



**Intelligent Transport Systems (ITS);
Framework for Public Mobile Networks in
Cooperative ITS (C-ITS);
Release 2**

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ETSI

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Introduction

Cooperative Intelligent Transport Systems (C-ITS), e.g. as defined in Directive (EU) 2023/2661 [i.6], cover a wide range of different scenarios for road transport with entities in the infrastructure (already existent or newly to be developed), in vehicles, in portable devices, and in ITS backends. C-ITS can be implemented using communication technologies out of multiple classes and benefit from the interoperability at different ISO OSI layers. Different communication technologies may include but not be limited, e.g.:

- Direct communications, also known as ad-hoc communications, e.g. ITS-G5 standardized at ETSI and 3GPP Cellular V2X PC5 interface (LTE PC5 or NR PC5).
- Cellular network communications, e.g. the Uu interface of 3GPP UMTS (3G), LTE (4G), NR (5G), and future generations.
- Non-Terrestrial Network (NTN) communications or satellite communications.

The present document describes the framework of public cellular mobile networks and the usage of 3GPP Uu interface in C-ITS implementations. The focus of the present document is on the standardization activities in ETSI TC ITS to enable interoperability, mainly at the ITS facilities layer, among C-ITS implementations using cellular networks, as well as among C-ITS implementations using different communication technologies.

In the present document, C-ITS refers to the ITS ecosystem implementation in Europe according to the definition and requirements in Directive (EU) 2023/2661 [i.6]. When discussing cellular mobile network functions, features, and supports that are generally applicable to different ITS ecosystem implementations, including but beyond C-ITS, e.g. ITS implementation in other public and private sectors, the term ITS may be used.

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1 Scope

The present document is based on an analysis of cooperative ITS (C-ITS) services using public mobile cellular networks for communications between ITS stations, in order to:

- identify related functional requirements on the ITS architecture;
- identify required amendments/modifications of existing standards on ITS, in order to enable usage of public mobile cellular networks.

The result of the investigations is illustrated in the present document.

2 References

2.1 Normative references

Normative references are not applicable in the present document.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

- [i.1] ETSI TS 103 900 (V2.2.1): "Intelligent Transport Systems (ITS); Facilities Layer; Cooperative Awareness Service; Release 2".
 - [i.2] ETSI TS 103 831 (V2.3.1): "Intelligent Transport Systems (ITS); Facilities Layer; Decentralized Environmental Notification Service; Release 2".
 - [i.3] ETSI TR 102 638 (V2.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Release 2".
 - [i.4] ETSI TR 102 962 (V1.1.1): "Intelligent Transport Systems (ITS); Framework for Public Mobile Networks in Cooperative ITS (C-ITS)".
 - [i.5] ETSI TR 103 630 (V1.1.1): "Intelligent Transport Systems (ITS); Security; Pre-standardization Study on ITS Facility Layer Security for C-ITS Communication Using Cellular Uu Interface".
 - [i.6] [Directive \(EU\) 2023/2661](#) of the European Parliament and of the Council of 22 November 2023 amending Directive 2010/40/EU on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.
 - [i.7] C-Roads Platform: "[C-ITS IP Based Interface Profile Version 1.7.0](#)".
- NOTE: Document "C-ITS IP Based Interface Profile Version 1.7.0" (which is part of the "Harmonised C-ITS Specifications - Release 1.7").
- [i.8] AMQP: "[Advanced Message Queuing Protocol](#)".
 - [i.9] C-Roads Platform: "[Working Group 2 Technical Aspects, Task force 2 "Service Harmonization, Common C-ITS Service and Use Case Definitions](#)". Version 1.7.0, June 2020.

