

ETSI TS 103 246-3 V1.2.1 (2017-03)



Satellite Earth Stations and Systems (SES); GNSS based location systems; Part 3: Performance requirements

iTeh STANDARDS PREVIEW
(standards.iteh.ai)
Full standard available at: <https://standards.iteh.ai/catalog/standards/sist/ad414be5-6b96-46ce-9435-932a5ae5993a/etsi-ts-103-246-3-v1.2.1-2017-03>

ReferenceRTS/SES-00408

KeywordsGNSS, location, navigation, performance,
receiver, satellite, system

ETSI650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommitteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2017.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.
GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	6
Foreword.....	6
Modal verbs terminology.....	6
Introduction	6
1 Scope	7
2 References	7
2.1 Normative references	7
2.2 Informative references.....	8
3 Definitions and abbreviations.....	9
3.1 Definitions.....	9
3.2 Abbreviations	11
4 Overview of GNSS based Location System Performance Features and Classes	12
4.1 GNSS based Location System (GBLS).....	12
4.2 Performance Features	13
4.3 Class of Performance requirements.....	14
4.4 Use cases associated to Performance Features	15
5 Performance Requirements	15
5.1 General	15
5.2 Horizontal Position Accuracy.....	16
5.2.1 Definition.....	16
5.2.2 Metrics	16
5.2.3 Performance requirements	17
5.2.3.1 Use case: Moving Location Target	17
5.2.3.1.1 Operational environment: Open area.....	17
5.2.3.1.2 Operational environment: Urban area	18
5.2.3.1.3 Operational environment: Asymmetric area.....	18
5.2.3.2 Use case: Static Location Target	18
5.2.3.2.1 Operational environment: Open area.....	18
5.2.3.2.2 Operational environment: Urban area	19
5.2.3.2.3 Operational environment: Asymmetric area.....	19
5.3 Vertical Position Accuracy.....	19
5.3.1 Definition.....	19
5.3.2 Metrics	19
5.3.3 Performance requirements	19
5.3.3.1 Use case: Moving Location Target	19
5.3.3.1.1 Operational environment: Open area.....	19
5.3.3.1.2 Operational environment: Urban area	20
5.3.3.1.3 Operational environment: Asymmetric area.....	20
5.3.3.2 Use case: Static Location Target	20
5.3.3.2.1 Operational environment: Open area.....	20
5.3.3.2.2 Operational environment: Urban area	20
5.3.3.2.3 Operational environment: Asymmetric area.....	21
5.4 GNSS Time Accuracy	21
5.4.1 Definition.....	21
5.4.2 Performance requirements	21
5.4.2.1 Use case: Moving Location Target	21
5.4.2.1.1 Operational environment: Open area.....	21
5.4.2.1.2 Operational environment: Urban area	21
5.4.2.1.3 Operational environment: Asymmetric area.....	22
5.4.2.2 Use case: Static Location Target	22
5.4.2.2.1 Operational environment: Open area.....	22
5.4.2.2.2 Operational environment: Urban area	22
5.4.2.2.3 Operational environment: Asymmetric area.....	22

