SLOVENSKI STANDARD
SIST-TS CEN/TS 13149-7:2020

01-april-2020

Nadomešča:
SIST-TS CEN/TS 13149-7:2016

Javni prevoz - Sistemi za časovno razporejanje in nadzor cestnih vozil - 7. del: Sistem in arhitektura omrežja

Public transport - Road vehicle scheduling and control systems - Part 7: System and network architecture

Öffentlicher Verkehr - Planungs- und Steuerungssysteme für Straßenfahrzeuge - Teil 7: System- und Netzwerkarchitektur

Transport public - Systèmes de planification et de contrôle des véhicules routiers - Partie 7 : Architecture Système et Réseau

Ta slovenski standard je istoveten z: **CEN/TS 13149-7:2020**

ICS:

03.220.20	Cestni transport	Road transport
35.240.60	Uporabniške rešitve IT v prometu	IT applications in transport
43.040.15	Avtomobilska informatika. Vgrajeni računalniški sistemi	Car informatics. On board computer systems

SIST-TS CEN/TS 13149-7:2020 **en,fr,de**

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 13149-7

February 2020

ICS 35.240.60; 43.040.15

Supersedes CEN/TS 13149-7:2015

English Version

Public transport - Road vehicle scheduling and control systems - Part 7: System and network architecture

Transport public - Systèmes de planification et de contrôle des véhicules routiers - Partie 7 : Architecture Système et Réseau

Öffentlicher Verkehr - Planungs- und Steuerungssysteme für Straßenfahrzeuge - Teil 7: System- und Netzwerkarchitektur

This Technical Specification (CEN/TS) was approved by CEN on 8 December 2019 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (CEN/TS 13149-7:2020) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TS 13149-7:2015.

In comparison with the previous edition, the following technical modifications have been made:

— reference to normative service specifications dependent on this document;

— addition of reference to MQTT;

— restructuring of SRV record.

This document is Part 7 of a series of European Standards and Technical Specifications that includes:

— CEN/TS 13149-7, *Public transport – Road vehicle scheduling and control systems – Part 7: System and network architecture* [this document];

— CEN/TS 13149-8, *Public transport – Road vehicle scheduling and control systems – Part 8: Physical layer for IP communication*;

— CEN/TS 13149-9, *Public transport – Road vehicle scheduling and control systems – Part 9: Time service* [currently at voting stage];

— CEN/TS 13149-10, *Public transport – Road vehicle scheduling and control systems – Part 10: Location service* [currently at voting stage];

— CEN/TS 13149-11, *Public transport – Road vehicle scheduling and control systems – Part 11: Vehicle platform interface service* [currently at voting stage].

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This Technical Specification is Part 7 of a series of European Standards and Technical Specifications. The scope of this series is on-board data communication systems on public transport vehicles.

Public Transport (PT) vehicles have an increasing array of information and communications systems, including ticket machines, Automated Vehicle Location (AVL) systems, destination displays, passenger announcement systems, vehicle monitoring systems, etc. Other systems are beginning to be included such as advertising screens, tourist guides, WiFi "hotspots" and infotainment.

In addition, equipped PT vehicle will usually have a communications facility to enable voice and data to be exchanged with the control centre, other PT vehicles, PT infrastructure and roadside devices for instance in requesting priority at traffic signals. Many types of communication channel are used including public and private wireless communication networks.

These systems may be provided by a number of different suppliers and may need to be integrated. For instance:

— a ticket machine may need location information to update fare stages;

— next-stop and destination information may be drawn from schedule information held in the ticket machine;

— vehicle location systems may be used to drive signal priority requests.

As data exchange between functional units becomes more widespread, a networked approach begins to become efficient. With standardized underlying technology, the PT vehicle begins to look like a local area network: making use of IEEE 802 communications and the Internet Protocol (IP) suite.

Without a clear technology framework, integrating these systems would require complex technical discussions every time a device is procured. The existing EN 13149 standards recognized this long ago in respect of the core vehicle systems, but these have not been adapted to IP networking.

