Security Standardizations overview of ITS and Connected Autonomous Vehicle

Koji Nakao

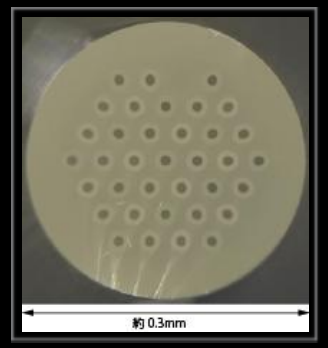
National Institute of Information and Communications Technology (NICT)

Research Topics in NICT

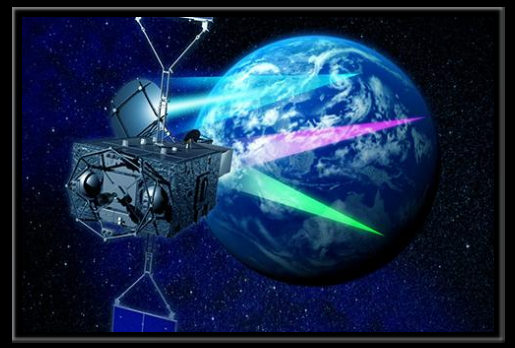
NICT - the sole national research institute in the field of ICT in Japan -



Japan Standard Time (JST)
（Leap second on Jan 1, 2017）



Optical Communication
(Peta bps class multi-core fiber)



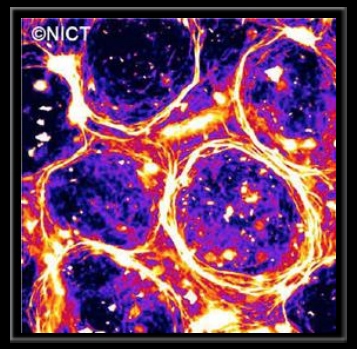
Satellite Communication
（Internet Satellite WINDS）



Science Cloud
（Reai-time Web of Himawari-8）



Remote Sensing
（Pi-SAR2 image after 3.11）



Bio/Nano ICT
(Self-organizing bio molecule)



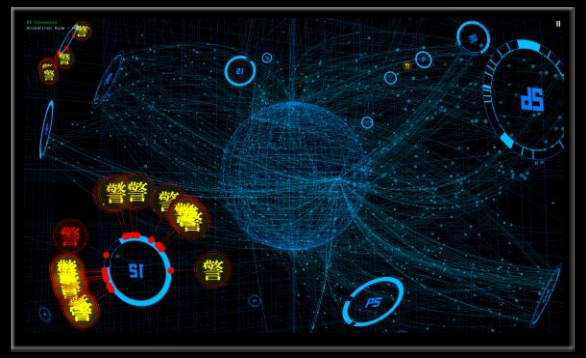
Brain ICT
(Brain-machine Interface)



Multi-lingual Machine Translation
(VoiceTra)



Ultra Realistic Communication
(Electronic Holography)



Cybersecurity
(DAEDALUS)

Conducting a Survey Based on CITS Activities

"**CITS** (**Collaboration on ITS Communication Standards**)," which aims to promote international collaboration in ITS (Intelligent Transportation Systems) for automobiles, is an **international** mechanism **for promoting standardization collaboration established under the ITU-T (International Telecommunication Union Telecommunication Standardization Sector)**.

It serves as a “coordination forum” to avoid duplication among the myriad ITS communication specifications and standards that exist worldwide and to enhance global interoperability. The organizational overview and specific activities are as follows.

Organizational Overview

- Status: A joint coordination group established within ITU-T on an equal footing (not an organization that mandates specific standards, but rather a mechanism to promote collaboration).
- Establishment: Began operations in December 2014.
- Main Members:
  - International standardization organizations: ITU-T, ITU-R, ISO (TC204), IEC, etc.
  - Regional Standardization Organizations (SDOs) and Related Forums: Major ITS-related organizations in Asia, North America, and Europe, including the IEEE (U.S.), and NHTSA (National Highway Traffic Safety Administration).

Main Activities of CITS

CITS leads the following activities to ensure that automotive communication technologies (such as connected cars and autonomous driving) from countries around the world can be widely adopted and interconnected on a global scale.