5.5	Time-to-First-Fix (TTFF).....	23
5.5.1	Definition.....	23
5.5.2	GBLS starting conditions.....	23
5.5.3	Performance requirements.....	24
5.5.3.1	Use case: Moving Location Target.....	24
5.5.3.1.1	Operational environment: Open area.....	24
5.5.3.1.2	Operational environment: Urban area.....	24
5.5.3.1.3	Operational environment: Asymmetric area.....	24
5.5.3.2	Use case: Static Location Target.....	25
5.5.3.2.1	Operational environment: Open area.....	25
5.5.3.2.2	Operational environment: Urban area.....	25
5.5.3.2.3	Operational environment: Asymmetric area.....	25
5.6	Position Authenticity.....	26
5.6.1	Definition.....	26
5.6.2	Metrics.....	26
5.6.3	Performance requirements.....	26
5.6.3.1	Specific conditions and interference threat scenarios.....	26
5.6.3.2	Use case: Moving Location Target.....	27
5.6.3.2.1	Operational environment: Open area.....	27
5.6.3.2.2	Operational environment: Interference (Spoofing) Scenario.....	27
5.6.3.3	Use case: Static Location Target.....	27
5.6.3.3.1	Operational environment: Open area.....	27
5.6.3.3.2	Operational environment: Interference (Spoofing) scenarios.....	28
5.7	Robustness to Interference.....	28
5.7.1	Definition.....	28
5.7.2	Metrics.....	28
5.7.3	Performances requirements.....	28
5.7.3.1	Specific conditions and operational environment.....	28
5.7.3.2	Use case 1: 20 MHz FM deviation.....	29
5.7.3.3	Use case 2: 10 MHz FM deviation.....	29
5.8	GNSS Sensitivity.....	30
5.8.1	Definition.....	30
5.8.2	Metrics.....	30
5.8.3	Performance requirements.....	30
5.8.3.1	Operational scenario and specific masking conditions.....	30
5.8.3.2	Use case 1: Open area and fine time assistance.....	31
5.8.3.3	Use case 2: Asymmetric area and coarse time assistance.....	31
5.9	Position Integrity (Protection Level).....	31
5.9.1	Definition.....	31
5.9.2	Operational conditions.....	32
5.9.3	Use case: Moving Location Target.....	32
5.10	Position day-to-day repeatability in the Horizontal Plane.....	32
5.10.1	Definition.....	32
5.10.2	Metrics.....	33
5.10.3	Performance requirements.....	34
5.10.3.1	Use case: Moving Location Target.....	34
5.10.3.1.1	Operational environment: Open area.....	34
5.10.3.1.2	Operational environment: Urban area.....	34
5.10.3.1.3	Operational environment: Asymmetric area.....	34
5.10.3.2	Use case: Static Location Target.....	34
5.10.3.2.1	Operational environment: Open area.....	34
5.10.3.2.2	Operational environment: Urban area.....	35
5.10.3.2.3	Operational environment: Asymmetric area.....	35
5.11	Position day-to-day repeatability in the Vertical Plane.....	35
5.11.1	Definition.....	35
5.11.2	Metrics.....	35
5.11.3	Performance requirements.....	36
5.11.3.1	Use case: Moving Location Target.....	36
5.11.3.1.1	Operational environment: Open area.....	36
5.11.3.1.2	Operational environment: Urban area.....	37
5.11.3.1.3	Operational environment: Asymmetric area.....	37
5.11.3.2	Use case: Static Location Target.....	37

