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Intelligent transport systems — Architecture — Applicability of data distribution technologies within ITS

Systèmes de transport intelligents — Architecture — Applicabilité des technologies de distribution des données dans les ITS

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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Abbreviated terms **2**
5 Transitioning from traditional to cooperative thinking **4**
5.1 General 4
5.1.1 Need for data exchanges 4
5.1.2 Data distribution functionality 5
5.2 Systems engineering process 6
5.2.1 Conceptualization 6
5.2.2 System architecture 6
5.2.3 System design 6
5.3 Traditional silos versus cooperative approaches 7
6 Summary of needs and considerations **7**
6.1 General 7
6.2 Types of information flows 7
6.2.1 General 7
6.2.2 Non-emergency information sharing 8
6.2.3 Emergency information sharing 8
6.2.4 Control flows 8
6.2.5 Interrogatives 8
6.2.6 Local exchanges 8
6.3 Characteristics 8
6.4 Solution characteristics 9
6.4.1 General 9
6.4.2 Architectural topology 9
6.4.3 Technology maturity and deployment characteristics 13
6.5 Objective analysis 15
6.5.1 General 15
6.5.2 Protocols tested 15
6.5.3 Protocols considered and not analysed 16
6.5.4 Protocols considered and investigated but not tested 17
6.5.5 Summary 17
7 Summary of analysis results **18**
7.1 General 18
7.2 Quantitative results 18
7.2.1 General 18
7.2.2 Many2One 18
7.2.3 One2Many 20
7.2.4 10 to Many 21
7.2.5 50 to Many 23
7.2.6 N to N 24
7.2.7 Latency as a function of completion percentage 29
7.2.8 Other tests 30
7.3 Qualitative lessons learned 31
8 Summary of protocol characteristics and applicability to ITS **31**
9 Conclusion **35**
Annex A (informative) **Test environment** **37**

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Bibliography **40**

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Foreword

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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).

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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.

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

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.

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Introduction

Since the early 2000s, various study, design and prototype efforts have been undertaken to explore the potential use of communications in the vehicular environment. The first of these to demonstrate at real scale was the Vehicle Infrastructure Initiative (VII), which demonstrated short range wireless-based probe data generation and traveller advisory message delivery. This suggested the viability of initial vehicle-to-vehicle and vehicle-to-infrastructure communications.

Subsequent projects worked to more formally define the "glue" components necessary to enable widespread deployment. Several of these projects concluded that a publish-subscribe data distribution paradigm was a necessary component of any connected vehicle implementation of significant scale. These conclusions and much of the supporting work eventually found its way into ITS architectures. Much of this material is currently included in the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)[6].

More recent pilot projects and deployments in both the United States and Europe have included publish-subscribe technologies, but no independent, objective analyses of the advantages and disadvantages of using specific protocols to facilitate data exchange within ITS are available. This document describes such an analysis.

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Intelligent transport systems — Architecture — Applicability of data distribution technologies within ITS

1 Scope

A variety of general-purpose data distribution technologies have emerged within the Information and Communications Technologies (ICT) industry. These technologies generally provide services at the Open System Interconnect (OSI) session, presentation and application layers (i.e. layers 5-7). Within Intelligent Transport Systems (ITS), these layers roughly correspond to the facilities layer of the ITS station (ITS-S) reference architecture, as defined within ISO 21217.

This document investigates the applicability of these data distribution technologies within the ITS environment.

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/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 and the following 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/

3.1
data distribution functionality
DDF
facilities layer (OSI layers 5, 6, and 7) functionality comprised of a set of data distribution services that enables distribution of data throughout a communication network controlled by a set of policies, regulations and rules

Note 1 to entry: Each distinct data distribution technology has its own unique data distribution functionality.

3.2
data distribution service
DDS
element of a set of services that implements a data distribution functionality in a communication network

EXAMPLE 1 Publish: the provision of data from one entity to another, where the receiving entity has previously registered to receive such data from the entity providing the data.

EXAMPLE 2 Subscribe: mechanism by which one entity registers for the reception of particular data from another entity.

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EXAMPLE 3 Discovery: mechanism by which entities implementing DDF learn necessary particulars about how to communicate with one another (e.g. lower layer network address, ports, etc.).

Note 1 to entry: This is a specific protocol standardized by the OMG.

4 Abbreviated terms

AES	Advanced Encryption Standard
AMQP	advanced message queuing protocol
API	application programming interface
ARC-IT	architecture reference for cooperative and intelligent transportation
ASN.1	abstract syntax notion one
AUTOSAR	automotive open system architecture
C-ITS	cooperative ITS
C2C	centre-to-centre
C2F	centre-to-field
C2P	centre-to-personal station
C2V	centre-to-vehicle
C2X	centre-to-anything
CoAP	constrained application protocol
ConOps	concept of operations
CSSDDS	commercial source software DDS
CSV	comma separated value
DSRC	dedicated short range communications
FEP-SDK	functional engineering platform software development kit
FIPS	Federal Information Processing Standard
HARTS	harmonized architecture reference for technical standards
HTTP	hypertext transfer protocol
IANA	internet assigned numbers authority
ICD	interface control document
ICT	information and communications technology
IDL	interface definition language
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers

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