ABSTRACT

The integration of Vehicle Ad-hoc Networks (VANETs) with 5G technology presents a promising frontier in the advancement of intelligent transportation systems (ITS). As vehicular communication systems evolve, the need for faster, more reliable, and low-latency communication becomes critical for the enhancement of safety, traffic management, and autonomous driving applications. 5G offers a significant improvement over previous generations of mobile networks, providing ultra-reliable low-latency communication (URLLC), massive machine-type communication (mMTC), and enhanced mobile broadband (eMBB), which are essential for the future of VANETs.

The integration of VANET-5G explores the potential of 5G to support the high-speed data transfer and seamless connectivity required for real-time communication between vehicles, infrastructure, and other elements of the road environment. Key challenges such as network scalability, security, and interference management are also examined, along with solutions that 5G offers, including network slicing, edge computing, and dynamic resource allocation. The integration of 5G with VANETs not only improves vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications but also facilitates the implementation of autonomous vehicles, smart cities, and efficient traffic flow systems.

Ultimately, the synergy between VANETs and 5G technology is poised to redefine the future of transportation by enabling highly connected and intelligent systems, thereby contributing to safer, more efficient, and sustainable mobility solutions.

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