TECHNICAL SPECIFICATION

ISO/TS 19091

Second edition
2019-06

Intelligent transport systems — Cooperative ITS — Using V2I and I2V communications for applications related to signalized intersections

Systèmes intelligents de transport — Coopérative ITS — Utilisation de communications V2I et I2V pour des applications relatives aux intersections signalées

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO/TS 19091:2019
https://standards.iteh.ai/catalog/standards/iso/a6d32fbd-72a7-4ae6-86dc-ae77e8bb4546/iso-ts-19091-2019

Reference number
ISO/TS 19091:2019(E)

© ISO 2019

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO/TS 19091:2019
https://standards.iteh.ai/catalog/standards/iso/a6d32fbd-72a7-4ae6-86dc-ae77e8bb4546/iso-ts-19091-2019

COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

© ISO 2019 – All rights reserved

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO/TS 19091:2019
https://standards.iteh.ai/catalog/standards/iso/a6d32fbd-72a7-4ae6-86dc-ae77e8bb4546/iso-ts-19091-2019

Contents

Page

Foreword vi

Introduction vii

1 Scope 1

2 Normative references 1

3 Terms and definitions 2

4 Abbreviated terms 10

5 General description (informative) 12
5.1 Overview 12
5.2 Functional model 12
5.2.1 Description 12
5.2.2 Architecture 14
5.2.3 Message interactions 16
5.2.4 Common operational assumptions 16
5.3 Safety use cases 18
5.3.1 Intent 18
5.3.2 Additional assumptions 18
5.3.3 Architecture implications 18
5.4 Mobility/sustainability use cases 19
5.4.1 Intent 19
5.4.2 Additional assumptions 19
5.4.3 Architecture implications 19
5.5 Priority/pre-emption use cases 20
5.5.1 Intent 20
5.5.2 Additional assumptions 21
5.5.3 Architecture implications 21
5.5.4 Public transport signal priority application 22
5.5.5 Freight vehicle signal priority application 23
5.5.6 Emergency (public safety) vehicle pre-emption application 25

6 Function description (informative) 25
6.1 Public safety vehicle 26
6.1.1 Broadcast public safety vehicle information 26
6.1.2 Broadcast emergency response indication 26
6.2 Signal pre-emption 26
6.2.1 Signal pre-empt request (normal power) 26
6.2.2 Signal pre-empt request (high power) 26
6.2.3 Request signal pre-empt — Message identifier 27
6.2.4 Request signal pre-empt — Intersection identifier 27
6.2.5 Request signal pre-empt — Approach lane 27
6.2.6 Request signal pre-empt — Egress lane 27
6.2.7 Request signal pre-empt — Vehicle class 27
6.2.8 Request signal pre-empt — Time of service 27
6.2.9 Request signal pre-empt — Vehicle identity 28

iTeh Standards (https://standards.iteh.ai) Document Preview
ISO/TS 19091:2019
https://standards.iteh.ai/catalog/standards/iso/a6d32f8d-72a7-4ae6-86de-ae77e8bb4546/iso-ts-19091-2019

© ISO 2019 – All rights reserved

6.2.10 Request signal pre-empt — Vehicle location and speed 28
6.2.11 Request signal pre-empt — Cancellation 28
6.2.12 Request signal pre-empt — Transaction identifier 28
6.2.13 Request signal pre-empt — Duration 28
6.3 Public transport and commercial vehicle 28
6.3.1 Broadcast priority requesting vehicle information 28
6.4 Signal priority requirements 29
6.4.1 Signal priority request 29
6.4.2 Request signal priority — Message identifier 29
6.4.3 Request signal priority — Intersection identifier 29
6.4.4 Request signal priority — Approach lane 29
6.4.5 Request signal priority — Egress lane 29
6.4.6 Request signal priority — Vehicle class 30
6.4.7 Request signal priority — Time of service 30
6.4.8 Request signal priority — Vehicle identity 30
6.4.9 Request signal priority — Vehicle location and speed 30
6.4.10 Request signal priority — Service information 30
6.4.11 Request signal priority cancellation 31
6.4.12 Request signal priority — Priority request level 31
6.4.13 Request signal priority — Transaction identifier 31
6.4.14 Request signal priority — Duration 31
6.4.15 Request signal priority — Transit schedule 31
6.5 Broadcast area's geometrics 31
6.5.1 Broadcast roadway geometrics 31
6.5.2 Broadcast roadway geometrics — Message identifier 31
6.5.3 Broadcast intersection — Identifier 32
6.5.4 Broadcast intersection — Reference point 32
6.5.5 Broadcast intersection — Lane/approach default width 32
6.5.6 Broadcast intersection — Egress lanes/approach 32
6.5.7 Broadcast intersection — Ingress lanes/approach 32
6.5.8 Broadcast intersection — Lane/approach number 32
6.5.9 Broadcast intersection — Lane/approach centerline coordinates 32
6.5.10 Broadcast intersection — Vehicle lane/approach manoeuvres 33
6.5.11 Broadcast intersection — Pedestrian crossing lane/approach manoeuvres 33
6.5.12 Broadcast intersection — Special lane/approach manoeuvres 34
6.5.13 Broadcast intersection — Version identifier 34
6.5.14 Broadcast intersection — Crossings 34
6.5.15 Broadcast intersection — Lane/approach width 34
6.5.16 Broadcast intersection — Node lane/approach width 34
6.5.17 Broadcast intersection — Egress connection 35
6.5.18 Broadcast intersection — Traffic control 35
6.5.19 Broadcast intersection — Traffic control by lane/approach 35
6.5.20 Broadcast road conditions 35
6.5.21 Broadcast intersection — Signal group 35
6.6 Broadcast GNSS augmentation details 35
6.6.1 Broadcast GNSS augmentations 35
6.6.2 Broadcast GNSS augmentation detail — NMEA 36
6.6.3 Broadcast GNSS augmentation detail — RTCM 36
6.7 Signalized intersection requirements 36
6.7.1 Broadcast signal phase and timing information 36
6.7.2 Broadcast signal phase and timing — Message identifier 36
6.7.3 Broadcast signal phase and timing — Intersection identifier 36

