February 10, 2021

CAT Coalition Technical Resources Working Group

Qualcomm

C-V2X Standards Updates

Jim Misener

Sr. Director, Product Management

Global V2X Ecosystem Lead

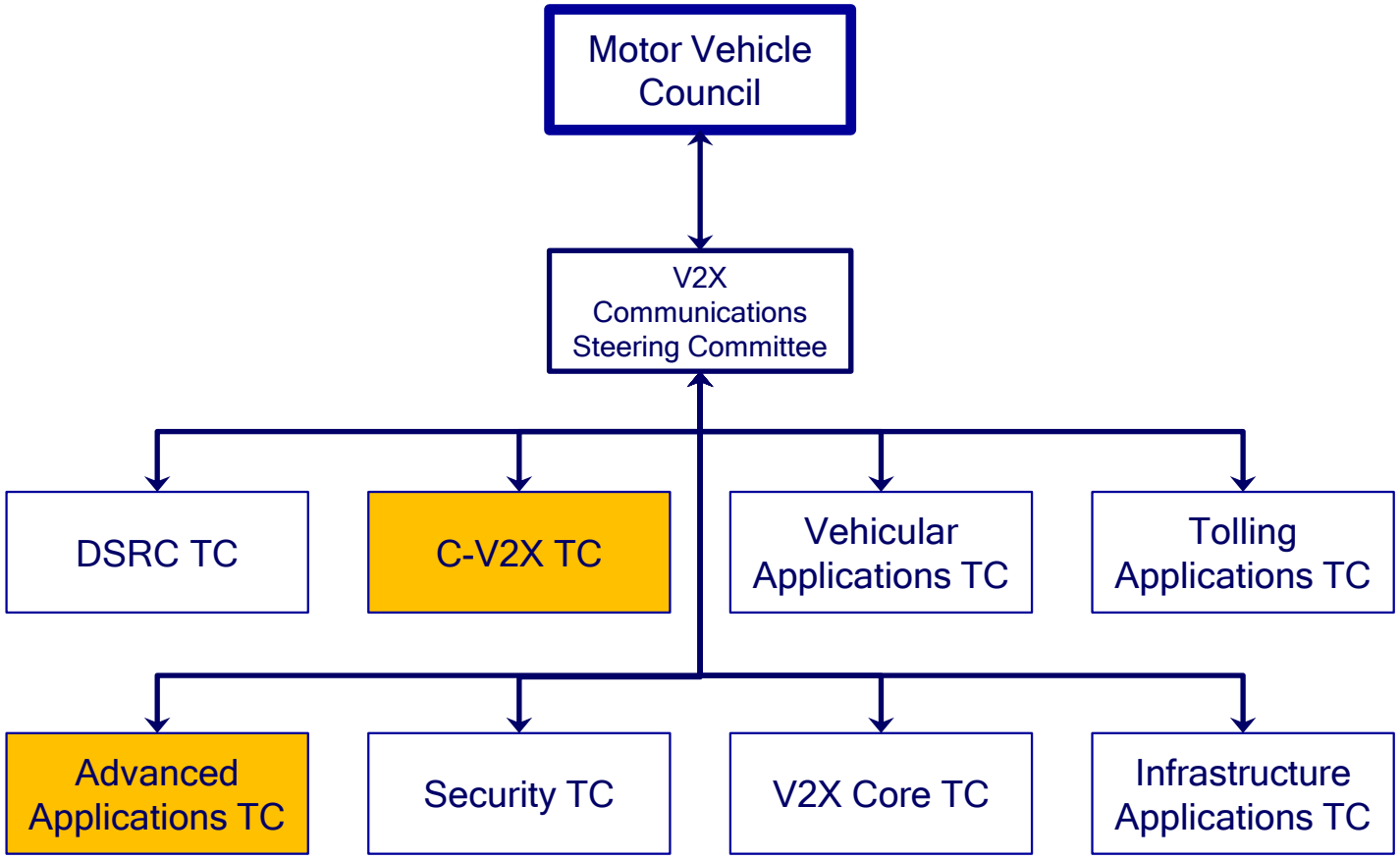
Qualcomm Technologies, Inc.

Agenda

- C-V2X Standards Development
- RSU Standard (NEMA TS-10)
- OmniAir Certification
- Projecting Ahead

SAE International Committee Structure

New Committee Outside of Communications Steering Committee: Connected and Automated Driving (CAD)



C-V2X Technical Committee

Three WIPs

1. Primary: "On-Board System Requirements for LTE-V2X V2V Safety Communications" - J3161/1
   - Final affirmation ballot approved by the committee
   - At Motor Vehicle Council for final ratification and publishing

2. "C-V2X Deployment Profiles" – J3161(/0) - *will describe later*
   - V2I/I2V profile
   - Initial ballot passed – just completed second ballot to resolve remaining comments

3. "Vehicle-Level Validation Test Procedures for LTE-V2X V2V Safety Communications" – J3161/1A
   - Test specification standard – analogous to J2945/1A test spec
   - Initial ballot passed – just completed second ballot to resolve remaining comments

C-V2X in Other Technical Committees

- **Advanced Applications**
  - **J3224 –** V2X Sensor-Sharing for Cooperative & Automated Driving
    - Expected to go out for ballot soon
  - **J3186 -** Application Protocol and Requirements for Maneuver Sharing and Coordinating Service
    - Expected to go out for ballot soon
- **Security** – (“Service Specific Permissions and Security Guidelines for Connected Vehicle Applications”)
  - Working on Standards Harmonization and SCMS management
- **Tolling Applications** Work continues on tolling using C-V2X (J3217).
- **Core**
  - J3242 – Systems Engineering process for V2X – draft expected in Q2
  - J2945/7 - enhanced positioning draft in development

