

## **ABSTRACT**

*In the digital era, telecommunications technology is required to be able to provide fast, large-capacity and adaptive internet connectivity to dynamic User Equipment (UE) mobility. Direct Virtual Small Cell (DVSC) technology is proposed to increase the speed, capacity and adaptability of telecommunications networks. To be able to implement DVSC technology, a UE clustering algorithm is required. UE clustering aims to direct beamforming towards a group of UEs. Beamforming is a technique for transmitting signals in a certain direction. The algorithm used must have a high level of accuracy and Silhouette Score, so that it can produce reliable network services. This study compares the performance of two clustering algorithms for implementing DVSC. The comparison is carried out based on the influence of DVSC using the K-Means algorithm and the Grid Affinity Propagation Clustering (GAPC) algorithm, with reference to clustering parameters, RSSI, silhouette score and SINR. The study began by searching for literature to create a simulation model, followed by creating a simulation model using MATLAB software. If the model does not match the theory, improvements are made until it is valid. After being valid, the simulation results are analyzed. The results of the study obtained an average accuracy value of the K-Means algorithm of 93.35% and the GAPC algorithm of 91.89%, while the average silhouette score value of the K-Means algorithm was 0.95 and the GAPC algorithm was 0.96, the average RSSI value of K-means was -67.84 dB while GAPC was -68.82 dB, and the average SINR value in the K-Means algorithm was 22.67 dB, while in the GAPC algorithm it was 20.75 dB. It was concluded that the GAPC algorithm showed superior performance compared to the K-Means algorithm in terms of accuracy, adaptiveness and probability of obtaining good SINR values, thus supporting a more reliable network with strong signals and low interference.*

**Keywords:** Adaptive, Clustering, DVSC, GAPC-SNR, K-Means