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### Blockchain-Based Secure and Trustworthy Internet of Things in SDN-Enabled 5G-VANET

The modern intelligent transportation system brings not only new opportunities for vehicular Internet of Things (IoT) services but also new challenges for vehicular ad-hoc networks (VANETs). Apart from enhanced network performance, a practical and reliable security scheme is needed to handle the trust management while preserving user privacy at the same time. The emerging 5G mobile communication system is viewed as a prominent technology for ultra-reliable, low-latency wireless communication services. Furthermore, incorporating software-defined network (SDN) architecture into the 5G-VANET enables global information gathering and network control. Hence, real-time IoT services on transportation monitoring and reporting can be well supported. Both pave the way for an innovative vehicular security scheme. There are several security and privacy issues in the transportation system and the vehicular IoT environment in SDN-enabled 5G-VANET. Due to the decentralized and immutable characteristics of blockchain, a blockchain-based security framework is designed to support the vehicular IoT services, i.e., real-time cloud-based video report and trust management on vehicular messages. So a SDN-enabled 5G-VANET model and the scheduling procedures of the blockchain-based framework can tackle the issues in the transportation system. The numerical simulation results also show that malicious vehicular nodes or messages can be well detected while the overhead and impact on the network performance are acceptable for large-scale scenarios. Through case studies and theoretical analysis, this design guarantees a secure and trustworthy vehicular IoT environment with user privacy preserved.

Keywords: Blockchain, 5G-VANET, IoT, security and privacy, SDN, trust.