- **Avoiding Duplication in Standardization Efforts (Efficiency)**: When various organizations around the world (such as ISO, IEEE, and ITU) develop ITS communication standards independently, it wastes development resources and causes confusion among users. CITS plays a role in coordinating the division of labor among these organizations to prevent technological duplication.
- **Maintenance and Expansion of the "ITS Communications Standards Online Database"**: To achieve full interoperability of ITS products and services at an early stage, we are building an online database that comprehensively covers ITS communications standards from around the world. We keep the database up to date through biannual meetings and Liaison Statements (LS), and we encourage relevant organizations to share information and participate.
- **Documentation of Global Requirements**: As a result of our efforts to date, we have published documents such as *"HSTP-CITS-Req (Global ITS Communication Requirements)"* through ITU-T, which summarize the requirements for global ITS communications.

Overview (International/Local Standardization on ITS)-Part1

Organization	Role in International Standardization	Characteristics of the Role
ERTICO – ITS Europe	A hub for industry-government-academia collaboration in European ITS. Exerts significant influence on C-ITS, CCAM, data sharing, and urban mobility standardization.	Leads multiple standardization platforms, including C-Roads, TN-ITS, ADASIS, and SENSORIS. Serves as the liaison with the EC, ISO, and ETSI.
TSDSI (India)	India's national SDO. Reflects Indian requirements in international standards through collaboration with 3GPP and ITU.	Proposes standardization initiatives—such as AERT, V2X, and AI-Native Air Interface—based on India's unique transportation environment.
ISO/IEC JTC 4 (Smart Cities)	An umbrella organization for international standards on smart cities, including urban and transportation sectors.	Coordinates the standardization of data models, infrastructure, and urban services for ITS and urban transportation across various sectors.
C-Roads (EU)	An implementation-led organization that develops European C-ITS implementation standards (communication profiles).	Develops ETSI ITS-G5 / C-ITS Security (EU-CCMS) standards for practical operational use.
ETSI TC ITS	A leading SDO for European ITS communications. Develops international standards for C-ITS communications (CAM, DENM, CPM, etc.).	Advanced features such as security, misbehavior detection, and CPM were introduced in Releases 1 and 2.
CAR 2 CAR Communication Consortium (C2C-CC)	A European OEM-led organization for developing V2X specifications. Defines in-vehicle profiles based on ETSI standards.	Standardizes in-vehicle implementation requirements through the Basic System Profile (BSP).

Note: Although SG17 isn't included in this list, SG17 has been a core member from the very beginning.

Overview (International/Local Standardization on ITS)-Part2

Organization	Role in International Standardization	Characteristics of the Role
5GAA	A global alliance of OEMs and telecommunications carriers. Provides feedback on C-V2X standardization requirements to 3GPP.	Defines requirements for next-generation ITS, including V2N2X, security, ISAC, and Data Space.
CCSA (China)	China's national SDO. Develops numerous national standards for C-V2X, roadside equipment, security, location information, and more.	National standardization of LTE-V2X/NR-V2X implementation standards, PKI, and misbehavior management.
ISO/TC 204	The hub for international ITS standards. Covers a wide range of areas, including traffic management, public transportation, commercial vehicles, and urban transportation.	Systematizes international standards for C-ITS, traffic management, and urban transportation.
SAE International	A vehicle standardization organization focused on North America. Leads standardization efforts in autonomous driving, V2X, AI, and safety.	It has established safety requirements for V2X and autonomous driving, such as J2945, J3161, and J3295.
WWRF (Wireless World Research Forum)	A 6G research community. Organizes future V2X, AI, and security requirements at the research stage.	Research recommendations on V2X security and AI utilization in the 6G era.
IEEE 1609 WG	Standardization organization for WAVE (DSRC) communications. The foundation for ITS communications in the U.S.	Develops standards such as 1609.2 (Security), 1609.3 (Network), and 1609.30 (WSA).
NTN Forum (ESA)	Promotes collaboration between satellite communications (NTN) and ITS. Compiles requirements for 3GPP NTN standardization.	Promotes the use of NTN to complement V2X, device standardization, and collaboration on demonstration projects.

Key Activities by Security Domain

Security Areas	Lead Organization	Details
PKI / Credential Management	ETSI, C-Roads, C2C-CC, CCSA, IEEE 1609, ITU-T SG17	EU-CCMS (European PKI), China PKI, IEEE 1609.2, In-Vehicle Certificate Management, Multi-Domain Certificates.
Misbehavior Detection	ETSI, C2C-CC, 5GAA, CCSA, ITU-T SG17	CAM/DENM/CPM integrity verification, misbehavior reporting protocol, AI-based detection.
V2X Communication Security	ETSI, IEEE, SAE, CCSA, 5GAA, ITU-T SG17	1609.2, ETSI Release 2 security extensions, TLS + V2X certificates, C-V2X security requirements.
Data Quality and Data Space Security	5GAA, ERTICO, ISO JTC4	Quality assurance for urban and vehicle data, data-sharing security, and privacy protection.
AI Safety (AI for ITS)	TSDSI, SAE, WWRF, 5GAA	AI-Native Air Interface, AI model safety, and risk management for AI/ML in V2X applications.
V2X Security via Satellite (NTN)	NTN Forum, 3GPP, ESA, ITU-T SG17	NTN security requirements, device authentication, and secure V2X supplementation via satellite.

