This document contains supplemental information referenced by the European Rolling Plan for ICT Standardisation.

IEEE Standards Activities in the Intelligent Transportation Systems (ITS) Space (ICT Focus)

Overview

As the transportation sector increasingly incorporates autonomous system features and electric vehicles are incorporated into the smart grid, IEEE has standards activities in a number of different aspects of ITS and transportation, including:

- Intra-vehicle communication: IEEE 802.3 (Ethernet) standards evolve to support very high bitrates and time-sensitive communication.
- Vehicle-to-vehicle and/or vehicle to infrastructure (V2X) wireless communication: IEEE 802.11 (WLAN) standards have been modified and are further improved for ad-hoc V2X communication and networking in the dedicated 5.9 GHz spectrum, as well as the IEEE 1609 family of standards for Wireless Access in Vehicular Environments (WAVE).
- Security: IEEE 1609.2 enables secure vehicle-to-vehicle and vehicle-to-infrastructure wireless communication. There is coordination with ETSI.
- Ethical considerations: The IEEE P7000 standards family is addressing ethical considerations in a broad range of artificial intelligence/autonomous system uses, including vehicular context.

As part of the global technology ecosystem, the IEEE Vehicular Technology Society Intelligent Transportation Systems (VTS/ITS) collaborates and coordinates with many other organizations. IEEE VTS/ITS 1609 working group experts have participated in the exchange of IEEE draft documents to facilitate the expeditious development of profiles for use of IEEE drafts for European Norms (ENs).

IEEE launched a new “Industry Connections” initiative in 2017 bringing together stakeholders in the automotive industry to discuss emerging technology issues and the development of a roadmap document exploring standards needs and opportunities to facilitate integration of these technologies. In addition to the standards and topical areas cited above, this group is also considering artificial intelligence issues for autonomous vehicles. AI topics also correlate with the
recently formed IEEE P7000 series of standards projects addressing ethical considerations for AI and autonomous systems.

In 2014, IEEE created the IEEE Standards Coordinating Committee on Transportation (IEEE SCC42 Transportation). With the support of more than 30 IEEE Societies and Councils, and with the goal of helping to ensure a future for transportation that will be more connected, automated, intelligent, electric, and electronic, IEEE SCC42 Transportation brings together related disciplines to promote transportation standards and to facilitate adoption throughout the entire transportation ecosystem.

**Relevant Standards Activities**

**Approved Standards***

- IEEE Std 802.11-2012, IEEE Standard for Information Technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
  
  **NOTE:** The original IEEE Std 802.11p-2010, which added *Wireless Access in Vehicular Environments*, has been superseded by IEEE Std 802.11-2012 in which the content is now incorporated.

- IEEE Std 802.15.4-2015, IEEE Standard for Low-Rate Wireless Networks


- IEEE Std 1609.4-2016, IEEE Standard for Wireless Access in Vehicular Environments (WAVE)--Multi-channel Operation
- IEEE Std 1616-2004, IEEE Standard for Motor Vehicle Event Data Recorders (MVEDRs)
- IEEE Std 1616a-2010, IEEE Standard for Motor Vehicle Event Data Recorders (MVEDRs)--Amendment 1: Motor Vehicle Event Data Recorder Connector Lockout Apparatus (MVEDRCLA)
- IEEE has standards on charging communication: IEEE 1901 provides broadband over powerline communications to be used in charging, and IEEE 2030.1.1 on DC quick charging.

Current New or Revision Projects*
- IEEE P1609.2b, Standard for Wireless Access in Vehicular Environments--Security Services for Applications and Management Messages Amendment
- IEEE P1609.2.1, Wireless Access in Vehicular Environments (WAVE)--Certificate Management Interfaces for End-Entities
- IEEE p2030.1.1, Standard Technical Specifications of a DC Quick and Bi-directional Charger for Use with Electric Vehicles
- IEEE P2020, Standard for Automotive System Image Quality
- IEEE P2040, Draft Standard for Connected, Automated and Intelligent Vehicles: Overview and Architecture
- IEEE P2040.1, Draft Standard for Connected, Automated and Intelligent Vehicles: Taxonomy and Definitions
- IEEE P7001, Transparency of Autonomous Systems

Autonomous vehicles - IEEE 2040 series of projects* including:
- IEEE P2040, Standard for Connected, Automated and Intelligent Vehicles: Overview and Architecture
- IEEE P2040.1, Standard for Connected, Automated and Intelligent Vehicles: Taxonomy and Definitions
- IEEE P2025.1, Standard for Consumer Drones: Taxonomy and Definitions
- IEEE P2025.2, Standard for Consumer Drones: Privacy and Security

*Draft standards projects, once approved, are often revised and/or used as the base for new projects, and therefore may appear in both the "active standards" and "projects under development" lists.