

Regulatory Framework for Vehicle-to-Everything (V2X) Communication

FORMAL CONSULTATION RESPONSE

About the Automotive Research Association of India

The Automotive Research Association of India (ARAI) is the apex automotive Research, Development and Testing organisation under the Ministry of Road Transport and Highways (MoRTH), Government of India. Established in 1966, ARAI is the designated Nodal Agency for Type Approval, Homologation, Certification, and Technical Standards development for all motor vehicles and components sold in India. ARAI operates India's premier automotive test facilities across Pune and is the sole organisation in India with the integrated mandate spanning vehicle safety regulation, emissions compliance, crash testing, and advanced vehicular technology evaluation.

As the body that type-approves every category of motor vehicle — including two-wheelers, three-wheelers, passenger cars, commercial vehicles, and electric vehicles — ARAI holds a unique institutional position at the intersection of automotive engineering, safety regulation, and emerging mobility technology. The V2X mandate, which fundamentally integrates radio communication technology into safety-critical vehicle architecture, falls squarely within ARAI's jurisdiction.

- ARAI is the designated testing and certification agency under MoRTH for automotive systems. The On-Board Unit (OBU), when integrated into a vehicle, becomes a safety and security critical automotive component and must be subject to the same homologation rigour as ABS, airbags, and advanced driver assistance systems.
- ARAI is explicitly referenced in the Task Force Report (Final Report, January 2026) and is a member of the MoRTH V2X Task Force. Recommendation 8.9 of the Task Force assigns automotive implementation standardisation to agencies designated by MoRTH — a mandate that ARAI is best positioned to fulfil.
- ARAI administers the Bharat New Car Assessment Programme (Bharat NCAP). Task Force Recommendation 8.10 explicitly identifies Bharat NCAP as the vehicle-level mechanism for V2X evaluation. ARAI therefore has a direct and unavoidable role in shaping V2X integration into India's vehicle safety rating framework.

Important Requirements to be considered

is that the regulatory framework for V2X in India must be architected around two non-negotiable requirements:

1. V2X must function as a genuine road safety instrument, not merely a spectrum management exercise.
2. The Indian deployment framework must be calibrated to Indian conditions — India's vehicle mix, road geometry, fatality patterns, and infrastructure realities; rather than transplanted wholesale from frameworks designed for European or North American contexts.

A formal response for specific important questions is shared in the sections below.

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Q	Question: Consultation Paper No. 08/2026	Remarks from ARAI
Q1	<p>Whether there is a need to introduce an authorisation for vehicle-to-infrastructure (V2I) communication service under Section 3(1)(a) of the Telecommunications Act, 2023? If yes, please provide input with respect to the following aspects:</p> <p>(a) Eligibility conditions for the authorisation;</p> <p>(b) Period of validity of the authorisation and conditions for its renewal;</p> <p>(c) Service area of the authorisation;</p> <p>(d) Scope of service of the authorisation;</p> <p>(e) Technical, operating, security related conditions etc. of the authorisation;</p> <p>(f) Any other related aspect.</p> <p>Kindly provide a detailed response with justification.</p>	<p>YES : A formal V2I service authorisation is necessary.</p> <p>RSU-licensed/OBU-exempt model; dual-tier eligibility including OEM test zones; dual technical conditions (TEC + ARAI)</p> <p>Key Design Principles:</p> <p>(1) Eligibility restricted to government road agencies and a controlled pathway (ARAI MRC can be used as a controlled environment for OEM, Tier 1, Tier 2, test environments;)</p> <p>(2) Corridor/zone-based service areas;</p> <p>(3) Technical conditions — TEC/MTCTE radio compliance AND other Automotive compliance;</p> <p>(4) 10-year validity with performance audit at renewal;</p> <p>(5) Roll-out obligations mandatory to prevent spectrum hoarding without deployment.</p> <p>(Model: China requires MIIT frequency license and radio station license before RSU operation).</p>
Q1	<p>Additional Aspects to be considered:</p>	<ol style="list-style-type: none"> 1. A controlled test-zone RSU authorisation pathway for OEMs is essential, without it, Indian V2X product development migrates to Global European and US test facilities. 2. Two-wheeler V2X use case development; fatality-weighted deployment methodology; pilot evaluation. India's 210 million registered two-wheelers are structurally invisible to the global V2X architecture. The entire C-V2X cooperative awareness framework was designed for enclosed four-wheeled vehicles in defined lane positions. 3. INTEROPERABILITY TESTING: V2X systems from different vendors frequently fail to communicate despite meeting individual certification standards. Mandatory interoperability test events with all certified vendor OBUs and RSUs must precede any scale deployment authorisation.
Q4	<p>Whether a specific technology (such as LTE-based C-V2X, NR-based C-V2X etc.) should be prescribed for the implementation of C-V2X in India?</p> <p>If yes, which technology should be adopted for the implementation of C-V2X?</p> <p>If no, in what manner, the issues related to inter-operability between different technologies should be addressed?</p> <p>Kindly provide a detailed response with justification.</p>	<p>India must avoid being technology Neutral but constructively select LTE-V2X (Rel-14 min and Release 15 preferred) as the baseline technology for all OBU and RSU in initial phases of deployment.</p> <p>LTE-V2X production chipsets are commercially available from multiple vendors at scale. NR-V2X Rel-16 ecosystem remains primarily in trial phase globally. India's most critical Day-0 safety use cases (collision warning, intersection movement assist, emergency vehicle pre-emption, SPAT) are fully deliverable on Rel-14/15. PC5 side-link in Rel-14/15 operates infrastructure-independently critical for India's semi-urban corridors where cellular coverage is unreliable. South Korea (December 2023) and China have both mandated LTE-V2X, ensuring production volumes that benefit Indian OEMs through economies of scale. NR-V2X Rel-16 capability should be mandated for new RSU type approvals from Year T+5 of framework notification, and for new OBU type approvals from Year T+6 or when NR-V2X multi-vendor chipset ecosystem is commercially mature</p>