Six historical parts of EN 13149, namely Parts 1 to 6, have now been withdrawn in favour of the new IP-based approach. The core of this new approach was specified in two Technical Specifications (TS):

— CEN/TS 13149-7 specifies the Network and System Architecture for on board equipment. It describes basic principles of communications including a general description of the network topology, addresses schematics, basic network services, a system overview and basic module architecture.

— CEN/TS 13149-8 specifies the Physical Layer for IP-communication networks on board PT vehicles. This part specifies the cables, connectors and other equipment including pin assignment and environmental requirements.

Building on this, a series of specific services are being specified:

— CEN/TS 13149-9, specifying the structure to be used by a service providing time data to the on-bus network;

— CEN/TS 13149-10, specifying the structure to be used by a service providing location data to the on-bus network, specifically relating to Global Navigational Satellite Systems (GNSS);

— CEN/TS 13149-11, specifying the structure to be used by a service providing data from the vehicle platform to the on-bus network, using the Fleet Management System (FMS) for source data.

These documents draw on large scale trials undertaken within European projects such as EBSF (the "European Bus System of the Future" project) and its successors, together with technical developments which have since been adopted by programmes such as the German IBIS-IP platform [1] and, more recently, the European platform ITxPT [2]. This has ensured not only that the CEN specifications are robustly proved in practice, but also that they have the support of many key system developers and operators.

With these Technical Specifications, it will be easier to achieve:

— more efficient development of PT components;

— lower cost, lower risks and a smoother on board integration of PT equipment;

— more efficient operation and maintenance of on board PT equipment;

— high quality intermodal passenger services based on intermodal PT information;

— integration of new PT services.

As an IP based solution, this Technical Specification draws on a range of IETF Requests for Comment (RFCs), not all of which may be formal standards. A list of those cited is presented in the Bibliography.

1 Scope

This document specifies the general rules for an on-board data communication system between the different systems that may be used within public transport vehicles, based on the Internet Protocol (IPv4, [3] and IPv6, [4]). This includes operational support systems, passenger information systems, fare collection systems, etc.

This document describes:

— the requirements for an on board IP network;

— the overview architecture and components for an IP based on-board network;

— the modular structure of the network architecture;

— the Service Oriented Architecture (SOA) approach, and approach to defining services.

Systems directly related to the safe operation of the vehicle (including propulsion management, brake systems, door opening systems) are excluded from the scope of this document and are dealt with in other standardization bodies. However, the architecture described in this document may be used for support services such as safety information messages. Interfaces to safety-critical systems should be provided through dedicated gateways with appropriate security provisions; for the purposes of this document, these are regarded as simply external information sources.

This document is designed primarily for vehicles with a fixed primary structure, where networks can be installed on a permanent basis and the system configuration task consists largely of the integration, adjustment or removal of the functional end systems that produce and/or consume data. Public transport vehicles consisting of units linked temporarily for operational purposes (specifically, trains in which individual engines, cars or consists are routinely connected and disconnected) require additional mechanisms to enable the communications network itself to reconfigure. Such mechanisms are provided through other standards, notably the IEC 61375 series [5].

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

• ISO Online browsing platform: available at https://www.iso.org/obp

• IEC Electropedia: available at http://www.electropedia.org/

3.1
application
piece of software constructed to capture, process and/or interpret data within the context of a business process; for example estimating vehicle location within the transport network

3.2
function
logical set of data processing activities that fulfils a business need

EXAMPLE Automated Vehicle Monitoring System (AVMS).