5.11.3.2.1	Operational environment: Open area.....	37
5.11.3.2.2	Operational environment: Urban area	38
5.11.3.2.3	Operational environment: Asymmetric area.....	38
5.12	Time-to-Fix-Ambiguity (TTFA)	38
5.12.1	Definition.....	38
5.12.2	Metrics	38
5.12.3	Performance requirements	39
5.12.3.1	Use case: Moving Location Target	39
5.12.3.1.1	Operational environment: Open area.....	39
5.12.3.1.2	Operational environment: Urban area	39
5.12.3.1.3	Operational environment: Asymmetric area.....	39
5.12.3.2	Use case: Static Location Target.....	40
5.12.3.2.1	Operational environment: Open area.....	40
5.12.3.2.2	Operational environment: Urban area	40
5.12.3.2.3	Operational environment: Asymmetric area.....	40
Annex A (normative):	Applicable Conditions and Scenarios.....	42
A.1	General	42
A.2	External Location Systems Parameters	42
A.2.1	GNSS system parameters	42
A.2.2	Wireless systems parameters	42
A.3	Operational Environments.....	43
A.3.1	Operational Environments definition	43
A.3.2	Sky Attenuation Conditions	43
A.3.3	Multipath Level	45
A.3.4	Magnetic Conditions	45
A.3.4.1	Output model	45
A.3.4.2	Perturbation level.....	46
A.3.5	Telecommunications Beacons	46
A.4	Moving Location Target Scenario - Track trajectory.....	47
A.5	Moving Location Target Scenario - Straight line trajectory.....	48
A.6	Interference source definition.....	48
A.7	Authenticity Threat Scenarios	49
A.7.1	Scenarios description.....	49
A.7.2	Moving Location Targets	49
A.7.3	Static Location Targets.....	49
A.7.4	Scenario parameters	50
A.7.4.1	Attack classification.....	50
A.7.4.2	Total spoofing power.....	50
A.7.4.3	Misleading information categories	51
A.8	Integrity Threat Scenarios	51
A.8.1	Integrity Threat definition	51
A.8.2	Non-LoS tracking	51
A.8.3	Pseudo-range Ramp errors	52
Annex B (informative):	Differential GNSS: GBLS implementing differential GNSS and integrity performance through RTCM standards.....	53
B.1	Specific case of a GBLS implementing differential GNSS.....	53
B.2	D-GNSS monitoring and integrity concept in RTCM standards.....	54
B.2.1	Overall concept and implementation	54
B.2.2	Monitoring and alerting	55
B.2.3	D-GNSS integrity performance and system implementation	55
Annex C (informative):	Bibliography.....	57
History		58

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPR's not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document is part 3 of a multi-part deliverable. Full details of the entire series can be found in part 1 [7].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The increasing expansion of location-based applications aims to satisfy more and more complex and diversified user requirements: this is highlighted for example by the widespread adoption of multi-functional smart-phones or by the ever wider adoption of tracking devices (e.g. in transport), etc. This requirement for new and innovative location-based applications is generating a requirement for increasingly complex location systems.

The wide spectrum of location-based applications identified in ETSI TR 103 183 [i.1] calls for a new and broader concept for location systems, taking into account solutions in which GNSS technologies are complemented with other technologies to improve robustness and performance. The notion of **GNSS-based location systems** is introduced and defined in the present document.

Additional clauses and information related to the implementation in **GNSS-based location systems** of the various differential GNSS technologies, namely D-GNSS, RTK and PPP are also included in order to facilitate the use of this set of standards by manufacturers and service providers.

1 Scope

This multi-part deliverable addresses integrated GNSS based location systems (GBLS) that combine Global Navigation Satellite Systems (GNSS), with other navigation technologies, as well as with telecommunication networks in order to deliver location-based services to users. As a consequence the present document is not applicable to GNSS only receivers.

This multi-part deliverable proposes a list of functional and performance requirements and related test procedures. For each performance requirement, different classes are defined allowing the benchmark of different GBLS addressing the same applications.

The present document defines Performance Features applicable to GBLS and specifies the conditions and requirements for these Performance Features.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are necessary for the application of the present document.

