



International
Standard

ISO 6029-2

**Intelligent transport systems —
Seamless positioning for
multimodal transportation in ITS
stations —**

**Part 2:
Nomadic and mobile device dataset
for positioning data fusion**

*Systèmes de transport intelligents — Positionnement homogène
pour le transport multimodal dans les stations ITS —*

*Partie 2: Ensemble de données d'appareils nomades et mobiles
pour la fusion de données de positionnement*

**First edition
2026-01**

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

ISO 6029-2:2026

<https://standards.iteh.ai/catalog/standards/iso/f379592e-071d-40ea-9bb3-9a2cc767f365/iso-6029-2-2026>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2026

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
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols and abbreviated terms	4
4.1 Abbreviated terms	4
5 Seamless positioning system overview	6
5.1 General	6
5.1.1 Objective	6
5.1.2 Standard references and scope of application	6
5.1.3 Compliance requirements	6
5.1.4 Positioning scenario	6
5.2 Positioning system components	9
5.2.1 Global navigation satellite systems (GNSS)	9
5.2.2 Inertial measurement units (IMU)	9
5.2.3 Short-range sensor (SRS)	9
5.2.4 Long-range sensor (LRS)	9
5.2.5 Infrastructure components	10
5.2.6 Nomadic devices	10
5.2.7 Integration and fusion units	10
5.2.8 Data transmission and networking	10
5.2.9 User interfaces and applications	10
5.3 Multimodal transportation concepts	11
5.4 Seamless positioning system architecture	11
5.5 System reliability and security	14
5.5.1 Data exchange protocols	14
5.5.2 Communication infrastructure configuration	14
5.5.3 Rational error handling and security measures	15
5.5.4 Robust error handling and security measures	16
6 Data fusion for seamless positioning	16
6.1 Sensor data specification	16
6.1.1 Data specification by sensor type	16
6.1.2 Sensor data types and characteristics	17
6.1.3 Data format and structure	18
6.1.4 Data size and length	20
6.2 Sensor data fusion process	20
6.3 Positioning output process	21
6.3.1 Positioning output calculation	21
6.3.2 Additional considerations for confidence estimation	22
7 Requirements and guidelines	23
7.1 Domain requirement level (DRL)	23
7.1.1 General	23
7.1.2 Actor requirements	23
7.1.3 Functional requirements	23
7.1.4 Performance requirements	24
7.2 Sensor requirement level (SRL)	24
7.3 Required and recommended data	25
7.4 Quality of service (QoS) requirements	27
7.4.1 QoS of seamless positioning system	27
7.4.2 System performance metrics	28
7.4.3 Data processing efficiency	28

8	Implementation considerations	29
8.1	Sensor integration strategies and implementation	29
8.1.1	Sensor integration strategies	29
8.1.2	Sensor selection criteria	29
8.1.3	Sensor calibration and synchronization	30
8.1.4	Sensor fusion techniques	30
8.1.5	Sensor placement and configuration	30
8.2	Sensor integration testing	30
8.2.1	General	30
8.2.2	Documentation and maintenance	30
8.2.3	Data transmission protocols and optimization	31
8.3	Error handling, fault tolerance and recovery mechanisms	31
8.4	Security and privacy measures in sensor deployment	32
8.5	Signal strength and sensor integration	32
8.5.1	General	32
8.5.2	Signal strength assessment for nomadic devices	32
8.5.3	Signal strength-based sensor selection	33
8.5.4	Signal strength optimization techniques	34
8.5.5	Dynamic signal strength adaptation for nomadic devices	34
8.5.6	Signal strength monitoring and maintenance for nomadic devices	34
8.5.7	Case studies and best practices	35
Annex A (informative)	Sensor fusion dataset code examples	37
Bibliography		79

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

ISO 6029-2:2026

<https://standards.iteh.ai/catalog/standards/iso/f379592e-071d-40ea-9bb3-9a2cc767f365/iso-6029-2-2026>

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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

A list of all parts in the ISO 6029 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.

ISO 6029-2:2026

<https://standards.itech.ai/catalog/standards/iso/f379592e-071d-40ea-9bb3-9a2cc767f365/iso-6029-2-2026>

Introduction

As new forms of mobility services (e.g. e-mobility, delivery robot, autonomous driving) are emerging in the intelligent transport systems (ITS) industry, the role of the nomadic device is becoming indispensable. Currently, mobility service platforms use position data gathered via the nomadic devices of the passengers, and positioning systems rely on global navigation satellite system (GNSS) technology. The functionality of the system is occasionally constrained by network interference, GNSS-denied environments and data loss. A seamless positioning system would enable interoperability between ITS domains to provide a seamless location-based service.

