

ABSTRACT

Abstract—In Vehicular Ad Hoc Networks (VANETs), developed a wireless technology for Vehicle to vehicle communication (V2V) and Vehicle to Road Side Unit (V2R). In VANET vehicles driving along highways can be grouped into clusters to facilitate communication. The design of the clusters, e.g., size and geographical span, has significant impacts on communication quality. Such design is affected by the Media Access Control (MAC) and the mobility of the vehicles. This thesis aims to analyze the performance of the *cluster formations* : *cluster formation* weighted-based, *cluster formation* K-Means, *cluster formation* Markov Chain and we present a comprehensive analysis that integrates the important factors into one model, MAC operations and vehicle mobility.

Highway modelling scenarios used to test the density and speeds of vehicle. The network performance measures of *cluster formation* weighted-based and K-Means such as : *cluster overhead*, *normalized cluster load*, *packet delivery ratio*, *packet loss ratio* and *cluster convergence time*. The results of the performance evaluation of the three most influential parameters are the packet delivery ratio (PDR), packet lost ratio (PLR) and cluster convergence time (CCT). At the time of vehicle speed 100 km/h the PDR value of K-Means formation cluster was 75.06%. For vehicle speed 100 km/h the lowest PDR value of other model was K-Means formation cluster that is 24,94%. And at a speed of 80 km/h the lowest CCT value of other model was K-Means formation cluster that is 9.46 s. The result of Cluster Markov chain model analysis on VANET resulted in the greater value of contention window (CW) can help reduce packet loss. As the CW value increases from 16 to 64, the probability of packet loss drops by more than 45%.

Keywords :VANET, *Vehicle to Vehicle*, *Vehicle to Road Side Unit*, *cluster formation* weighted-based, *cluster formation* K-Means, *cluster formation* Markov Chain.

INTISARI

Pada Vehicular Ad Hoc Networks (VANET) dikembangkan suatu teknologi wireless untuk komunikasi Vehicle to Vehicle (V2V) dan Vehicle to Road Side Unit (V2R). Di VANET kendaraan yang melaju di sepanjang jalan raya dapat dikelompokkan ke dalam cluster untuk memudahkan komunikasi. Perancangan cluster dipengaruhi ukuran dan rentang geografis yang memiliki dampak signifikan terhadap kualitas komunikasi seperti aspek operasi MAC dan mobilitas kendaraan. Penelitian ini bertujuan untuk menganalisa performa cluster formation yaitu cluster formation weighted-based, cluster formation K-Means, cluster formation Markov Chain.

Pemodelan jalan tol digunakan untuk menguji skenario kepadatan dan kecepatan kendaraan. Hasil evaluasi pengujian kinerja dari tiga parameter yang paling berpengaruh yaitu packet delivery ratio (PDR), packet lost ratio (PLR) dan cluster convergence time (CCT). Pada saat kecepatan kendaraan 100km/jam PDR cluster formation K-Means sebesar 75,06 %. Untuk kecepatan kendaraan 100km/jam PLR cluster formation K-Means lebih kecil yaitu 24,94%. Dan pada kecepatan 80km/jam nilai CCT K-means lebih kecil yaitu 9,46 s. Hasil analisa model Cluster Markov chain pada VANET menghasilkan nilai contention window (CW) yang lebih besar dapat membantu mengurangi packet loss. Pada kondisi nilai CW meningkat dari 16 menjadi 64, probabilitas packet loss turun lebih dari 45%.

Kata kunci – VANET, *Vehicle to Vehicle*, *Vehicle to Road Side Unit*, *cluster formation weighted-based*, *cluster formation K-Means*, *cluster formation Markov Chain*