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**Intelligent transport systems — Low-speed automated driving system (LSADS) service —**

**Part 1:  
Role and functional model**

*Systèmes intelligents de transport — Service de système de conduite automatisée à vitesse réduite (CAVR) —*

*Partie 1: Rôle général et modèle fonctionnel*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

A list of all parts in the ISO 5255 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

In order to introduce low-speed automated driving systems (LSADS) to support mobility used as a means of moving people, goods and services in urban and rural areas, it is necessary to standardize the related service role and functional model.

ISO 22737 describes vehicle driving supports, but does not cover the requirements of the service role or the functional model covering infrastructure facilities. Therefore, a document covering these topics is necessary.

Business use cases regarding LSADS services are currently emerging and further variations are coming to be deployed. Various roles and functional model presentation methodologies are available for use, and there is a need for a set of more commonly understandable role and functional model presentation guidelines. This document defines a common LSADS service role and functional model presentation.

Future emerging business cases can refer to this document as a baseline document. Indeed, this it is intended to assist in the development of future business, and does not hinder them. This document can also contribute to the development of future automated driving system service business cases other than LSADS services.

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# Intelligent transport systems — Low-speed automated driving system (LSADS) service —

## Part 1: Role and functional model

### 1 Scope

This document defines the requirements of the basic role and functional model of service applications for the introduction of low-speed automated driving system (LSADS) services including infrastructure facilities for supporting mobility in urban and rural areas.

This document covers services using LSADS-equipped vehicles only; in-vehicle control systems are outside the scope.

Examples of infrastructure facilities and road furniture include driving monitoring platforms, emergency response platforms, operation management platforms, user service platforms (e.g. for online reservations and online payments) and platforms for supporting automated driving systems.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/TR 4445, *Intelligent transport systems — Mobility integration — Role model of ITS service application in smart cities*

ISO/TS 14812, *Intelligent transport systems — Vocabulary*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 14812 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

### 4 Abbreviated terms

AD	automated driving
CAD	connected and automated driving
CONOPS	concept of operations
E-call	emergency call
ISAD	infrastructure support levels for automated driving

- LSAD low-speed automated driving
- LSADS low-speed automated driving system
- METR management for electronic traffic regulations
- ODD operational design domain
- PT public transport
- SCMS security credential management system

## 5 Automated driving system classification and service evolution

### 5.1 Introduction

The automated driving (AD) system classification and service evolution vision are described in this clause in order to present the current development and deployment situation of LSADS services.

### 5.2 Service classification of AD systems

A suggested AD system service classification is shown in [Table 1](#).

Within the context of the scope of this document, L2 operational design domain (ODD) is not classified as AD.

AD system services cover a range of use cases as described in [Table 1](#), including carrying people and goods, urban and rural use, normal mobility uses and emergency mobility use such as in pandemic/lockdown situations, where human driving vehicles can be unusable for transporting people and goods.

The majority of current LSADSs deployed are as per the SAE-defined ODD levels L3 and L4. However, LSADSs of L5 and above are anticipated as being the ideal mobility for flexible use cases in the future.

**Table 1 — AD system service classification**

ODD levels (OEM definition)	Mobility for people	Mobility for goods (including road service vehicles)	Urban use (Last/first mile use)	Rural area use (replacing PT)	Used under emergency or pandemic status
L5	A	A	A	A	A
L4	A	A	A	A	A
L3	O/S	O/S	O/S	O/S	O/S
L2	O/S	O/S	O/S	O/S	O/S
<b>Key</b>					
A: applicable to this document;					
O/S: out of scope of this document.					

### 5.3 AD system service evolution

[Table 2](#) shows the expected AD system service evolution. The deployment of the current low-speed automated driving (LSAD) service is for limited use only, as the safety function and emergency case manoeuvring ability are not qualified as being a sufficiently safely reliable services. However, the LSADS is intended to evolve into a fully functional connected and automated driving (CAD) system in the future. For this reason, it is necessary to develop a LSADS service role and a functional model defining and covering fully automated and connected driving such as is described by the term CAD.

[Tables 2](#) and [3](#) show where a current LSADS service sits within the fully automated CAD paradigm.



