

# DIN CEN ISO/TS 19091:2019-11 (E)

Intelligent transport systems - Cooperative ITS - Using V2I and I2V communications for applications related to signalized intersections (ISO/TS 19091:2019); English version CEN ISO/TS 19091:2019

---

<b>Contents</b>		<b>Page</b>
Foreword .....		vi
Introduction .....		vii
<b>1</b> Scope .....		<b>1</b>
<b>2</b> Normative references .....		<b>1</b>
<b>3</b> Terms and definitions .....		<b>2</b>
<b>4</b> Abbreviated terms .....		<b>10</b>
<b>5</b> General description (informative).....		<b>12</b>
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
<b>6</b> Function description (informative).....		<b>25</b>
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

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

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

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