- [i.10] ETSI TR 103 300-1 (V2.3.1): "Intelligent Transport Systems (ITS); Vulnerable Road Users (VRU) awareness; Part 1: Use Cases definition; Release 2" .
- [i.11] ETSI TR 103 299 (V2.1.1): "Intelligent Transport System (ITS); Cooperative Adaptive Cruise Control (CACC); Pre-standardization study".
- [i.12] ETSI TS 103 324: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Collective Perception Service; Release 2".
- [i.13] [ETSI White Paper No. 11](#): "Mobile Edge Computing, A key technology towards 5G" (First edition - September 2015).
- [i.14] ETSI TS 103 300-3 (V2.1.1): "Intelligent Transport Systems (ITS); Vulnerable Road Users (VRU) awareness; Part 3: Specification of VRU awareness basic service; Release 2".
- [i.15] ETSI GS MEC 030 (V2.2.1): "Multi-access Edge Computing (MEC); V2X Information Service API".
- [i.16] ISO/DIS 21217(en): "Intelligent transport systems — Station and communication architecture", 2020.
- [i.17] ITS America Whitepaper: "[Beyond 5.9 V2X Deployment Plan](#)", August. 2024.
- [i.18] 5GAA Position Paper: "[V2N2X security, privacy, and data quality](#)", December 2024.
- [i.19] 5GAA Whitepaper: "[Road Traffic Operation in a Digital Age: A Holistic Cross-Stakeholder Approach](#)", June 2025.
- [i.20] 5GAA Technical Report: "[Vehicle-to-Network-to-Everything \(V2N2X\) Communications: Architecture, Solution Blueprint, and Use Case Implementation Examples](#)", June 2025.
- [i.21] 5GAA Technical Report: "[Cross-Working Group Work Items; Automated Valet Parking Technology Assessment and Use Case Implementation Description; System Architecture, Cellular Network and PC5 Direct Communication Solutions](#)", September 2023.
- [i.22] VDA Position Paper: "[Requirements for automated valet parking systems](#)", May 2023.
- [i.23] Void.
- [i.24] 5GAA Technical Report: "[Cross-Working Group Work Item Network Reselection Improvements \(NRI\)](#)", 2021.
- [i.25] ETSI TS 123 501 (V19.6.0), 5G; System architecture for the 5G System (5GS) (3GPP TS 23.501 version 19.6.0 Release 19).
- [i.26] ETSI TR 103 562 (V2.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Analysis of the Collective Perception Service (CPS); Release 2".
- [i.27] ETSI TS 103 882 (V2.1.1): "Intelligent Transport Systems (ITS); Automated Vehicle Marshalling (AVM); Release 2".
- [i.28] [IEEE™ 1609.2-2022](#): "IEEE Standard for Wireless Access in Vehicular Environments--Security Services for Application and Management Messages".
- [i.29] [Commission Delegated Regulation \(EU\) 2015/962](#) of 18 December 2014 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide real-time traffic information services.

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

5G System: 3GPP system consisting of 5G Access Network (AN), 5G Core Network and UE

geocast: distributing ITS message to target vehicles or end user devices in a specific geographical area

ITS backend: centralized system in the backend providing ITS services

EXAMPLE: Systems at traffic control, traffic management, ITS application suppliers, or automotive OEMs.

NOTE: A central ITS station may be part of an ITS backend.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

5GS	5G System
5QI	5G Quality of Service Identifier
AID	Application Identifier
AMQP	Advanced Message Queuing Protocol
APDU	Application Protocol Data Unit
API	Application Programming Interface
AS	Application Server
AVM	Automated Vehicle Marshalling
BI	Backend Interface
BM-SC	Broadcast Multicast Service Centre
BSA	Basic Set of Applications
BSC	Base Station Controller
BTP	Basic Transport Protocol
BTS	Base Transceiver Station
CA	Certificate Authority
CACC	Cooperative Adaptive Cruise Control
CAM	Cooperative Awareness Message
CCoC	Common Code of Conduct
CELL_DCH	Cell Dedicated Channel
CELL_FACH	Cell Forward Access Channel
CHW	Cellular Hazard Warning
C-ITS	Cooperative Intelligent Transport Systems
CPM	Collective Perception Message
CPS	Collective Perception Service
C-V2X	Cellular Vehicle-to-Everything
DATEX	Data Exchange
DENM	Decentralized Environmental Notification Message
DL	Downlink
DNS	Domain Name System
DPCH	Dedicated physical channel
DRX	Discontinuous Reception
E2E	End to End
ETWS	Earthquake and Tsunami Warning System
E-UTRA	Evolved Universal Terrestrial Radio Access
E-UTRAN	Evolved Universal Terrestrial Radio Access Network