Activities of Standardization Organizations Related to ITS (Selected Examples)

- C-ROAD
- ETSI
- 5GAA
- SAE
- IEEE

C-ROADS

Collaboration on ITS Communication Standards (CITS)

16th March, 2026

C-Roads: Status Report & Update

Alexander Froetscher – alexander.froetscher@austriatech.at

Co-funded by the European Union

C-ITS (C-Roads) (Cooperative Intelligent Transportation System)

Overview of C-Roads and the Collaborative Framework

- C-Roads is a collaborative effort among multiple European countries and cities to deploy C-ITS.
- Using a combination of EU funding and national funds, they are building large-scale infrastructure and systems.
- More than 50 cities and over 6,000 RSUs (Roadside Units) have been deployed.
- Participants are working with the automotive industry and other stakeholders to promote standardization and interoperability.

C-ITS Standards and Message Formats

- Key messages include CAM, DENM, IVI, and SPAT/MAP, which are transmitted on a periodic or event-driven basis.
- These provide information that helps improve safety and traffic efficiency.
- New message types, such as POI-PA and CPM, have also been introduced.
- The standardized communication profiles are continuously updated, and Release 3.1.0 has been published.

C-ITS (C-Roads) (Cooperative Intelligent Transportation System) (continued)

Security and Authentication

- The EU's security framework is built on PKI and certificate policies.
- Elements such as the EU Root CA, TLM(Trust List Manager), and CPOC(C-ITS Point of Contact) ensure secure message exchange. In this case, **EU Root CA** (Certification Authority) issues certificates for each device, **TLM** ensures a list of trusted certification authorities, and **CPOC** centrally supports their operations and information sharing, thereby enabling “secure message exchange (communication) free from ‘impersonation’ or ‘data tampering’” between vehicles and between vehicles and road infrastructure.
- Security policies and protection profiles have also been updated in the latest release.

C-ITS Use Cases and Services

- A wide range of use cases—including traffic signs, hazard notifications, roadwork warnings, and traffic signal control information—have been standardized.
- Specific examples include GLOSA, traffic signal priority, emergency vehicle priority, and public transportation support. These promote real-time information sharing between vehicles and infrastructure, improving safety and efficiency.

X-Test and Interoperability

- The specifications for Release 1.7 were verified through X-tests, and interoperability was confirmed.
- Another round of X-tests is planned for 2026.
- Nearly all partners have conducted virtual testing to ensure compliance with the standard.

Current Status and Future Prospects of C-ITS

- Europe is the only region where C-ITS services are deployed, with extensive infrastructure and vehicles in place.
- C-ITS services are currently operational on 30% of the TEN-T (Trans-European Transport Network) road network.
- Going forward, efforts will focus on expanding operations, advancing standardization, and strengthening security.

The Standards People

Status on C-ITS work within ETSI

Presented by: **Niels Peter Skov Andersen**
Chair ETSI TC ITS

For: **ITU - Collaboration on ITS Communication Standards**

16.03.2026

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Security

- The Security is based on authenticating the sender, i.e., establishing trust.
- Traditional trust model based on signing the messages – Authorizations Tickets (AT) is used – Also often called pseudonyms
- PKI infrastructure provides a limited number of ATs with a limited validity time based on the C-ITS stations Long Term certificate
- Number of simultaneous valid ATs for one C-ITS station should be kept low to minimize risk of Sybil Attacks
- Revocation of ATs is in first release based on expiry, i.e., revocation of trust will be based on stopping issuing ATs

