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Intelligent transport systems — Management of electronic traffic regulations (METR) —

Part 2: Operational concepts (ConOps)

Systèmes de transport intelligents — Gestion des règles de circulation sous forme électronique —

Partie 2: Concepts opérationnels

Reference number
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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols and abbreviated terms **1**
5 Current system or situation **2**
5.1 General 2
5.2 Background, objectives and scope 3
5.2.1 Background 3
5.2.2 Objectives 3
5.2.3 Scope of application 4
5.3 Operational policies and constraints 4
5.3.1 Policies 4
5.3.2 Constraints 5
5.4 Description of the current situation 5
5.4.1 General 5
5.4.2 Terminators 6
5.4.3 Processes 9
5.4.4 Data flows 10
5.4.5 Additional stakeholders 10
5.4.6 Data details 12
5.5 Modes of operation for the current situation 15
5.6 User classes and other involved personnel 16
5.6.1 General 16
5.6.2 Users subject to rules 16
5.6.3 Entities that establish rules 17
5.6.4 Third party entities 18
5.7 Support environment 18
5.7.1 General 18
5.7.2 Sources of support 19
6 Justification for and nature of changes **20**
6.1 General 20
6.2 Justification of changes 20
6.2.1 General 20
6.2.2 Evolving transport environment 20
6.2.3 Discrepancy reports 21
6.3 User need statements 23
6.3.1 Trustworthiness needs 23
6.3.2 User needs 35
6.3.3 Rule maker needs 44
6.3.4 Third party needs: auditing 48
6.4 Priorities 48
6.5 Deferred user needs 48
6.5.1 General 48
6.5.2 User needs deferred to a future release 49
6.5.3 User needs considered but not included 49
6.6 Assumptions and constraints 49
6.6.1 Assumptions 49
6.6.2 Constraints 51
7 Concepts for the proposed system **52**
7.1 General 52

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7.2 Background, objectives, and scope ... 52
7.3 Operational policies and constraints ... 52
7.3.1 Policies ... 52
7.3.2 Constraints ... 52
7.4 Description of the proposed system ... 52
7.4.1 Overview ... 52
7.4.2 Terminators ... 54
7.4.3 Processes ... 54
7.4.4 Data flows ... 56
7.5 Modes of operation ... 57
7.5.1 General ... 57
7.5.2 Normal mode ... 57
7.5.3 Degraded mode ... 58
7.5.4 Fallback mode ... 58
7.6 User classes and other involved personnel ... 58
7.7 Support environment ... 58
7.7.1 General ... 58
7.7.2 Rule discovery service ... 58
7.7.3 Service registration and discovery service ... 59
7.7.4 Security service ... 59
7.7.5 Technology services ... 59
7.7.6 METR certification ... 59
7.7.7 Maintenance ... 59
7.7.8 Enforcement ... 59
7.7.9 Academic research and advocacy ... 59

8 Summary of impacts ... 60
8.1 Operational impacts ... 60
8.2 Organizational impacts ... 60
8.3 Impacts during development ... 60

9 Analysis of the proposed system ... 61
9.1 Benefits ... 61
9.2 Disadvantages and limitations ... 61
9.3 Alternatives considered ... 61

Annex A (informative) **Operational scenarios ... 62**

Annex B (informative) **Data flow diagram conventions ... 76**

Annex C (informative) **Tentative categories for METR information ... 77**

Bibliography ... 80

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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).

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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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

A list of all parts in the ISO 24315 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.

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Introduction

0.1 System overview

0.1.1 General

The ISO 24315 series is intended to provide users access to geo-specific, trustworthy, timely, authoritative, machine-interpretable, traffic and transport related rules enacted by jurisdictional entities, including those who define rules for campuses (i.e. private grounds). This is conceptually shown in Figure 1.

