ICS 33.060.30, 35.240.60 SLOVENSKÁ TECHNICKÁ NORMA Marec 2021

STN	**Vesmír** **Aplikácia na určovanie polohy založená na GNSS pre inteligentné dopravné systémy (ITS) v cestnej doprave** **Časť 1: Definície a postupy systémového inžinierstva na stanovenie a posudzovanie výkonnosti**	**STN** **EN 16803-1** 31 0545

Space - Use of GNSS-based positioning for road Intelligent Transport Systems (ITS) - Part 1: Definitions and system engineering procedures for the establishment and assessment of performances

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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English version

Space - Use of GNSS-based positioning for road Intelligent Transport Systems (ITS) - Part 1: Definitions and system engineering procedures for the establishment and assessment of performances

Espace - Utilisation du positionnement GNSS pour les systèmes de transport routier intelligents (ITS) - Partie 1 : Définitions et procédures d'ingénierie système pour l'établissement et l'évaluation des performances

Raumfahrt - Anwendung von GNSS-basierter Ortung für Intelligente Transportsysteme (ITS) im Straßenverkehr - Teil 1: Definitionen und Systemtechnikverfahren für die Festlegung und Überprüfung von Leistungsdaten

This European Standard was approved by CEN on 12 July 2020.

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European foreword

This document (EN 16803-1:2020) has been prepared by Technical Committee CEN-CENELEC/TC 5 "Space", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2021, and conflicting national standards shall be withdrawn at the latest by March 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 16803-1:2016.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

This revision of EN 16803-1 includes updates that are necessary to understand correctly the two next EN – Part 2 and Part 3. Some concepts and metrics not identified at the very beginning of EN 16803-1 definitively required to be aligned with last works of CEN/TC 5/WG 1 standardization group. Global architecture has not been modified, i.e. the table of content is unchanged. Among updates, the Introduction describes the LBS and ITS market for which these EN series are targeted. The GNSS Based Positioning Terminal (GBPT) is introduced later in the document, so that the "positioning system" concept can be developed and be included in the new set of ITS applications such as autonomous driving. The clause "Terms and Definitions" includes some new inputs now, like "Record&Replay", or "Reference Material". About metrics, a new one has been introduced: the continuity metric that is slightly different from the availability metric and could help to define how a service should be continuous. Definition of Time To First First (TTFF) is also proposed in this revision. It should help to share a common vision of what should be a hot/warn/cold start by using commonly accepted definitions. The concept of performances classes has also been refined with the new subclause "Introduction to Performance Requirements". Finally, the sensitivity analysis concept has been enlarged or adapted to cover the integrity assessment.

EN 16803, Space — *Use of GNSS-based positioning for road Intelligent Transport Systems (ITS)*, consists of the following parts:

— *Part 1: Definitions and system engineering procedures for the establishment and assessment of performances*;

— *Part 2: Assessment of basic performances of GNSS-based positioning terminals*;

— *Part 3: Assessment of security performances of GNSS-based positioning terminals*.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The civil applications of geopositioning are undergoing exponential development. The latest market analysis for the GNSS systems shows two major fields of application that, all together, practically share the whole of the market:

— intelligent Transport Systems (ITS), mainly in the Road ITS domain;

— location Based Services (LBS), accessible on smartphones and tablets.