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Q5	<p>Whether there is a need to bring road-side units (RSUs) and on-board units (OBUs) under the regime of Mandatory Testing Certification of Telecom Equipment (MTCTE)? If no, in what manner, Electromagnetic Interference (EMI), Electromagnetic Compatibility (EMC), safety, technical and security requirements prescribed by TEC/ DoT may be ensured? Kindly provide a detailed response with justification</p>	<p>Mandatory certification is essential but MTCTE alone is insufficient. A Dual-Certification Architecture is required: Track A (TEC/MTCTE) for radio and telecom compliance; Track B (ARAI/MoRTH) for automotive compliances related to automotive operating environments (temperature -40°C to +85°C, vibration per AIS-004, vehicle-body EMC), functional safety standards (ISO 26262), or end-to-end V2X use case execution performance.</p> <p>Both certifications are prerequisites before any OBU is sold in India or installed in a vehicle, and before any RSU is deployed on a public road.</p> <p>Dual-Certification Architecture RSUs can be certified under the MTCTE regime (TEC) RSUs are fixed roadside radio infrastructure telecom devices with no automotive integration dimension. MTCTE is complete and appropriate. ARAI additionally proposes that RSU Site Commissioning Validation (deployment-level check by performed by a designated agency by MoRTH) as a complement to MTCTE device certification, ensuring installed site performance meets India ITS Application Profile coverage requirements.</p> <p>OBUs to be certified under the V2X Type Approval under CMVR (ARAI/MoRTH) OBUs installed in vehicles are automotive safety components under the Motor Vehicles Act and CMVR. ARAI will develop AIS-XXX (Requirements for C-V2X On-Board Units in Motor Vehicles), which incorporates TEC's notified radio parameters by reference and adds the automotive environmental, functional safety, antenna integration, message performance, cybersecurity, and interoperability requirements that standalone MTCTE cannot assess. V2X Type Approval is granted to a vehicle model capturing the vehicle-specific integration reality that determines actual safety performance. Every safety-critical electronic system in vehicles — ABS, airbags, ESC, ADAS goes through ARAI certification under CMVR. The V2X OBU belongs in exactly the same framework.</p>
Q6	<p>To ensure inter-operability among different RSUs/ OBUs, whether there is a need to standardize the layered communication framework (stack) for higher layers (other than the access layer in which C-V2X will be used) of Intelligent Transportation System (ITS)?</p> <p>If yes, which standard for ITS stack and security should be adopted?</p> <p>Specifically, whether the ETSI standard for ITS stack and security, as recommended by the Task Force on Intelligent Transportation System for the use of 5.9 GHz (mentioned at para 3.5 of this consultation paper) should be adopted?</p> <p>If no, in what manner, inter-operability among different RSUs/ OBUs can be ensured? Kindly provide a detailed response with justification.</p>	<p>ETSI TC ITS can be benchmarked/Aligned. as an Architectural framework, with modification</p> <p>Adopt ETSI TC ITS as the architectural framework — but NOT by direct transplantation. An India ITS Application Profile must be developed as a mandatory overlay specification, adapting ETSI parameters to Indian conditions. Direct adoption of ETSI parameter sets without adaptation will produce a system that is technically standards-compliant but operationally ineffective in India's traffic environment.</p>

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Q7	Is there a need for a security framework? If yes — (a) what framework? (b) which agency for PKI? (c) how to ensure coexistence with X.509-based RCAI?	<p>V2X security is existential to the technology's safety value. The entire V2X premise rests on vehicles trusting that received collision warnings are authentic, accurate, and untampered. A V2X system without a security framework is worse than no V2X system it creates exploitable false safety. Yes, a security framework is absolutely required there is no viable or safe V2X deployment without it. Adopt an ETSI TS 102 941-derived security architecture with CCA as Root of Trust, using the countersigning bridge to resolve the X.509/IEEE 1609.2 incompatibility. Three Non-Negotiable Security Properties</p> <p>(1) Message Authenticity: every V2X message cryptographically verified as from a legitimately enrolled road user (2) Vehicle Privacy: No entity can track an individual vehicle through its V2X transmissions, via pseudonym certificate rotation (3) Misbehaviour Response: A compromised or malicious devices rapidly identified and revoked, with national Misbehaviour Detection System (MDS) operational before any scale deployment.</p>
Q11	Other Issues / Suggestions on V2X Regulatory Framework	<p>As per the Task Force Recommendation 8.9, the automotive V2X standardisation will be designated by MoRTH to agencies like ARAI's as India's apex automotive R&D and certification body. It is further proposed to have a specific, time-bound roadmap for V2X integration into Bharat NCAP, as per Task Force Recommendation 8.10</p>