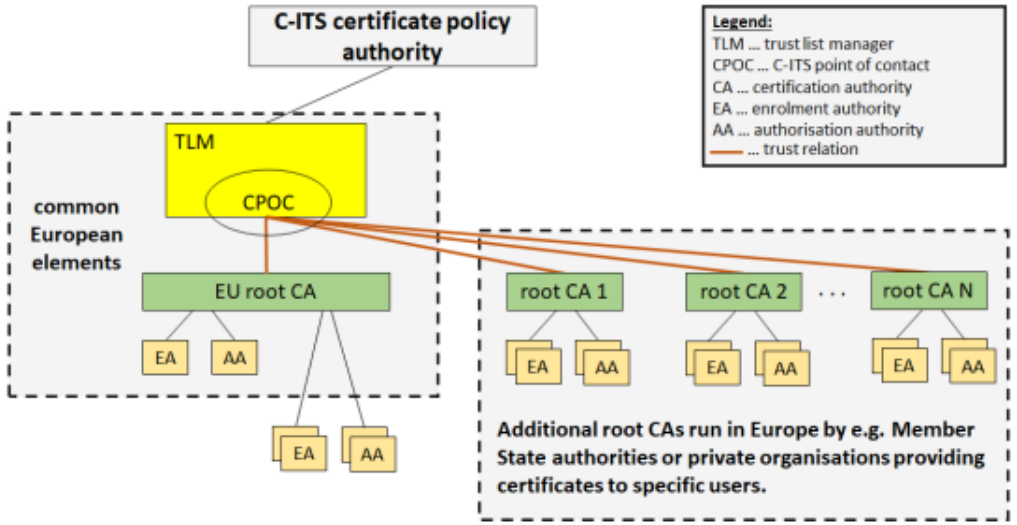


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Security

- ETSI TC ITS have a close cooperation with the EC (JRC) regarding the Certification and Security Police to ensure the standards reflect the regulatory requirements as well as the operational requirements.

Figure 1: C-ITS trust model architecture



- The European Certificate and Security Policies require compliance not only to the security part of the ETSI C-ITS standards but to the complete set of protocol specifications. In addition, compliance to profiling of the ETSI standard by C-Roads and CAR 2 CAR Communication Consortium are required.



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Ongoing work

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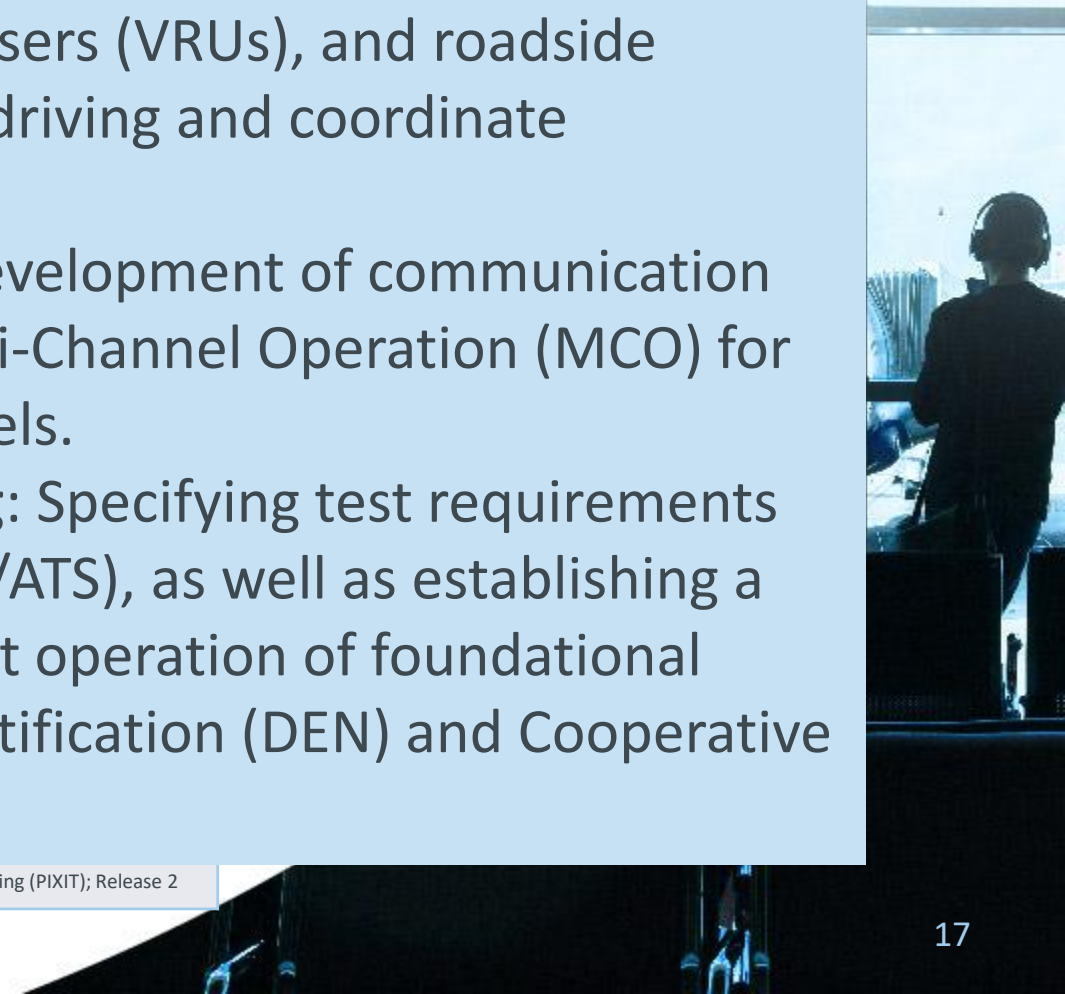
Ongoing work items 1/3