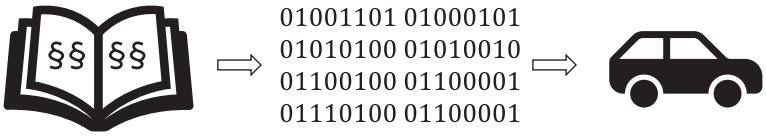

Figure 1 — METR concept

0.1.2 Purpose

Management of electronic traffic regulations (METR) is designed to assist developers and manufacturers of driving automation systems (i.e. automation levels 1-5) and driver information systems (including those at automation level 0) to electronically obtain traffic rules to better enable:

a) interacting safely with other road users;

b) following instructions from law enforcement organizations, and those authorized to direct traffic;

c) maintaining smooth and safe flow of traffic;

d) complying with other rules enacted to support legislative policies (such as environmental protection, noise, manage height and weight restrictions, and societal aspects such as market days, fiestas, pedestrian zones)[8].

METR is designed to provide a reference framework for the trustworthy distribution of electronic versions of legal traffic rules, however content and application of the traffic rules is outside of the scope of the METR standards and specifications.

0.1.3 Flow of information

The general flow of METR information is illustrated in Figure 2 and subsequently described.

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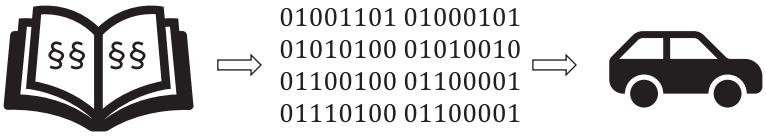

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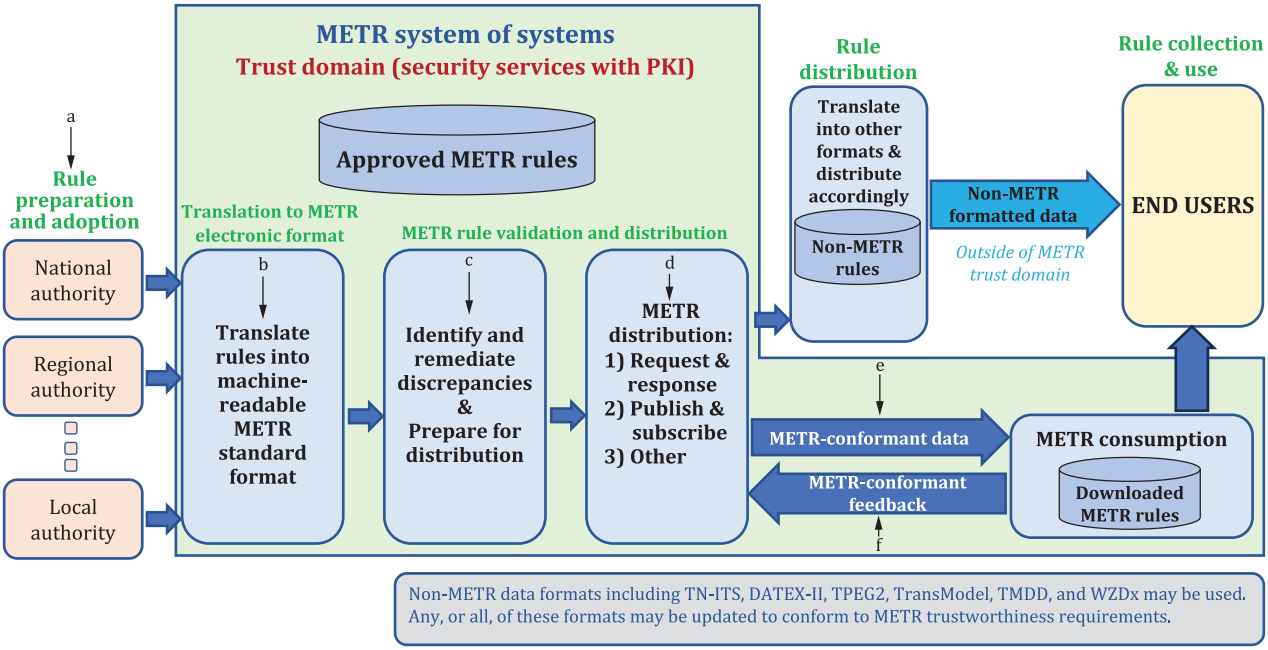

Key

a METR starts with rule makers defining and enacting rules that are relevant to transport users.

b Each legal rule is translated into a METR rule, which is a secure, standardized electronic representation that includes a digital signature of the rule signing organization.

c METR rules are collected for a geographic area(s) and specific scope(s).

d Rules are distributed to METR users based on their needs.

e METR users become aware of the METR rules, verify their authenticity, and respond appropriately.

f As needed, METR users can submit discrepancy reports to a discrepancy handler for investigation and correction.

