalan dengan kondisi dan batasan yang didefinisikan dalam simulasi. Hasil simulasi menunjukkan bahwa protokol perutean OH-AODV mempunyai kinerja EED 3 kali lebih baik dibandingkan AODV dengan PDR dan *Reliability* yang setara. Sehingga, protokol OH-AODV layak sebagai kandidat protokol perutean untuk aplikasi keselamatan jalan di Jaringan Ad hoc Kendaraan.

### Kata Kunci:

protokol perutean, aplikasi keselamatan, optimasi hop, *Intelligent Transportation Systems* (ITS), *Vehicular Ad hoc Networks* (VANETs), *Packet Delivery Ratio* (PDR), *En- to-End Delay* (EED), *Reliability*, *Ad hoc On demand Distance Vector* (AODV).

## ABSTRACT

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Based on the World Health Organization (WHO) data in 2019, traffic accidents result in 1.28 million deaths each year and are the 12th leading cause of death in the world. In Indonesia, according to the Central Bureau of Statistics (BPS), in 2018 there were 29,472 deaths and 143,886 serious and minor injuries due to traffic accidents. Indeed, traffic accident fatalities can be suppressed and prevented by implementing road safety applications using the Intelligent Transportation System (ITS) with supporting telecommunication technology, namely Vehicular Ad hoc Networks (VANETs). Since VANETs are mobile wireless telecommunication networks with multiple nodes, routing protocols play a very important role in the transmission of safety application messages. Dynamic topological conditions of VANETs lead to degradation of network performance, so a reliable routing protocol that meets safety application requirements is required with  $EED < 400$  ms,  $PDR > 95\%$ ,  $Reliability > 0.99$ . However, current routing protocols generally do not focus on small EED as the main criteria, which is why this proposed routing protocol was developed. The proposed routing protocol was developed with a cross-layer strategy (collaboration of physical layer and network layer), the application of Received Signal Strength and the farthest relay node that meets the threshold value to find the best route with the shortest latency and the most optimal number of hops. The proposed routing protocol is called Optimized Hop AODV (OH-AODV) which was developed based on the Ad hoc On-demand Distance Vector (AODV) protocol. Based on the simulation, the OH-AODV protocol can achieve  $EED < 400$  ms,  $PDR > 95\%$ , and  $Reliability > 0.99$  mostly so that it meets the requirements of road safety applications with the conditions and limitations defined in the simulation. The simulation results show that the OH-AODV routing protocol has 3 times better EED performance than AODV with equivalent PDR and Reliability. Thus, the OH-AODV protocol is feasible as a routing protocol candidate for road safety applications in Vehicle Ad hoc Networks.

Key words:

routing protocol, safety applications, hop optimization, Intelligent Transportation Systems (ITS), Vehicular Ad hoc Networks (VANETs), Packet Delivery Ratio (PDR), End-to-End Delay (EED), Reliability, Ad hoc On demand Distance Vector (AODV).