Framework; List of documents; Release 2

Vehicular Comm
Functional Safet
Position and Tim
Vehicular Comm
Testing; Conforn
Statement (PICS
Testing; Conforn
Structure and Te
Testing; Conforn
Information for
Testing; Conforn
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Architecture of
Facilities Layer;
Facilities layer fu
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Collective Percep
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- **Advancement of Cooperative Services (Release 2)**: Standardization of functional requirements and position/time accuracy for sharing information with surrounding vehicles, vulnerable road users (VRUs), and roadside infrastructure to facilitate safe autonomous driving and coordinate maneuvers (such as lane changes).
- **Optimization of Communication Control**: Development of communication protocols at the Facilities Layer, such as Multi-Channel Operation (MCO) for the efficient management of multiple channels.
- **Regulations for Rigorous Conformity Testing**: Specifying test requirements (PICS/PIXIT) and test configurations (TSS&TP/ATS), as well as establishing a verification framework to validate the correct operation of foundational services such as Distributed Environment Notification (DEN) and Cooperative Perception (CPS).

Conformance test specifications for Service Announcement (SA) service Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT); Release 2



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Ongoing work items 2/3

Pre-standardization study on ITS architecture; Part 1: Architecture for communications among ITS stations with multiple access layer technologies;
Profil
Feasil
Frame
Vehic Sub-p
Archi
GeoN Indep
ITS-G
Acces
Mitig Trans
Radio
Radio

Examples:

- **Pre-standardization study on ITS architecture; Part 1: Architecture for communications among ITS stations with multiple access layer technologies:** This is a preliminary study report based on the assumption of an environment where multiple different communication technologies (such as ITS-G5 and cellular V2X) coexist within the same 5.9 GHz band. It identifies challenges that arise when these technologies operate simultaneously and proposes a direction for a communication architecture to ensure system interoperability and backward compatibility.
- **Feasibility Study on the Use of UWB; Release 2**: This is a **report investigating the feasibility of using Ultra-Wideband (UWB) technology in an ITS environment**.
- **Framework for Public Mobile Networks in Cooperative ITS (C-ITS):** A framework for integrating and utilizing general **public mobile communication networks (such as 3G/4G/5G cellular networks) into Cooperative ITS (C-ITS)**.
- **Architecture; Multi-Channel Operation (MCO) for Cooperative ITS (C-ITS); Release 2:** This is the **overall architecture for multi-channel operation** in C-ITS, designed to enable flexible switching between and parallel use of multiple radio channels and different access technologies.



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Ongoing work items 3/3 on Security

Security; TVRA (Threat Vulnerability and Risk Analysis） such as ETSI TS 102 165-1 (Methods and protocols; Part 1: Method and pro forma for Threat, Vulnerability, Risk Analysis (TVRA))
Security; Trust and Privacy Management; Release 2
Security; Access Control; Release 2
Security; Security header and certificate formats; Release 2
Security; Confidentiality services; Release 2
Security; Mapping of Cyber Resilience Act (CRA) essential requirements to ITS capabilities; Release 2



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ETSI TS 102 165-1 V5.2.5 (2022-01)



CYBER;
Methods and protocols;
Part 1: Method and pro forma for Threat, Vulnerability, Risk Analysis (TVRA)

ETSI TS 102 165-1 provides a structured method for analysing **threats, vulnerabilities, and risks** in ICT systems, primarily to support ETSI standards development. It defines a Common-Criteria-based (ISO/IEC 15408) TVRA process applicable mainly to pre-production systems, enabling consistent identification of security issues and selection of appropriate countermeasures.

ETSI TS 102 943 V1.1.1 (2012-06)



Intelligent Transport Systems (ITS);
Security;
Confidentiality services

ETSI TS 102 943 Release 2 defines **confidentiality services for Intelligent Transport Systems (ITS)**, specifying mechanisms to protect sensitive ITS communications through encryption, key management, and secure message handling. It updates and extends the earlier release to ensure **interoperable, robust security** across ITS deployments.