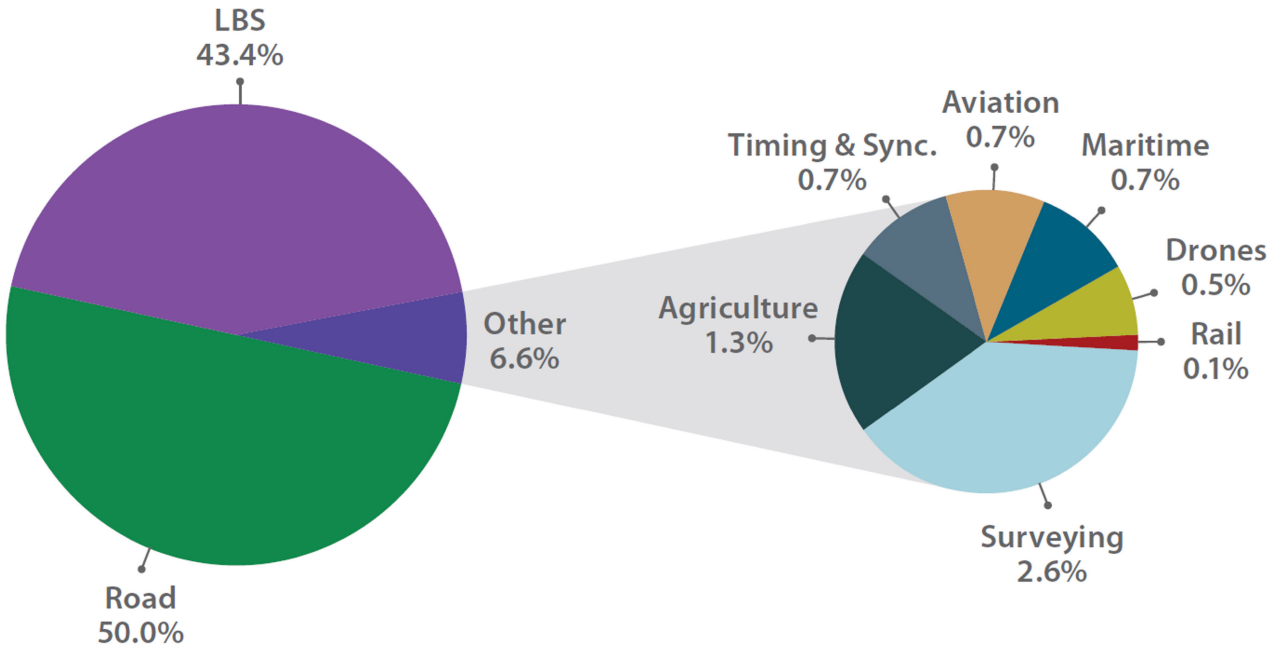

Figure 1 — Cumulative Revenue 2015-2025 by segment (Source: GNSS Market Report, Issue 5, copyright © European GNSS Agency, 2017)

When a *Road ITS system* needs GNSS positioning, which is the case for most of them, there is the question of the choice of the type of terminal or of its minimum performances that are necessary to satisfy the system's final requirements at user level. To meet these requirements, the system includes a processing module called *Road ITS application* which uses the outputs (*PVT* = Position-Velocity-Time) of a *positioning system* to provide the service with a given *End-to-end performance*. Consequently, this latter depends on the quality of the positioning outputs, which are highly variable with respect to the operational conditions of the system, but also on the performance of the *Road ITS application* itself.

Figure 2 represents the breakdown of a *Road ITS system* into its two main components.

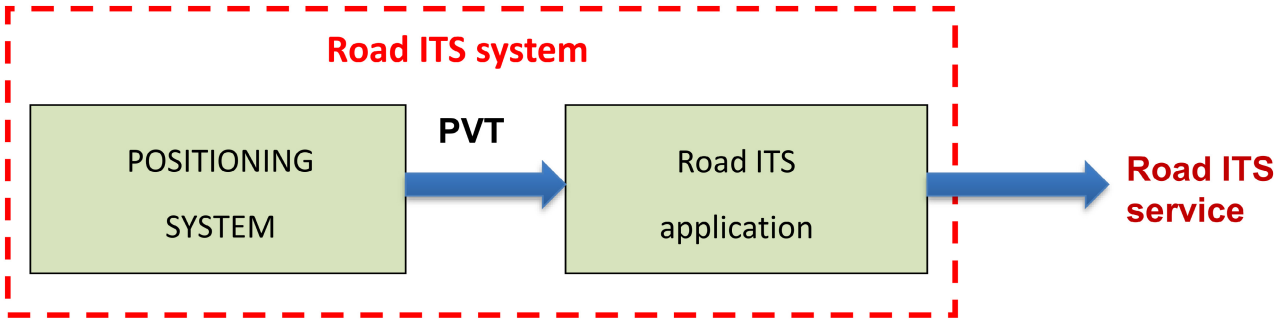

Figure 2 — The two main components of a Road ITS system

The main *Road ITS systems* concerned by this issue are:

— autonomous driving;

— GNSS-based Road User Charging systems (road, parking zone, urban…);

— localized emergency calls (eCall);

— electronic tachograph;

— taximeter;

— regulated freight transport systems (hazardous substances, livestock, etc.);

— "Pay-as-you-drive" insurance;

— road management systems, traffic information systems;

— advanced Driver Assistance Systems (ADAS);

— etc.

Some *Road ITS systems* are considered as "safety critical", because their failure may cause human death or injury and others are "liability critical", because they include financial or regulatory aspects. In some cases, their development is subject to an official certification/homologation process.

Particularly for those systems, there exists a strong need to be able to prove they do meet their *End-to-end performance* requirements related to positioning, but presently there is no standard that supports such certification process.

The performance management approach proposed in this document is based on a classical system engineering approach and is a support for engineers facing the problem of handling the performances of a *Positioning-based road ITS system* all along the system development.

