

Evaluation of the impact of movement speed and data load on routing performance in ad hoc networks

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Abstract: This study evaluates the impact of node mobility speed and data load on routing performance in mobile ad hoc networks (MANETs). Through extensive simulations using the NS-2 simulator, the performance of three prominent routing protocols—AODV, DSR, and DSDV—was analyzed under varying conditions of node velocity (ranging from 1 to 20 m/s) and network traffic load (from low to high). Key performance metrics including packet delivery ratio, end-to-end delay, throughput, and normalized routing overhead were measured. The results demonstrate that increased mobility speed significantly degrades packet delivery ratio and increases routing overhead for all protocols, with reactive protocols (AODV and DSR) showing greater resilience than the proactive DSDV. Conversely, higher data loads exacerbate congestion, leading to increased delay and packet loss, particularly affecting DSR due to its source routing mechanism. The findings reveal a critical trade-off between mobility and traffic intensity, providing insights for protocol selection and optimization in dynamic ad hoc environments. This research contributes to the understanding of MANET scalability and offers practical guidelines for deploying efficient routing strategies in real-world mobile networks.

Keywords: movement speed, data load, routing performance, ad hoc network