ITU C-ITS meeting

5GAA Progress report

5GAA CTO, Maxime Flament

16/03/2026

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5GAA released 15 publications since 2025

- **Enhanced Positioning Accuracy and Coherent Situational Awareness by Connected Sensors and Positioning as a Service** — *Report*, 18 Feb. 2026
- **5GAA Statement of Intent: How Industry Should Approach the Subject of Dataspaces** — *Position Paper*, 17 Oct. 2025
- **A Framework for Dynamic Trustworthiness Assessment in Cooperative and Automated Vehicles** — *White Paper*, 8 Sep. 2025
- **Mobile Edge Computing Use Cases, Initial Test Specifications and Evaluation Methodology Review** — *Report*, 15 Jul. 2025
- **Credential Management Supporting V2X Commercial Deployments** — *Report*, 14 Jul. 2025
- **Road Traffic Operation in a Digital Age: A Holistic Cross-Stakeholder Approach** — *White Paper*, 3 Jun. 2025
- **V2N2X Security, Privacy, and Data Quality** — *Position Paper*, 3 Jun. 2025
- **Vehicle-to-Network-to-Everything (V2N2X) Communications: Architecture, Solution Blueprint, and Use Case Implementation Examples** — *Report*, 3 Jun. 2025
- **Driving Forward: 5GAA 2024 Annual Report Showcases Momentum in C-V2X Deployment** — *Press Release / White Paper*, 16 May. 2025
- **Study on Integrated Sensing and Communication (ISAC) for C-V2X Application** — *Report*, 9 May. 2025
- **V2X State of Play in China II** — *Report*, 27 Feb. 2025
- **Safety Treatment in V2X Applications, Phase 2** — *White Paper*, 3 Feb. 2025
- **Safety Treatment in Connected and Automated Driving Functions, Phase 2 (STiCAD II)** — *Report*, 3 Feb. 2025
- **Automated Valet Parking Technology Assessment and Use Case Implementation Description** — *Report*, 3 Feb. 2025
- **C-V2X Use Cases and Service Level Requirements (Volumes I, II and III)** — *Report*, 14 Jan. 2025

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C-V2X Use Cases and Service Level Requirements (Volumes I, II and III)

- Document series that provides a comprehensive framework for **defining and analysing C-V2X use cases** (UCs) and their associated **service-level requirements** (SLRs)
- Each volume features a curated set of UCs and serves as a reference for 5GAA working groups in the development of C-V2X solutions



Published in 2025

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V2N2X: Reference Architecture Blueprint









- ❑ **For** ecosystem stakeholders interested in using cellular networks for V2X services and applications:
  - *Automotive OEMs (OEMs), Infrastructure Owners, and Operators (IOOs), Service Providers (SPs)*
- ❑ **To** understand the V2N2X architecture, cross-stakeholder information sharing concept, and V2N2X technical details
- ❑ **By** existing use case implementation examples
  - *Traffic event information sharing; Traffic signal information sharing and priority request, Emergency vehicle approaching, HD Map handling, Automated valet parking, Object detection and sharing, and Vulnerable road user protection.*

Download the V2N2X White Paper

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Study on Integrated Sensing and Communication (ISAC) for C-V2X Application

- Work Item ISAC discussed integration of sensing and communciation systems
- TR outlines:
  - Implementation descriptions of **automotive use cases with ISAC**
  - **Key technology trends** to facilitate the application of ISAC in C-V2X scenarios



Published in 2025

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Safety Treatment in Connected and Automated Driving Functions

- White Paper on Safety Treatment in Connected and Automated Driving (STiCAD II)
- Addresses open challenges in applying safety treatment to V2X-enabled automated driving functions
- Explores use cases requiring safety treatment
- Introduces the **concept of mutual trust in V2X communications**
- Examines potential standardisation contributions from 5GAA