Figure 2 — METR flow of information

0.1.4 Graphical overview

Figure 3 provides an overview of the data and devices included within the scope of the METR environment.

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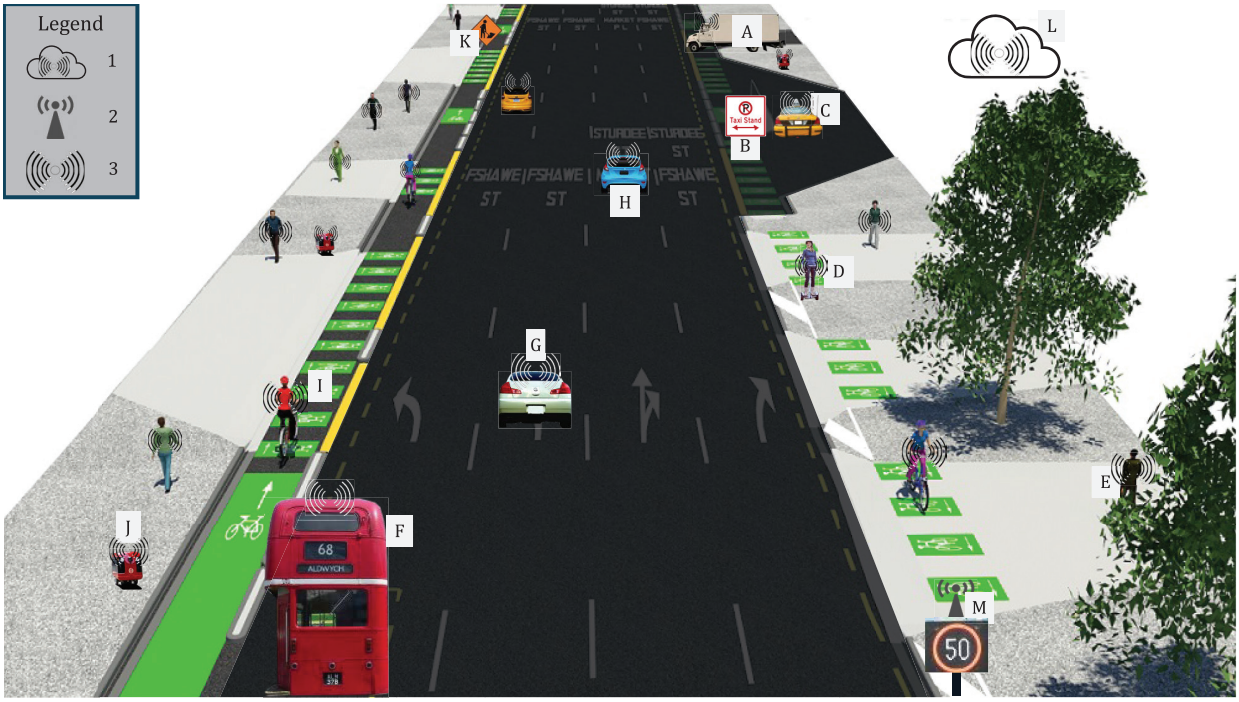

Key

A freight rules
B kerbside usage rules
C ride sharing rules
D micromobility rules
E VRU rules
F public transport rules
G rules for automated driving systems
H driving rules
I lane use rules
J public-area mobile robot rules
K road work rules
L pre-announced rules with subset of emergent rules and/or supporting data
M emergent rules and/or supporting data
1 various communications and network infrastructure
2 roadside communication unit
3 METR user system

Figure 3 — METR streetscape

0.1.5 Rule distribution

Electronic traffic rules and their distribution have three orthogonal characteristics that are often confused with one another.

a) Electronic rules can be pre-announced (i.e. known and publicized well in advance of the user's need) or emergent (i.e. publicized and needed while previously obtained pre-announced rules are still considered fresh).

b) Electronic rules can be distributed through a wide-area distribution mechanism or a local distribution mechanism.