- [1] European GNSS (Galileo) Open Service (Issue 1.1): "Signal In Space Interface Control Document".
- [2] IS-GPS-200D: "Navstar GPS Space Segment/Navigation User Interfaces", March 7, 2006.
- [3] IS-GPS-705D: "Navstar GPS Space Segment/User Segment L5 Interfaces", September 24, 2013.
- [4] IS-GPS-800D: "Navstar GPS Space Segment/User Segment L1C Interfaces", September 24, 2013.
- [5] "Global Navigation Satellite System GLONASS Interface Control Document", Version 5.1, 2008.
- [6] BDS-SIS-ICD-B1I-2.0 (December 2013): "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal (Version 2.0)".
- [7] ETSI TS 103 246-1: "Satellite Earth Stations and Systems (SES); GNSS based location systems; Part 1: Functional requirements".
- [8] ETSI TS 103 246-2: "Satellite Earth Stations and Systems (SES); GNSS based location systems; Part 2: Reference Architecture".
- [9] RTCM 10402.3: "Recommended Standards for Differential GNSS (Global Navigation Satellite Systems) Service".
- [10] RTCM 10401.2: "Standard for Differential Navstar GPS Reference Stations and Integrity Monitors (RSIM)".
- [11] RTCM 10403.2: "Differential GNSS (Global Navigation Satellite Systems) Services".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 103 183: "Satellite Earth Stations and Systems (SES); Global Navigation Satellite Systems (GNSS) based applications and standardisation needs".
- [i.2] IEEE 802.11™: "IEEE Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".
- [i.3] IEEE 802.15™: "Wireless Personal Area Network".
- [i.4] IEEE 802.15.1™: "IEEE Standard for Telecommunications and Information Exchange Between Systems - LAN/MAN - Specific Requirements - Part 15: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Wireless Personal Area Networks (WPANs)".
- [i.5] IEEE 802.15.4a™: "IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs): Amendment 1: Add Alternate PHY".
- [i.6] ETSI TS 145 001: "Digital cellular telecommunications system (Phase 2+); Physical layer on the radio path; General description (3GPP TS 45.001)".
- [i.7] ETSI TS 125 104: "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (FDD) (3GPP TS 25.104)".
- [i.8] ETSI TS 136 171: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for Support of Assisted Global Navigation Satellite System (A-GNSS) (3GPP TS 36.171)".
- [i.9] R. Grover Brown and Gerald Y. Chin: "GPS RAIM: Calculation of Threshold and Protection Radius Using Chi-Square Methods - A Geometric Approach", Global Positioning System: Inst. Navigat., Volume V, pages 155-179, 1997.
- [i.10] Juan Blanch et al.: "An Optimized Multiple Hypothesis RAIM Algorithm for Vertical Guidance", Proceedings of ION GNSS 2007, Fort Worth (TX) September 2007.
- [i.11] Miguel Azaola et al.: "Isotropy-Based Protection Levels: a Novel Method for Autonomous Protection Level Computation with Minimum Assumptions", NAVITEC 2008, Noordwijk (The Netherlands), December 2008.
- [i.12] Clark B., Bevely D.: "FDE Implementations for a Low-Cost GPS/INS Module", 22nd International Meeting of the Satellite Division of The Institute of Navigation, Savannah, GA, September 22-25, 2009.
- [i.13] Walter T., Enge P., Blanch J. and Pervan B.: "Worldwide Vertical Guidance of Aircraft Based on Modernised GPS and New Integrity Augmentations", Proceedings of the IEEE Volume 96, Number 12, December 2008.
- [i.14] Gratton L., Joerger M., Pervan B.: "Carrier Phase Relative RAIM Algorithms and Protection Level Derivation", Journal of Navigation Volume 63, Number 2, April 2010.
- [i.15] Lee Y: "Optimization of Position Domain Relative RAIM", ION GNSS 21st International Technical Meeting of the Satellite Division, Savannah, GA, September 16-19, 2008.

- [i.16] M. Spangenberg PhD Thesis: "Safe navigation for vehicles", Ecole doctorale Mathématiques, Informatique et Télécommunications de Toulouse, Laboratoire de Télécommunications Spatiales et Aéronautiques (TéSA), June 2009.
- [i.17] J.L. Farrell: "Full integrity testing for GPS/INS", Journal of the institute of navigation Volume 53, Number 1, Spring 2006, USA.
- [i.18] Clark B., Bevely D.: "FDE Implementations for a Low-Cost GPS/INS Module", 22nd International Meeting of the Satellite Division of The Institute of Navigation, Savannah, GA, September 22-25, 2009.
- [i.19] DO-316: "Minimum Operational Performance Standards for Global Positioning System/Aircraft Base Augmentation System".
- [i.20] Void.
- [i.21] IALA Guideline No 1112 on Performance and Monitoring of DGNSS Services in the Frequency Band 283.5 - 325 kHz - Edition 1, May 2015.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

assistance: use of position data available from a telecommunications network to enable a GNSS receiver to acquire and calculate position (A-GNSS) under adverse satellite reception conditions

authentication: provision of assurance that the location-related data associated with a location target has been derived from real and not falsified signals

availability: percentage of time when a location system is able to provide the required location-related data