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ISO TS 19091:2019
https://standards.iteh.ai/catalog/standards/iso/4bd32fbd-72a7-4dab-86dc-aa77e8bb4546/iso-ts-19091-2019

© ISO 2019 – All rights reserved

6.7.4 Broadcast signal phase and timing — Intersection status 36
6.7.5 Broadcast signal phase and timing — Timestamp 37
6.7.6 Broadcast manoeuvre — Signal group 37
6.7.7 Broadcast manoeuvre — Manoeuvre state 37
6.7.8 Broadcast manoeuvre — Vehicular state 37
6.7.9 Broadcast manoeuvre — Pedestrian state 37
6.7.10 Broadcast manoeuvre — Special state 37
6.7.11 Broadcast manoeuvre — Time of change — Minimum 37
6.7.12 Broadcast manoeuvre — Time of change — Maximum 38
6.7.13 Broadcast manoeuvre — Succeeding signal indications 38
6.7.14 Broadcast manoeuvre — Succeeding signal indication time of change 39
6.7.15 Broadcast manoeuvre pending manoeuvre start time 39
6.7.16 Broadcast manoeuvre — Pedestrian detect 39
6.7.17 Broadcast manoeuvre — Pedestrian call 39
6.7.18 Broadcast manoeuvre — Optimal speed information 39
6.7.19 Broadcast manoeuvre — Signal progression information 39
6.7.20 Broadcast manoeuvre — Egress lane queue 39
6.7.21 Broadcast manoeuvre — Egress lane storage availability 40
6.7.22 Broadcast manoeuvre — Wait indication 40
6.8 Broadcast cross traffic sensor information 40
6.9 Broadcast vulnerable road user sensor information 40
6.10 Broadcast dilemma zone violation warning 40
6.11 Broadcast signal preferential treatment status 40
6.11.1 Broadcast preferential treatment — Signal status message 40
6.11.2 Broadcast preferential treatment — Message identifier 41
6.11.3 Broadcast preferential treatment — Intersection identifier 41
6.11.4 Broadcast preferential treatment — Intersection status 41
6.11.5 Broadcast preferential treatment — Prioritization request status 41
6.11.6 Broadcast preferential treatment — Vehicle source 41
6.11.7 Broadcast preferential treatment — Transaction identifier 41
6.12 Message identifier 41
6.13 System performance requirements 42
6.13.1 Broadcast intersection — Computed lane/approach 42
6.14 Transmission rates — Signal preferential treatment 42
6.14.1 Maximum transmission rate — Request signal preferential treatment 42
6.14.2 Maximum response time — Request signal preferential treatment 42
6.14.3 Minimum transmission rate — Signal status message 42
6.14.4 Minimum transmission period — Signal status message 42
6.15 Transmission rate requirements — Broadcast roadway geometrics information 42
6.15.1 Minimum transmission rate — Broadcast roadway geometrics information 43
6.15.2 Maximum transmission rate — Broadcast roadway geometrics information 43
6.15.3 Default transmission rate — Broadcast roadway geometrics information 43
6.16 Transmission rate requirements — GNSS augmentations detail broadcasts 43
6.16.1 Minimum transmission rate — GNSS augmentation details broadcasts 43
6.16.2 Default transmission rate — GNSS augmentation details broadcasts 43
6.17 Transmission rate requirements — Broadcast signal phase and timing information 43
6.17.1 Minimum transmission rate — Broadcast signal phase and timing information 43
6.17.2 Maximum transmission rate — Broadcast signal phase and timing information 43
6.17.3 Default transmission rate — Broadcast signal phase and timing information 43
6.18 Transmission rate requirements — Broadcast cross traffic sensor information 44
6.18.1 Minimum transmission rate — Broadcast cross traffic sensor information 44
6.18.2 Maximum transmission rate — Broadcast cross traffic sensor information 44
6.18.3 Default transmission rate — Broadcast cross traffic sensor information 44

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ISO/TS 19091:2019
https://standards.iteh.ai/catalog/standards/iso/a6d32fbd-72a7-4ae6-86dc-ae77e8bb4546/iso-ts-19091-2019

 © ISO 2019 – All rights reserved

6.19 Transmission rate requirements — Broadcast vulnerable road user sensor information 44
6.19.1 Transmission rate — Broadcast vulnerable road user sensor information 44
6.19.2 Maximum transmission rate — Broadcast vulnerable road user sensor information 44
6.19.3 Default transmission rate — Broadcast vulnerable road user sensor information 44
7 Messages 44
8 Conformance 45
Annex A (informative) Use cases 46
Annex B (informative) Use case to requirements traceability 110
Annex C (informative) Requirements traceability matrix 127
Annex D (normative) Extension procedures 143
Annex E (normative) Profile A for J2735™ 144
Annex F (normative) Profile B for J2735™ 148
Annex G (normative) Profile C for J2735™ 173
Bibliography 233

iTeh Standards
(https://standards.iteh.ai)
Document Preview

ISO/TS 19091:2019
https://standards.iteh.ai/catalog/standards/iso/a6d32fbd-72a7-4ae6-86dc-ae77e8bb4546/iso-ts-19091-2019

© ISO 2019 – All rights reserved