This overall performance management approach can be summarized as follow:

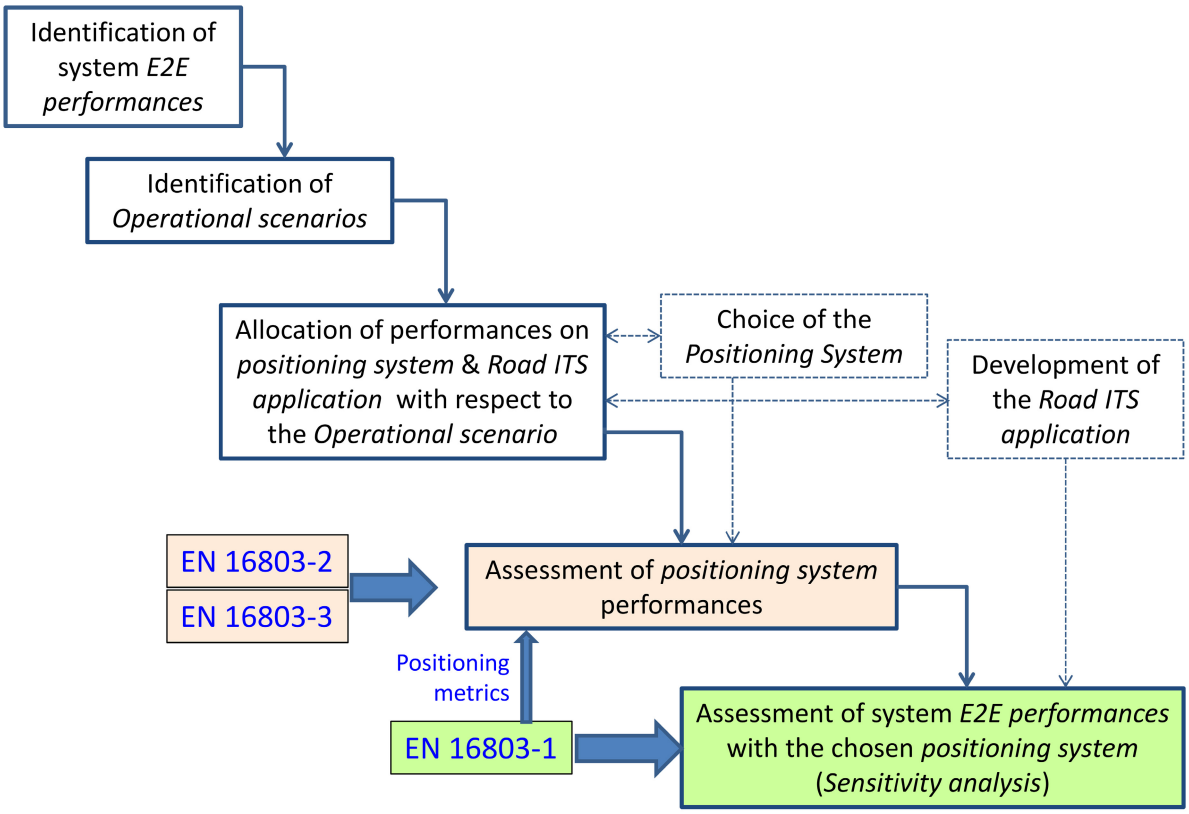

Figure 3 — Logic of the overall performance management approach

The starting point of any performance management of a *Positioning-based road ITS system* **should** be the definition and clear statement of the *E2E performances* which are targeted by the system to design and/or test, as expressed by the customer.

In the context of this document, the system breakdown into components is the one that has been introduced above:

— Positioning System;

— The Road ITS application.

The interface between these two components is assumed to be the *PVT* information, together with some auxiliary information, for instance *Integrity* information if the *Positioning System* is designed to support this kind of feature.

Performance requirements are generally stated as requirements on the outputs of a given system component, assuming that the other components feeding it with input information do respect their own performance requirements.

Hence, the performance allocation of the *E2E performances* between the system components **should** follow the general scheme below.