The main objective of a seamless positioning system is to support the development of a robust and ubiquitous indoor and outdoor seamless positioning solution for a mobile user (e.g. multimodal transportation) so that anyone can experience mobility services regardless of location, environment and disabilities.

The seamless positioning system consists of three domains:

- nomadic device [e.g. personal intelligent transport system station (P-ITS-S)],
- mobility [e.g. vehicle intelligent transport system station (V-ITS-S)], and
- infrastructure [e.g. roadside intelligent transport system station (R-ITS-S)].

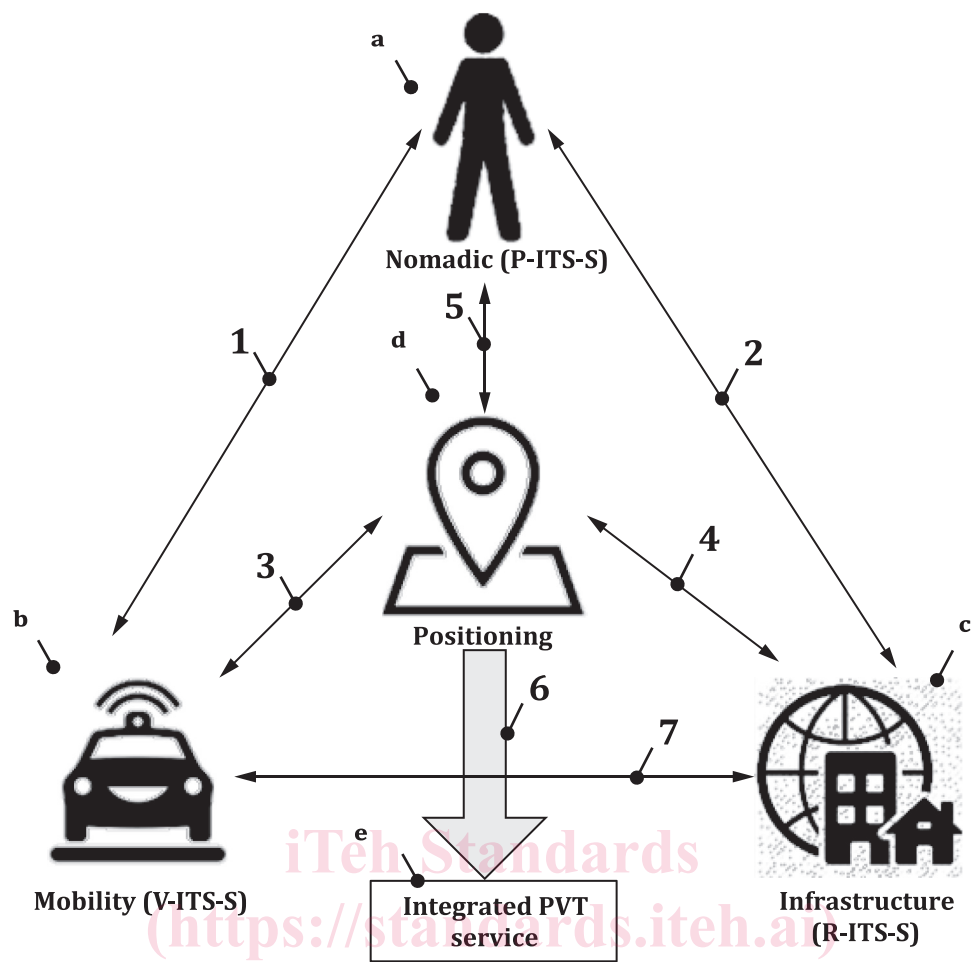
The system integrates multiple data from different domains and provides positioning data (e.g. position, velocity, time service implemented in the ITS-S) in a seamless manner.

[Figure 1](#) shows the seamless positioning system.

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

ISO 6029-2:2026

<https://standards.iteh.ai/catalog/standards/iso/f379592e-071d-40ea-9bb3-9a2cc767f365/iso-6029-2-2026>



Key

- 1 exchange of data between P-ITS-S and mobility containing mobility/personal data and network environment
- 2 exchange of data between P-ITS-S and infrastructure containing personal data and infrastructure information
- 3 exchange of data between mobility end and sensor-fusion positioning application
- 4 exchange of data between infrastructure end and sensor-fusion positioning application
- 5 exchange of data between P-ITS-S and sensor-fusion positioning application
- 6 seamless positioning calculation
- 7 positioning exchange use cases
- a The P-ITS domain is represented by ITS-compliant nomadic devices carried by human beings.
- b The V-ITS domain is represented by ITS-compliant vehicles.
- c The R-ITS domain is represented by ITS-compliant roadside infrastructure devices.
- d Positioning domain of all devices in P-ITS, V-ITS and R-ITS domain.
- e Outcome is the integrated position, velocity and time service provision.

Figure 1 — Seamless positioning system