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c) Electronic rules can be pulled by users well in advance of their need or pushed to users as special conditions necessitate.

It is expected that the characteristics of METR users and the limitations on data capacities for local distribution mechanisms mean that virtually all persistent rules will be pre-announced and distributed from a wide-area distribution source, likely using a pull mechanism. However, any emergent rule that is activated while previously distributed pre-announced rules are still considered fresh will require a push mechanism, often from a local distribution source. It is important to note that those two combinations are only typical use cases and that METR supports every possible combination of these three characteristics and addresses how discrepancies can be reported and resolved.

In addition, supporting data may provide context to the rules and can be transmitted by wide-area communication systems, roadside units, other vehicles, or on-board devices.

The rules cover virtually any rule related to surface transport systems; the graphic depicts rules for freight vehicles, kerbside usage, ride sharing, micromobility operations, vulnerable road users (VRUs), public transport usage, driving (i.e. human-in-the-loop, including driver support systems, which represent levels 1 and 2 of automation), automated driving systems (ADS, i.e. automation levels 3-5), lane usage, public-area mobile robots (PMRs), and road works. This information needs to be available and conveyed to all transport users including nomadic devices, PMRs, and vehicles equipped with driving automation systems (i.e. levels 1-5 of automation). Although not shown in the diagram, METR is also intended to be flexible enough to support rules relating to the use of ferries, passenger rail (e.g. trams, subways, and inter-city rail), and off-road environments.

0.2 Framework adaptation

METR is defined through the ISO 24315 series, which provides a comprehensive framework for the interoperable digitalization, distribution, and management of electronic traffic regulations. This framework will be defined at a relatively high-level and will support both regional adaptation and customization, as well as the use of non-METR protocols and data formats, as depicted in Figure 4.

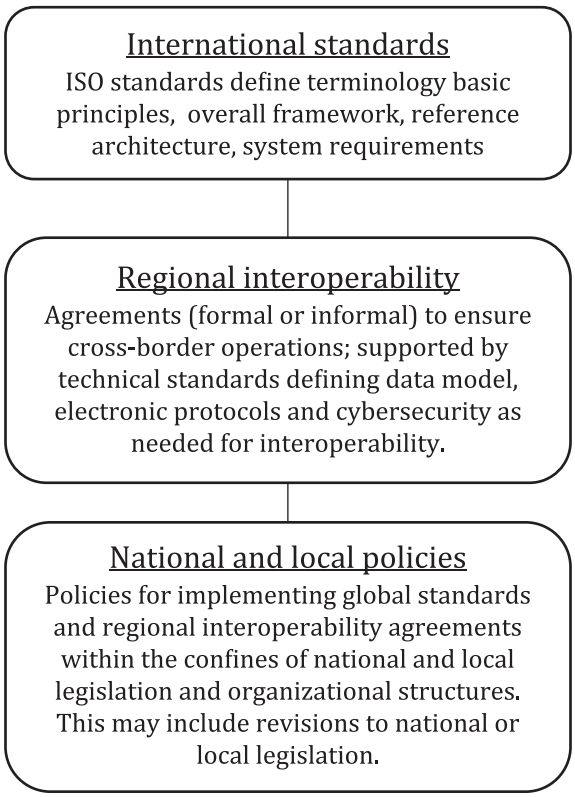

Figure 4 — METR three-tier framework

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ISO standards are developed to address international stakeholder needs. Other international organizations (e.g. UNECE) also play a role in standards development and implementation policies. The first set of ISO documents of the ISO 24315 series provide a framework based on the ISO-specified systems engineering methodology, as defined by ISO/IEC/IEEE 29148, and consist of a vocabulary, a concept of operations, a reference architecture, and requirements for the METR system of systems (SoS). Subsequent documents in the ISO 24315 series will define requirements for each component system within the METR SoS and other requirements common to all component systems. The ISO 24315 series will promote semantic interoperability, but it will need to be interpreted and adapted for regional use to provide complete interoperability (i.e. including syntactic interoperability).