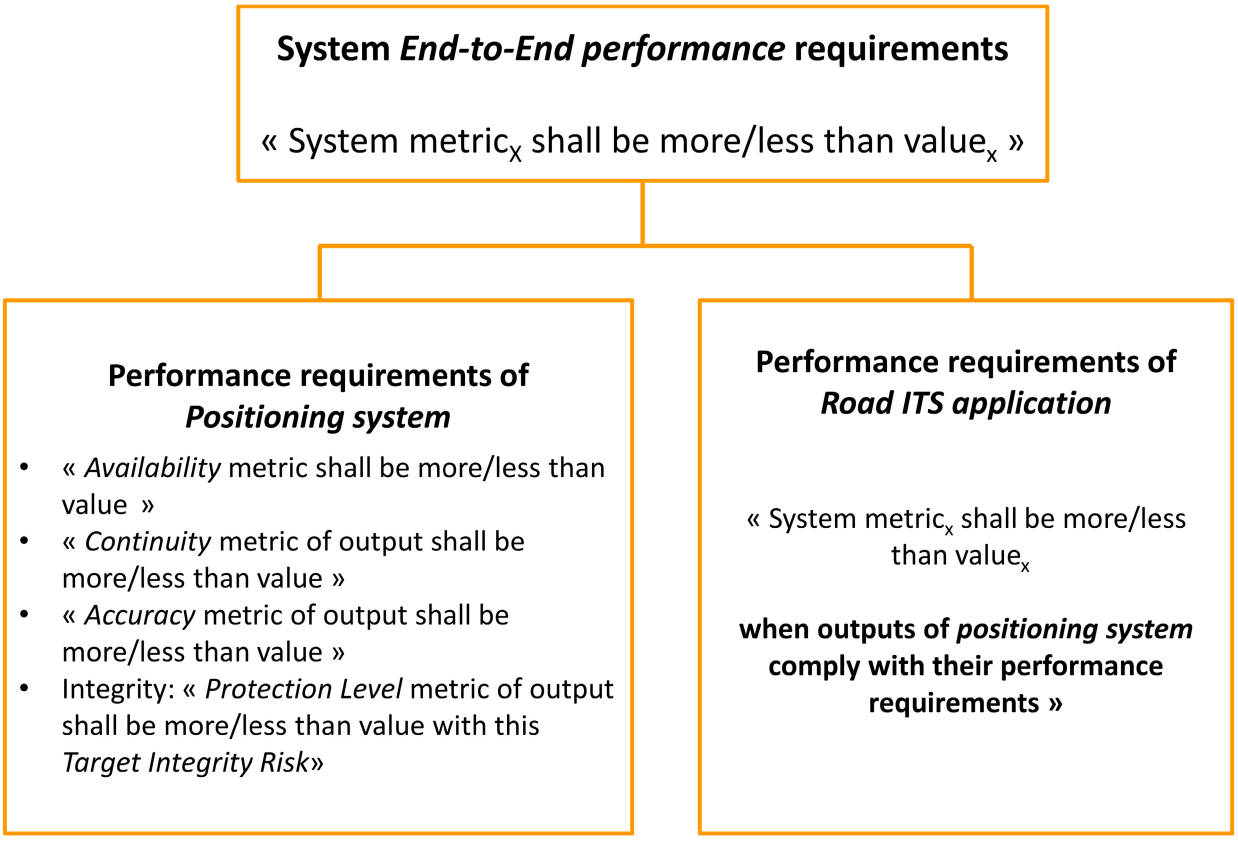

Figure 4 — Generic performance allocation process

The performance requirements of the *Road ITS application* are actually the same ones as the system *E2E performance* requirements but expressed under the condition that the *Positioning System* respects certain performances requirements.

NOTE Depending on the application, performance requirements may need to be put only on the position output or only on the velocity output by the *Positioning System*.

Due to the specificities of GNSS performances, which are due to be defined statistically and which are highly dependent on the operational conditions, margins should be planned in the performance allocations, in order to allow the system to meet its performance requirements, even when, in certain conditions, one of its component does not strictly meet its own requirements. This is the objective of what is called “Sensitivity Analysis”.

1 Scope

EN 16803-1 addresses the final stage of the performance management approach, i.e. the assessment of the whole *Road ITS system* performance equipped with a given *Positioning System*, using the *Sensitivity analysis* method.

EN 16803-1 addresses the identification and the definition the positioning performance features and metrics required for Positioning System assessment.

This document gives definitions of the various items to be considered when specifying an *Operational scenario* and provides a method to compare finely two environments with respect to their effects on GNSS positioning performance.

This document gives definition of the most important terms used all along the document and describes the architecture of a *Road ITS system* based on GNSS as it is intended in this standard.

This document **does not** address:

— the performance metrics to be used to define the *Road ITS system* performance requirements, highly depending on the use case and the will of the owner of the system;

— the performance requirements of the various kinds of *Road ITS systems*;

— the tests that are necessary to assess *Positioning System* performances (Record and Replay tests for this purpose will be addressed by EN 16803-2 and EN 16803-3.

2 Normative references

There are no normative references in this document.