V2X in Other Technical Committees

- **Infrastructure/Traffic Signal Applications**
  - J2945/4 Road Safety Applications
  - J2945/A Lane-Level and Road Furniture Mapping for Infrastructure-based V2X Applications
  - J2945/B Recommended Practices for Signalized Intersection Applications
  - J2945/C Traffic Probe Use and Operation
  - J3238 Infrastructure Applications Testing for Interoperability
- **Vehicular Applications**
  - J2945/6 - Performance Requirements for Cooperative Adaptive Cruise Control and Platooning – out for ballot
  - J2945/8 - Cooperative Perception System – in process
  - J2945/D - Road user-to-Road User Courteous Communication – in process
- **On Road Automated Driving (ORAD) Task Force**
  - J3164 – Taxonomy for AV – ongoing
  - Other WID in process
- **Cooperative Automated Driving (CDA) – new committee**
  - Partial USDOT fundingFour Task Forces:
    - Architecture and Interfaces TF
    - Cooperative Intersection and Traffic Management TF
    - Cooperative Perception TF
    - Security TF

IEEE 1609 Updates

- **1609.2** Security Services: Revision cycle underway – expected publication date Q2/2022
- **1609.2.1** Certificate Management Interfaces: Published
- **1609.3** Network Services: Approved by IEEE RevCom and into pre-publication processing; likely publication date March 2021.
- **1609.13** Data distribution: underway; expected publication date Q1/2022
- **1609.20** Underway; expected publication date Q1/2022
- Published and not currently under revision
  - **1609.0** Guide
  - **1609.4** Multi-Channel Operation (not relevant to C-V2X)

Traffic Families

Defined in SAE J3161 WIP C-V2X Deployment Profiles

Critical V2V (example: Event BSM)	Critical I2V (example: RSM, MAP)	Essential V2V (example: BSM)	Essential I2V (example: SPaT)
Transactional (example: tolling transactions)	Low Priority (example: TIM)	Background (example: TCP/IP)	Priorities are assigned to each of these families.

Communication profiles (# subchannels, data rate, retransmission) set for V2V, V2I and I2V

Source sample text

Allows V2V and V2I services to be delivered by one 20 MHz Radio*

* Opportunity for lower 10 MHz can be used for platooning or other apps

RSU Specifications (NEMA TS 10 and ITE)

ITE Draft Specification Just Released (and not covered here)

- **TS 10:** Designed for Agencies and other transportation infrastructure owner/operators to procure and deploy Connected Vehicle (CV) Roadside Units (RSU)
- Set of gaps covered by NEMA TS 10 specification:
  - Standardizing minimal set of messages via a uniform interpretation for safety applications
  - Standardizes RSU functions needed by vehicles and road users
  - Account for hardware, software, and communications capacity for future needs
  - Harmonizes communication protocols
  - Supports multiple radios
- Considers a minimum level of functionality requirements to support safety applications in a common message format
- NEMA TS10 RSU expected to be published in Q1/2021
- Integrated with OmniAir C-V2X certification program by adding additional RSU tests from NEMA TS10

Overview: OmniAir is Ready to Begin C-V2X Certification

Test Specs, Test Labs, Test Equipment, Standards, and Regulatory in Final Stages

- Certification Operating Council (COC) developed DSRC test specs almost 5 years ago
  - OmniAir inherited all COC test specifications
  - Only organization that does DSRC certification
- Upper layers of DSRC are common with C-V2X
  - e.g., Message sets (J2735), security (1609.2) are the same…as are many others
  - Minimal rewrite required
- Some new tests were needed for the PC5 sidelink radio
  - 3GPP had already written lower level radio tests
  - Needed a few tests for J3161/1, J3161/1A, new Test Controller Interface
  - OmniAir C-V2X sub-WG assembled the suite in about a year
  - >170 tests (RSU & OBU) available for Fall 2020 plugfest

OmniAir has used existing tests from SAE and 3GPP + developed new tests to launch a just-announced C-V2X certification program

Projecting Ahead

5G V2X builds on C-V2X

with advanced use cases

Safety use cases

Advanced use cases

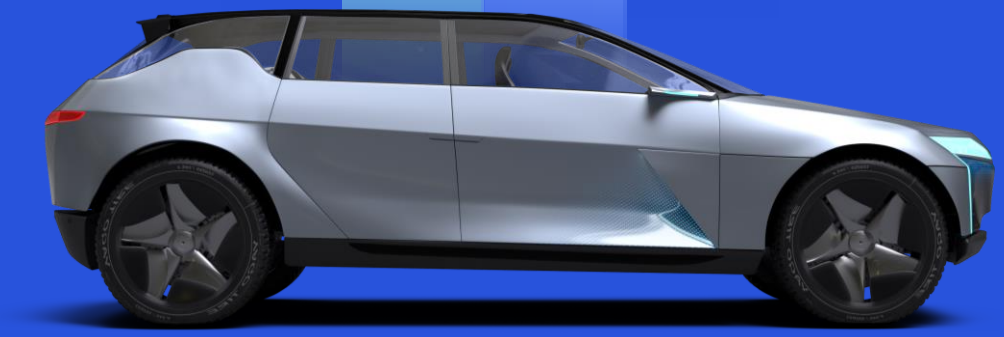
Upper layers

Mapping use cases to transport profile

C-V2X

Rel 14/15 sidelink

Broadcast messages



5G V2X

Rel 16+ sidelink

Multicast messages

5G V2X sidelink

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Thank you

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