

## ABSTRACT

This study presents a comparison analysis of routing protocol utilization on VANET especially in Intelligent Transportation System (ITS) environment. Based on actual conditions for ITS application, the simulation scenarios were designed by common traffic around Universitas Gadjah Mada, Yogyakarta. The limitation of ITS components in real condition, such some areas has a limited infrastructure became a challenge to look forward VANET performance. Infrastructure limitations, especially internet may occur due to malfunction of the network, or intermittent connectivity, for an example case of post-disaster conditions. In order to control the environment and traffic running well, VANET communication is necessary resistance towards delay to support the performance.

Network communication that can accommodate the delay are usually used in rural areas known as Delay Tolerant Networks (DTN). DTN may be applied to the urban traffic in support of the performance of ITS such this condition. VANET simulation is used by the real environment on Universitas Gadjah Mada. Simulation of routing protocol used multicast routing in order to improve message delivery optimally. There are few multicast protocol routing that has the same tendency based classification Queue Management (QM), replication (R) and forwarding (F). The fourth protocol is Epidemic, Spray and Wait, First Contact and Epidemic Oracle.

The simulation results proved that the DTN protocol can be applied to the ITS environment with better latency, in particularly for a limited number of nodes by use First Contact routing protocol. Epidemic Oracle routing protocol is the highest number of delivery probability that significantly better than other protocols.

**Keywords :** delay, intelligent, networks, protocol, tolerant, transportation, vanet

## INTISARI

Penelitian ini menyajikan perbandingan kinerja penggunaan protokol *routing* pada VANET pada lingkungan *Intelligent Transportation System* (ITS). Menggunakan simulasi skenario peta jalur lalu lintas umum di wilayah Universitas Gadjah Mada untuk merepresentasikan kondisi aktual dalam penerapan ITS. Keterbatasan ITS dengan memanfaatkan jaringan internet pada daerah yang memiliki infrastruktur terbatas menjadi tantangan untuk melihat kinerja komunikasi VANET. Keterbatasan infrastruktur dapat terjadi disebabkan malfungsi dari jaringan, atau konektivitas yang tidak stabil atau sebagai contoh kondisi pasca bencana. Toleransi terhadap *delay* diperlukan untuk mendukung kinerja VANET agar kontrol terhadap lingkungan dan lalu lintas dapat berjalan.

Protokol *routing* VANET yang dapat digunakan mentoleransi *delay* yaitu *Delay Tolerant Networks* (DTN). DTN dapat diterapkan pada lalu lintas dalam mendukung kinerja ITS. Simulasi VANET menggunakan kondisi sebenarnya yaitu dengan peta lingkungan Universitas Gadjah Mada. Simulasi protokol *routing* yang digunakan bersifat *multicast* agar pengiriman pesan dapat berlangsung optimal. Terdapat empat protokol *multicast* yang memiliki kemiripan berdasarkan klasifikasi *queue management* (QM), *replication* (R) dan *forwarding* (F). Keempat protokol tersebut adalah Epidemic, Spray and Wait, First Contact dan Epidemic Oracle.

Hasil simulasi menunjukkan protokol DTN dapat diaplikasikan pada lingkungan ITS dengan latency yang baik, terutama pada *node* dengan jumlah terbatas yaitu protokol First Contact. Dalam hal probabilitas terkirim maka Epidemic Oracle secara signifikan lebih tinggi dari protokol lain.

**Kata kunci** -- delay, intelligent, networks, protocol, tolerant, transportation, vanet