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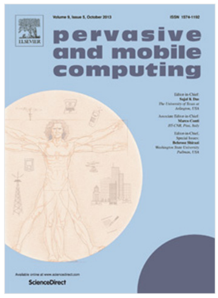

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Software Defined P2P Architecture for Reliable Vehicular Communications

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Abstract

Vehicular networking is considered a promising and enabling technology that helps in the realization and diversification of vehicle related applications such as road traffic safety, emergency management, and infotainment. For applications such as the road traffic safety, the system has to respond in certain bounded time and ensure higher reliability. A major bottleneck of the existing architectures is the reliability and scalability that results in a considerable performance degradation. Therefore, in this paper, we proposed a software defined peer to peer (P2P) architecture for reliable vehicular communications solution that scales out overall network intelligence into the system components (Road side units, on-board units, Gateways, Control center) and offer an unprecedented reliability, adaptability and scalability. The reliability of the communication is achieved by using redundant system components such as multiple switches and GWs links that are deployed to achieve lower communication latencies and higher packet success rates. Furthermore, higher reliability is achieved by the application of fast-failover and fast recovery techniques. The proposed architecture is implemented using Docker, and containerized ONOS and Cassandra. The obtained results show that the proposed architecture offer higher reliability by offering higher packet success rate (PSR) and smaller round trip time (RTT).

1. Introduction

Vehicular networks are a trending topic nowadays, whose communications requirements pose challenging issues at various levels, from the network architecture to the physical layer technology. Moreover, distinct applications and use cases are expected to be deployed, each of them with specific demands for throughput, latency, availability, security, etc. For instance, some services such as intelligent intersections, also known as virtual traffic lights, cooperative adaptive cruise control (CACC) or other safety-critical applications require extreme low-latency and fault-tolerance mechanisms [1] in order to prevent accidents or to mitigate the effects of a crash. On the other hand,

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