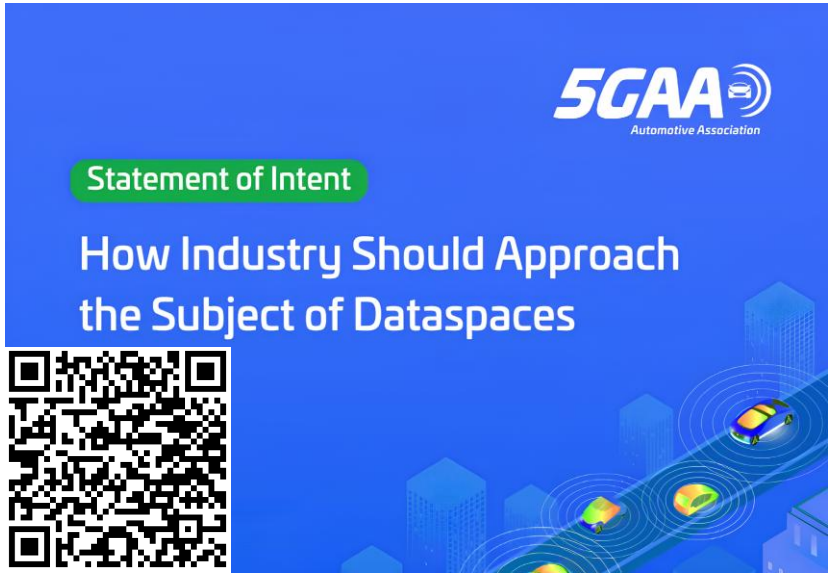
A related **technical report** offers complementary analysis and implementation insights

Published in 2025

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Statement of Intent: How Industry Should Approach Dataspaces

- Document provides guidance on evolving to **dynamic Information Networks** defining key concepts and best practices for trusted information sharing.
- Highlights the need to move from raw data to meaningful and contextualized information delivered where and when it matters.
- Promotes a **publish/subscribe model** where providers **publish** and deliver information and stakeholders **subscribe** to receive relevant services proactively and at scale.



Published in 2025

SAE INTERNATIONAL

SAE STANDARDS DEVELOPMENT REPORT: CITS/ITU 16 MARCH 2026

S. William Gouse

Director, International Government Industry Technical Affairs

Global Ground Vehicle Standards

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www.SAE.org – *US Domiciled International Mobility Standards Development Organization*

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Connected Transportation Interoperability Committee

Connected Transportation Interoperability Committee Documents

Stds Wrks	Description	Publish as	Joint Dev Logo's^	Charge For	MVC Hold*	Doc Type	Published
J3340	Quick Reference Guide for Connected Intersection Messages	J3340	No	No	Yes, hold	RP	
J4501	Connected Intersections (CI) Implementation Guide v2.0	CTI4501	Yes	No	Yes, hold	RP	
J4501/1	CI Implementation Guide - SPaT Messages	CTI4501/1	Yes	No	Yes, hold	RP	
J4501/2	CI Implementation Guide - MAP Messages	CTI4501/2	Yes	No	Yes, hold	RP	
J4501/3	CI Implementation Guide – Security	CTI4501/3	Yes	No	Yes, hold	RP	
J450							
J294							
J325							
J325							
J325							
J323							
J323							
J329							
J330							
J500							

SAE CTI 4501/3 (official title: *Connected Intersections Implementation Guide – Security*) is an **implementation guide specifically focused on cybersecurity for "connected intersections"** that utilize connected car (V2X) technology.

Purpose: To ensure security in communications between vehicles and roadside infrastructure (intersections) and to achieve secure interoperability.

Main Content: It defines **guidance and requirements for security measures** against cyber threats such as unauthorized access, GPS spoofing, and man-in-the-middle (MitM) attacks.

Cooperative Driving Automation

New Work Item:

J3357 Emergent Traffic Rules for Cooperative Driving Automation (CDA) Applications

Scope

This document defines the concept of operations (ConOps), functional requirements and design of new CDA message(s) for exchanging emergent traffic rules intended for vehicles equipped with CDA (CDA cooperation according to SAE J3216). Vehicles includes light duty vehicles, buses, emergency vehicles, and commercial motor vehicles (CMV). The scope of information for this application extends beyond basic road geometry to include vital emergent traffic rules requiring lane-level high-definition geometry requirements for disruptions use-cases such as work zones, incidents, and operations use-cases such as allowed traffic maneuvers, and speed limits.

Artificial Intelligence

Published Documents:

Artificial Intelligence Data for Ground Vehicle Applications, SAE Standard J3298_202407, Issued July 2024: This is a technical information report that provides preliminary information on the current state of data collection, processing methods, and operations related to the development of AI and AI-enabled systems in the ground vehicle sector. It covers the impact of data on AI solutions and methods for improving related processes, with the aim of enhancing safety, optimizing performance, developing regulatory compliance methods, and promoting innovation.