**Table 2 — AD system service evolution (current)**

Service type	Public transport use (PT)	Shared and personal use (Robot taxi)	Demand management	Integration with kerbside operation	All levels of ODDs
Mobility for people	C/L	C/L	C/L		
Mobility for goods	C/L	C/L	C/L		
Dedicated lane (road)	C/L	C/L	C/L		
Mixed lane					
Road service vehicles (snowplough)					
<b>Key</b>					
C/L: current LSAD emerging status.					

**Table 3 — AD system service anticipated evolution (future)**

Service type	Public transport use (PT)	Shared and personal use (Robot taxi)	Demand management	Integration with kerbside operation	All levels of ODDs
Mobility for people	F/L	F/L	F/L	F/L	F/L
Mobility for goods	F/L	F/L	F/L	F/L	F/L
Dedicated lane (road)	F/L	F/L	F/L	F/L	F/L
Mixed lane					
Road service vehicles (snowplough)	F/L	F/L	F/L	F/L	F/L
<b>Key</b>					
F/L: future LSAD emerging status --> reaching to CAD mobility status					

## 6 Infrastructure support for LSADS service role and functional model

The LSADS service shall be fully functional with support from infrastructures, such as safety information provisioning, kerb operation interactions, road signs and road digital and physical facilities for CAD.

- Kerb operation, LSADS shall use the kerb for loading and unloading goods and people. The operation environment should be carefully considered to achieve safe operations.
- Management for electronic traffic regulations (METR), for the efficient and safer operation of CAD-type LSADS, electronic regulation information shall be given to the vehicle with the safety information provisioning given from infrastructure facilities.
- V2X communication path between vehicle and infrastructure (LTE, 5G and beyond) should be carefully designed and the various communication paths between LSADS and infrastructure should be according to relevant International Standards.

- Infrastructure support levels for automated driving (ISAD) system service categorization per infrastructure support platform utilization levels shall be according to the Level A (highest level: cooperative driving) to level E (basic level: conventional infrastructure/no AV support), as developed by the EU INFRAMIX project.

NOTE A technical report issued by the EU INFRAMIX project proposes the careful study of LSAD operation according to the ISAD concept, and it is recommended that adoption of this concept be thoroughly discussed in order to classify the levels for automated driving for supports from infrastructure facilities (see [Annex A](#)).

## 7 Role and functional model

### 7.1 Objective

This clause describes a generic role and functional model for the provision of ITS service applications for LSADS services. It explains the general concept of role and functional model operations. It also provides a definition for the role and functional model and the elaboration of the model at a conceptual level.

### 7.2 National variations

The definition of what comprises an ITS service application is an issue for national decision and can vary from country to country. The instantiation of interoperable on-board platforms (or nomadic devices such as smart phones) for ITS service application with common features is ideal but varies between countries, as does the provision of services. It is possible that certain countries will mandate the use of such a platform, while others will offer it as an option to meet the requirements of the ITS service application with minimum administration and paperwork (providing a good business case for operators to fit and use the equipment). Certain countries might implement a single, government-operated, -controlled, or -contracted service provider, which will be the single communication manager between the user and the service. Other countries might provide a market-based solution with multiple service providers competing for the business of vehicle operators.

### 7.3 Basic role model

The role model concept defined in ISO/TR 4445 shall be considered as baseline document. [Figure 1](#) shows the basic role model for ITS service application for smart cities.

