Vehicular Networking and 6G Data Taxonomy


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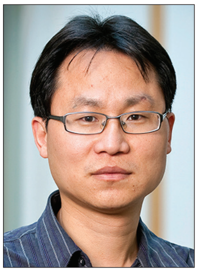
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The representation of vehicular transportation in fifth generation (5G) networks requires complete projection of virtual reality that surrounds any of the vehicles at a specific location. The challenge obviously appears when trying to identify what type of data is to be captured and how such data would be processed. In reality, there would be multiple sensors that monitor and sense the physical domain with multi-service management entities for each category of these sensors. The 3rd Generation Partnership Project (3GPP) provides technical specification for such data modeling in TS 22.261 to handle multi-model virtual reality (VR) applications. This standard shows the management of multi-modality outputs, data transfer over separated links, and the multi-service processors per data type. Obviously, the success of such a system is very dependent on synchronizing the data transfers across a large network to multiple destinations and the retrieval of outputs to build the VR at the central unit of the transportation system. Although this seems to be a little similar to multi-slice services that 5G supports, this modeling is very much dependent on achieving time alignment between data transactions. The technical enablers for such a system will range from cross-service analytics capture to cross-domain orchestrators. Considering the strict key performance indicators (KPIs) for transport VR and dynamic adaptation in cloud-based networks, it is most likely that such a system will not be deployed until the next mobile generation. By then, vendors and operators will have evolved the current network topology and data filtering techniques to be able to support such multi-modality platforms with high user experience.

The transformation that 5G brought to network topology as cloud-based architecture has changed forever the way that network operations are managed and audited. The network automation in response to user behavior, location, resource availability, and so on mitigated the challenge of network management from administrating operations to data categorization. The 5G and beyond networks will be overloaded with unseen amounts of various types of traffic and telemetry data. This tremendous amount of transferred data will require a magnificent amount of computation resources and cause massive increase in power consumption. Therefore, future networks should only create selective messages that provide only necessary and informative updates to existing domain descriptions. Tailoring this concept to vehicular networks would significantly improve the creation of VR for transportation systems. This would happen only if the artificial intelligence (AI) for any network platform has acquired the necessary data for predicting the next change in network status. To this point, it seems that the future sixth generation (6G) will filter and transfer messages using special data managing modules that are driven by AI provisioning mechanisms. Those mechanisms will operate in mesh architecture to allow large-scale audit of data, but with ability to access any local domain per user.

This issue of the Vehicular Networking series has two articles: The first article, "Post-Quantum Era in V2X Security: Convergence of Orchestration and Parallel Computation" is by Engin Zeydan, Yekta Turk, Berkin Aksoy, and Yaman Yagiz Tasbag. The article's main focus is the integration of post-quantum and mobile network connectivity through a service and computation orchestrator framework. The proposed modeling involves multiple user cases for different types of vehicles (e.g., cars and drones). The authors provide results that show the impact in terms of consumed computational resources and related research in standardization activities.

The second article, "In-Depth Exploration on ISO/SAE 21434 and Its Correlations with Existing Standards" is by Gianpiero Costantino, Marco De Vincenzi, and Ilaria Matteucci. This article reviews the standard for cybersecurity risk management for electrical and electronic (E/E) systems in road vehicles. The authors provide detailed and comprehensive discussions of possible interactions with mechanical automotive components. Additionally, the authors define a designed documents list that car manufacturers could use to define the cybersecurity of an E/E item and be compliant with ISO/SAE 21434. Finally, the authors support their proposals with an example of applying ISO/SAE 21434 concepts on an electric window power regulator.

Biographies

Anwer Al-Dulaimi [M'11, SM'17] (anwer.al-dulaimi@exfo.com) received his Ph.D. degree in electronic and computer engineering from Brunel University, London, United Kingdom, in 2012. Currently, he is a senior manager for emerging technologies and innovations in the Mobile Solutions Unit at EXFO, Canada. He is also recognized as a Distinguished Member of EXFO's technical staff and is an IEEE Distinguished Lecturer. His research interests include 5G and beyond, cloud networks, and V2X. He is the Chair of the IEEE 1932.1 Working Group "Standard for Licensed/Unlicensed Spectrum Interoperability in Wireless Mobile Network" and the new IEEE 5G and Beyond Testbed project.

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