Each region (e.g. EU, Japan, Korea) customizes (e.g. extends, adapts) the ISO 24315 series based on their specific needs and environment, as necessary to provide cross-border interoperability within their region. The METR reference architecture is refined to provide regional implementation guidance. For example, in Europe, METR can eventually become part of the National Access point (NAP). Furthermore, non-METR data formats including TN-ITS,[7] DATEX-II,[6] TPEG2,[2] TransModel,[5] TMDD,[9] and WZDx[10] can be refined to support METR requirements or used as-is to deliver METR information to the extent that the data can be supported (i.e. non-METR distribution). The preferred solution is to update these formats to conform to the full set of METR trustworthiness requirements.

Translating and adapting international standards and regional interoperability agreements is achieved at the national level and can even be done at local levels. Operations, funding and governance are determined nationally, locally, or both. Legal implications of electronic rules provided through METR must be defined nationally or locally. Many locations are starting this digitalization of the rules at an informative supplemental level, rather than regulatory.

0.3 Document overview

The purpose of this document is to describe the operational concept (ConOps) for METR. A ConOps is a user-oriented document that describes system characteristics for a proposed system from the users' viewpoint. It includes a description of the key stakeholders along with the processes and data flows required to fulfil their responsibilities. It describes what the system will do (not how it will do it) and why (rationale). The ConOps is used to communicate overall quantitative and qualitative system characteristics to the acquirer, user, supplier, and other organizational elements (ISO/IEC/IEEE 29148). The ConOps is a critical tool in building consensus among stakeholders.

This document is designed to assist the following stakeholders in understanding and validating the proposed system:

a) transport users (e.g. vehicle users, micromobility users, and vulnerable road users);

b) transport infrastructure operators (e.g. traffic engineers, traffic managers and controllers, toll road operators, parking facility operators);

c) maintenance and construction personnel (e.g. road crews, maintenance managers);

d) transport service operators (e.g. public transport agencies, delivery companies, ridesourcing companies);

e) transport entity owners (e.g. municipalities, campus owners, fleet managers);

f) policy and rule-making entities (including elected officials, responsible legal authorities, and their staff);

g) enforcement personnel (e.g. law enforcement, lawyers, insurance companies);

h) manufacturers and developers (e.g. motor vehicle manufacturers, AMR manufacturers, driving automation system developers);

i) technology specialists (e.g. ADS-equipped vehicle experts, location perception experts, video image processing experts);

j) information support entities (e.g. map providers, navigation providers, traveller information providers); and

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k) advocates (e.g. safety advocates, environmental advocates, disability rights advocates).

In addition, this document will assist stakeholders in verifying that the requirements, which will be documented in subsequent parts of this document series, meet defined user needs.

This document has been developed by ISO/TC 204 in coordination with many experts from countries around the world. It is designed to be sufficiently generic to be used as an international standard applicable to any national or regional authority that wishes to adopt its processes.

System developers and system operators within authorities that adopt the METR model are advised to become familiar with this document and use it as their guide in operations.

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Intelligent transport systems — Management of electronic traffic regulations (METR) —

Part 2: Operational concepts (ConOps)

1 Scope

The management of electronic transport regulations (METR) provides trustworthy, authoritative, machine-interpretable, transport-related rules for using the road network.

This document describes the operational concept (ConOps) for METR in a format that is consistent with ISO/IEC/IEEE 29148.

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*

ISO/TS 24315-1, *Intelligent transport systems — Management of electronic traffic regulations (METR) — Part 1: Vocabulary*

ISO/IEC/IEEE 24765, *Systems and software engineering — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC/IEEE 24765, ISO/TS 14812, and ISO/TS 24315-1 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 Symbols and abbreviated terms

3G	third-generation technology standard for broadband cellular
3GPP	3rd generation partnership project
4G	fourth-generation technology standard for broadband cellular
5G	fifth-generation technology standard for broadband cellular
ADS	automated driving system
C-ITS	cooperative intelligent transport systems

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