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Foreword

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

Modal verbs terminology

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Introduction

The Collective Perception Service aims at enabling ITS-Ss to share information about other road users and obstacles that were detected by local perception sensors such as radars, cameras and alike. In that sense, it aims at increasing awareness between ITS-Ss by mutually contributing information about their perceived objects to the individual knowledge base of the ITS-S. The service does not differentiate between detecting connected or non-connected road users.

The service defines the Collective Perception Message (CPM) which allows for sharing of information about detected objects by the disseminating ITS-S. The message consists of information about the disseminating ITS-S, its sensory capabilities and its detected objects. For this purpose, the message provides generic data elements to describe detected objects in the reference frame of the disseminating ITS-S. The CPM is transmitted cyclically with adaptive message generation rates to decrease the resulting channel load while focusing on reporting changes in the dynamic road environment.

The present document represents the analysis for the service and to derive its requirements for future standardization activities.

1 Scope

The present document prepares the specification of the Collective Perception Service [i.1] to support applications in the domain of road and traffic safety applications. Collective Perception aims at sharing information about the current driving environment with other ITS-Ss. For this purpose, the Collective Perception Service provides data about detected objects (i.e. other road participants, obstacles and alike). Collective Perception reduces the ambient uncertainty of an ITS-S about its current environment, as other ITS-Ss contribute context information. This includes the definition of the syntax and semantics of the Collective Perception Service (CPS) and detailed description of the data, the messages and the message handling to increase the awareness of the environment in a cooperative manner.

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 are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 103 324: "Intelligent Transport Systems (ITS); Cooperative Perception Services".

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[i.5] CEN ISO/TS 19091: "Intelligent transport systems - Cooperative ITS - Using V2I and I2V communications for applications related to signalized intersections".

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[i.8] Recommendation ITU-T X.691/ISO/IEC 8825-2 (1997-12): "Information technology - ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)".

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3 Definition of terms, symbols and abbreviations

3.1 Terms

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

Collective Perception (CP): concept of sharing the perceived environment of a station based on perception sensors

NOTE: In contrast to Cooperative Awareness (CA), an ITS-S broadcasts information about its current (driving) environment rather than about its current state. Hence, CP is the concept of actively exchanging locally perceived objects between different ITS-Ss by means of V2X communication technology. CP decreases the ambient uncertainty of ITS-Ss by contributing information to their mutual Field-of-Views.

Collective Perception (CP) Basic Service: facility at the ITS-S facilities layer to generate, receive and process CPM

Collective Perception Message (CPM): CP basic service PDU

Collective Perception (CPM) protocol: ITS facilities layer protocol for the operation of the CPM transmission and reception

environment model: current computational representation of the immediate environment of an ITS-S, including all perceived objects detected by either local perception sensors or received by V2X

ITS Central System: ITS system in the backend, such as traffic control centre, traffic management centre, or cloud system from road authorities, ITS application suppliers or automotive OEMs

NOTE: See clause 4.5.1.1 of ETSI EN 302 665 [i.9].

object: state space representation of a physically detected object within a sensor's perception range

object list: collection of objects temporally aligned to the same timestamp

sensor measurement: measurement of a local perception sensor mounted to a station whereby a feature extraction algorithm provides object position and attitude descriptions

NOTE: The feature extraction algorithm processes a sensor's raw data (e.g. reflection images, camera images, etc.) to generate an object's state space representation description.

state space representation: mathematical description of a detected object

NOTE: It consists of state variables such as distance, speed, object dimensions, etc. The state variables associated to an object are interpreted as an observation for a certain point in time and are therefore always accompanied by a time reference.

V2X: vehicle to vehicle (V2V), vehicle to infrastructure (V2I) and/or infrastructure to vehicle (I2V), or vehicle to network (V2N) and/or network to vehicle (N2V) communication

3.2 Symbols

Void.

3.3 Abbreviations

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

ASN.1	Abstract Syntax Notation One
BTP	Basic Transport Protocol
CA	Cooperative Awareness
CAM	Cooperative Awareness Message
CBR	Channel Busy Ratio
CCH	Control CHannel