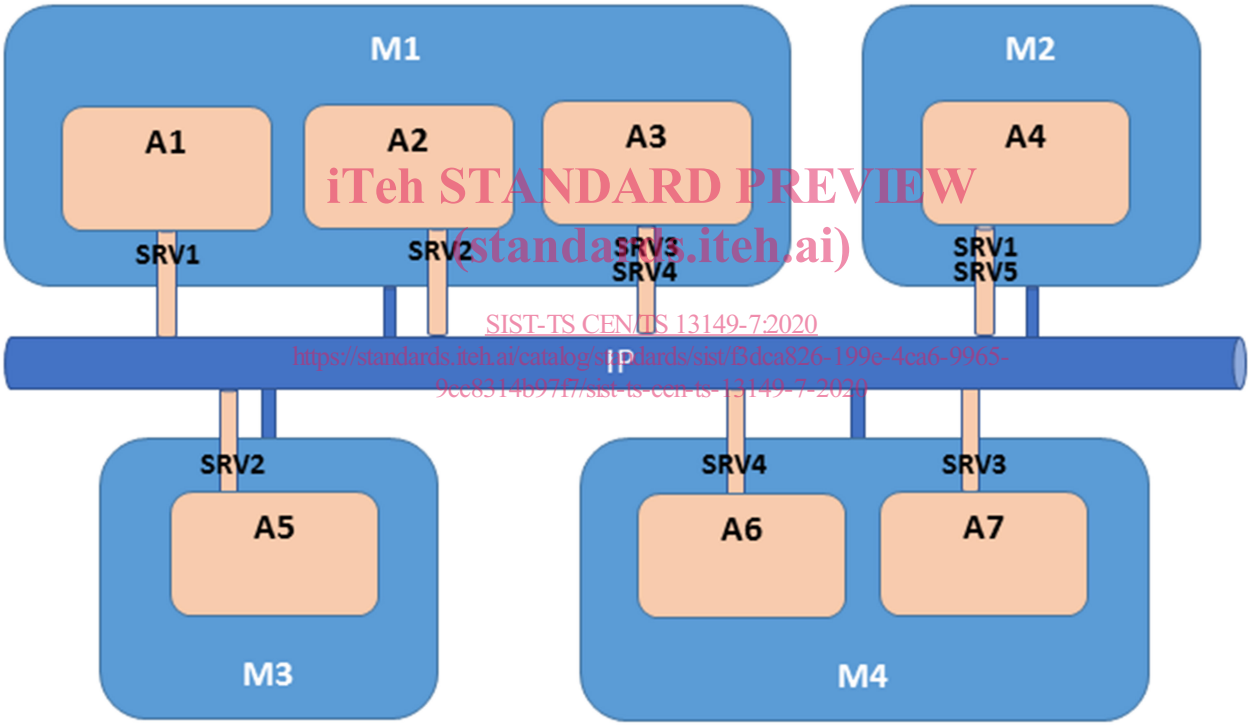
3.3
module
hardware or virtual component with an IP address on the IP network

EXAMPLE OnBoardUnit (on board computer).

3.4
service
mechanism to deliver data on the IP architecture

EXAMPLE Provision of information about the vehicle location within the transport network.

Note 1 to entry: Thus, a module will host one or more applications which are designed to implement functions; a service is provided by an application via a module (using an IP port), and communicates across the IP network. In particular, a module can host several applications, an application can provide several services, and identical services can be provided multiple times by different applications. Figure 1 depicts this relationship diagrammatically.



Key

M1 – M4	Modules
SRV1 – SRV5	Services
A1 – A7	Applications
IP	Primary network

Figure 1 — Relationship between terms (example)

Note 2 to entry: Applications, and the functions they support, are liable to regularly change and are independent of the technical features described in this document. Other Parts of the EN 13149 series provide service definitions for some key individual functions.

4 Symbols and abbreviations

API	Application Programming Interface
AVL	Automated Vehicle Location
AVMS	Automated Vehicle Monitoring System
CAN	Controller Area Network
DHCP	Domain Host Control Processor
DNS	Domain Name System
DNS-SD	DNS based Service Discovery
DPI	Dynamic Passenger Information
FTP	File Transfer Protocol
FTP	File Transfer Protocol
GPS	Global Positioning System
HTTP	HyperText Transfer Protocol
IP	Internet Protocol
IT	Information Technologies
LAN	Local Area Network
mDNS	Multicast DNS
MMI	Man Machine Interface
MQTT	Message Queuing Telemetry Transport
PT	Public Transport
PTA	Public Transport Authority
PTO	Public Transport Operator
QoS	Quality of Service
SOA	Service Oriented Architecture
SSH	Secure Shell protocol
TELNET	TErminaL NETwork
UDP	User Datagram Protocol

5 Design principles

5.1 Introduction

This clause describes the design principles adopted in the development of EN 13149 IP-based services. These consist of:

— the operational characteristics which are routinely required of an integrated on-board systems network, and the goals for which this Technical Specification has been designed;

— the language used to describe the systems and their connectivity.