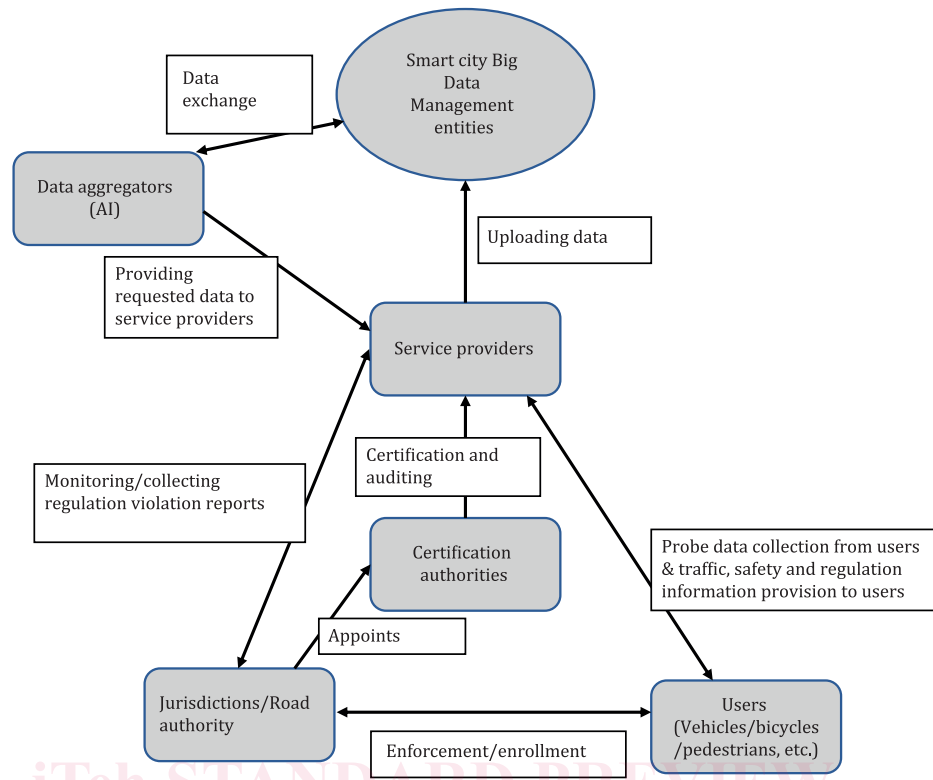


Figure 1 — Role model defined in ISO/TR 4445

#### 7.4 Application layer role and functional model for LSADS

The role model concept defined in ISO/TR 4445 is modified for LSADS service as shown in Figure 2.

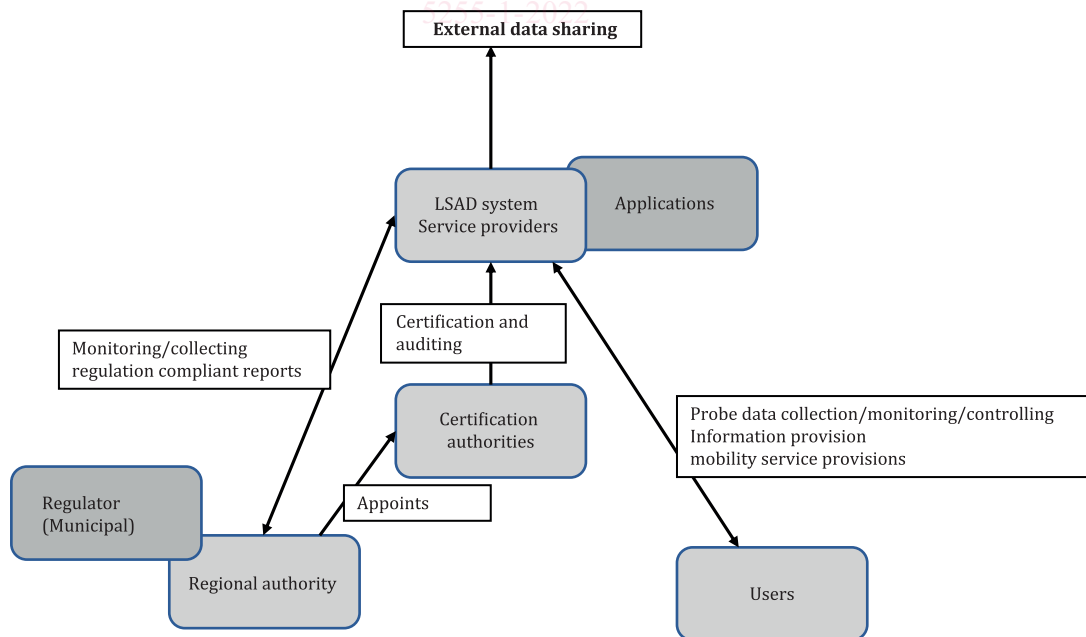


Figure 2 — Application layer role and functional model