Artificial Intelligence Use Cases for Ground Vehicle Applications, SAE Standard J3312_202502, Issued February 2025: This document is a technical report that systematically identifies and classifies use cases for artificial intelligence (AI) technology in ground-based vehicles and transportation infrastructure. It was established with the aim of improving vehicles'"Safety," "Security," and "Efficiency"

Artificial Intelligence

4 Documents in Development (WIPs: Work in Progress)

- 3347 Artificial intelligence Simulation: Best Practices
- J3329 AI Regulations, Standards & Applications Challenges *(in ballot)*
- J3321 Verification & Validation of AI/ML based Components & Systems in Ground Vehicles (in ballot)
- J3313 Artificial Intelligence - terms & definitions taxonomy

IEEE VEHICULAR TECHNOLOGY SOCIETY, ITS STANDARDS COMMITTEE (VT/ITS)

1609 WORKING GROUP UPDATE

ITU-T CITS MEETING – MARCH 16, 2026

JUSTIN MCNEW, CHAIR, IEEE VTS VT/ITS STANDARDS COMMITTEE

CHAIR, IEEE 1609 WORKING GROUP

JUSTINM@JMCROTA.COM

IEEE VTS | IEEE Vehicular Technology Society

IEEE 1609.2 (Security Services for Application and Management Messages)

IEEE 1609.2 (official title: Wireless Access in Vehicular Environments – Security Services for Application and Management Messages) is an **international security** standard **designed to ensure the security of messages in autonomous driving and connected cars (V2X communications)**.

It plays a role in defending against cyberattacks and protecting driver privacy during wireless communications between vehicles (V2V) and between vehicles and road infrastructure (V2I) in environments such as WAVE.

[Technical Features]

- Definition of Secure Message Formats: It standardizes the secure data structures and processing procedures for “application messages” and “management messages” handled in WAVE environments.
- Adoption of a Public Key Infrastructure (PKI): It employs a PKI-based mechanism using elliptic curve cryptography (such as ECDSA and ECIES) for digital signing and verification of messages.
- Privacy Protection: To prevent the tracking of a vehicle’s movement history, the system is designed to use pseudonym certificates that change frequently. This makes it difficult to identify or track individuals.

[Global Context and Related Standards]

- Foundation of North American V2X: It is adopted as the standard for V2X communications (SCMS: Security Certificate Management System) in regions centered on the United States. It has also significantly influenced European standards (such as ETSI TS 103 097), and international coordination is progressing.
- Related Standards: The specific interfaces and protocols for the certificate management system are defined in the extension standard IEEE 1609.2.1.

Final Remark-1

Today’s discussion made it clear that standardization of security for ITS and Connected Autonomous Vehicles (CAVs) can no longer be achieved through the efforts of individual organizations alone. ETSI, C-Roads, C2C-CC, IEEE, SAE, 5GAA, ISO, TSDSI, CCSA, the NTN Forum and ITU-T—while each of these organizations operates within distinct technical domains, regions, and industrial structures—all share the common goal of establishing a security foundation to realize “safe and reliable cooperative mobility.”

In particular, areas such as PKI/Credential Management, Misbehavior Detection, strengthening the security of V2X communications, ensuring data quality and the reliability of data spaces, safety and accountability associated with AI utilization, and wide-area security supplementation via satellite NTN may appear to be pursued independently by each organization, but in reality, international cross-referencing and ensuring consistency are essential.

The role played by CITS (Collaboration on ITS Communication Standards) lies precisely in guaranteeing this “international consistency.” Avoiding duplication in standardization, accommodating regional differences, and ensuring interoperability at the implementation level—these are not merely measures for efficiency but essential prerequisites for ensuring global safety and reliability.

Final Remark-2

Moving forward, security standardization for ITS and CAVs will cover:

1) Communications (ETSI, IEEE, 3GPP, ITU-T SG17)
2) In-vehicle implementation (C2C-CC, SAE),
3)Infrastructure (C-Roads, ISO/TC204),
4) Data and AI (5GAA, JTC4),
5) Satellite NTN (ESA).

A “multi-layered structure” in which standardization across these multiple layers proceeds simultaneously. The key to overcoming this complexity lies, for example, in SG17 taking a greater lead in international coordination while aiming for transparency in standardization and the harmonization of security requirements.

Finally, SG17 Q13 addresses security standardization across a wide range of areas, including ITS, V2X, in-vehicle networks, and cloud integration, and has already issued numerous Recommendations (such as X.1371 through X.1383). However, the biggest obstacle to implementation and adoption in the automotive industry is the inconsistency in requirements with other standardization bodies (SAE, ISO/IEC SC 204, ETSI, 5GAA, C-Roads, etc.). ITU-T SG17 is convinced that it is important to resolve these inconsistencies and to build strong collaborative relationships with many relevant standardization organizations (SDOs).

Thank you for listening

