IEEE Transactions on Vehicular Technology

Special Section on:

Open Radio Access Networks: Architecture, Challenges, Opportunities, and Use Cases in Vehicular Networks

Cellular vehicle-to-everything (C-V2X) was introduced to support autonomous driving through 5G and beyond networks. C-V2X leverages cellular network infrastructure to integrate vehicle-to-network, vehicle-to-pedestrian, vehicle-to-infrastructure, and vehicle-to-vehicle communications. It has been suggested that Open RAN can be used to achieve the latency requirements essential to realize C-V2X as it achieves real-time optimization through the use of AI in Near real-time RAN Intelligence Controller (Near-RT RIC). The Open RAN will allow the access to historical traffic data or acquisition of data from vehicles. The data will then be transferred to Near-RT RIC for detecting network anomalies while maintaining reliable communication, which is essential for realizing autonomous driving. Open RAN also supports non-real-time RAN intelligent controller (Non-RT RIC) that allows more complex ML workflows such as policy-based feature extraction and optimization to guide vehicles when real-time acquisition is not available. Open RAN provides support for edge cloud, i.e. Open Cloud that helps to interface the Near-RT RIC with Open RAN central unit's user and control plane. Together, the Open RAN and C-V2X are considered to be the key-enabling technologies for achieving low-latency in autonomous vehicular communication networks. The scope of this special issue is to highlight key research problems along with solid technical solutions for the development and testing of networks based on the Open RAN vision, for the adoption of open APIs, interfaces, standards in 5G network architectures, the integration of AI and ML workflows, coexistence with proprietary virtual RAN (vRAN) alternatives, developing performance measurement metrics, and dealing with vertical and horizontal flexibility for vehicular networks. Furthermore, the special issue will also focus on the Open RAN standards and architecture for the evolution of 5G to 6G, and O-RAN-based intelligent techniques for service orchestration, resource allocation and management, and O-RAN commercial use-cases.

This special issue will seek technical, empirical, and conceptual papers that could offer practical and novel solutions concerning the following topics in the context of Open RAN and its integration with C-V2X, but not strictly limited to:

- AI/ML methods for Near-RT RIC for Traffic Monitoring
- Design of Policy-based methods for Non-RT RIC for Autonomous Driving
- Simulation and Modeling of Open Cloud and C-V2X
- Improving reliability and lower latency of Autonomous driving using Open RAN
- Designing Access Traffic Steering, Switching, and Splitting (ATSSS) functions for Near-RT RIC
- Designing user plane functions for Open cloud.
- Routing data of autonomous vehicles to user plane functions via Open cloud.
- Computational Offloading for autonomous vehicles using Open RAN.
- AI/ML methods to minimize age of processing for autonomous vehicles using Open RAN
- Communication Planning Approach for predicting offloading delay.
- Privacy-Preserving AI/ML methods for vehicular networks in Open RAN
- Virtualization and Scaling techniques for C-V2X
- Simulation and Modeling of Fronthaul and Open Interfaces
- Distributed Cloud Architectures based on Service Management and Orchestrators (ONAP, OSM), Kubernetes, and OpenStack

- Coexistence of Open RAN with vRAN and cRAN in C-V2X
- Boosting Disaggregation functionalities in C-V2X through AI/ML workflows
- Enhancing Openness and Opportunities for non-top vendors with Digital Twins
- Design of Test-bed architectures.

Authors Guidelines

- Authors must refer to the guidelines as shown on the TVT webpage (https://vtsociety.org/publication/ieee-transactions-vehicular-technology/guidelines-authors).
- During submission, authors must submit their paper to the "Special Section" and include the title of Special Section during paper registration. The cover letter should mention specifically "Open Radio Access Networks: Architecture, Challenges, Opportunities, and Use Cases in Vehicular Networks Special Section".

Deadlines

- Paper submission: 31 May 2023
- First round of review notification: 31 August 2023
- First Revision Submission deadline: 15 October 2023
- Notification of final decision: 15 December 2023
- Final Manuscript Submission Deadline: 30 December 2023
- Publication: Q1 2024

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