Class A, B, C: categorization of the performance level of the GBLs for a given performance feature

NOTE: In all cases Class A is the highest performance class and C is the lowest.

carrier phase measurement: measure of the range between the satellite and receiver expressed in units of cycles of the carrier frequency

continuity: likelihood that the location system functionality will be available during the complete duration of the intended operation if the system is operational at the beginning of the operation

D-GNSS: technique aiming at enhancing position accuracy and integrity of a GNSS receiver by using differential pseudorange corrections and "do not use flag" for faulty satellites delivered by a GNSS reference station located at a known location

NOTE: In the present document, the term D-GNSS refer to conventional differential GNSS.

electromagnetic interference: any source of RF transmission that is within the frequency band used by a communication link, and that degrades the performance of this link

GNSS based location system (GBLS): location system using GNSS as the primary source of positioning

GNSS only receiver: location receiver using GNSS as the unique source of positioning

Horizontal Dilution Of Precision (HDOP): measure of position determination accuracy that is a function of the geometrical layout of the satellites used for the fix, relative to the receiver antenna

integrity: measure of the trust in the accuracy of the location-related data provided by the location system and the ability to provide timely and valid warnings to users when the location system does not fulfil the condition for intended operation

jamming: deliberate transmission of interference to disrupt processing of wanted signals (which in this case are GNSS or telecommunications signals)

NOTE: Spoofing is considered to be a deceptive form of jamming.

latency: measure of the time elapsed between the event triggering the determination of the location-related data for a location target and the availability of the location-related data at the user interface

localisation: process of determining the position or location of a location target

location: 3-dimensional position or location

location-based application: application which is able to deliver a service to one or several users, built on the processing of the location information (location-related data) related to one or several targets

location-related data: set of data associated with a given location target, containing at least one or several of the following time-tagged information elements:

- location target position,
- location target motion indicators (velocity and acceleration), and
- Quality of Service indicators (estimates of the position accuracy, reliability or authenticity)

location system: system responsible for providing to a location based application the location-related data of one or several location targets

location target: physical entity on whose position the location system builds the location-related data

NOTE: This entity may be mobile or stationary.

Observed Time Difference Of Arrival (OTDOA): time interval observed between the reception of downlink signals from two different cells (in a cellular telecoms system)

NOTE: If a signal from cell 1 is received at the moment t_1 , and a signal from cell 2 is received at the moment t_2 , the OTDOA is $t_2 - t_1$

performance feature: set of performance requirements for a given location-related data category produced by the GBLS

position: 3-dimensional position or location

positioning: process of determining the position or location of a location target

Precise Point Positioning (PPP): Differential GNSS technique that uses a worldwide distributed network of reference stations to provide, in quasi real time, a highly accurate geodetic positioning of a receiver

privacy: function of a location system that aims at ensuring that the location target user private information (identity, bank accounts, etc.) and its location-related data cannot be accessed by a non-authorized third party

Protection Level (PL): upper bound to the positioning error such that the probability: $P(\epsilon > PL) < I_{\text{risk}}$, where I_{risk} is the integrity risk and ϵ is the position error

NOTE: The protection level is provided by the location system, and with the integrity risk, is one of the two sub-features of the integrity system.

pseudorange: pseudo distance between a satellite and a navigation receiver computed by multiplying the propagation delay determined by the receiver with the speed of light

Pseudo Range Correction (PRC): simple difference between a pseudorange measured by a GNSS reference station, set at a known location and the estimated range between the satellite and this known location

Real Time Kinematic (RTK): particular Differential GNSS technique that provides, in real time, highly accurate positioning of a target based on carrier phase measurements

NOTE 1: In the RTK context, the target is called the "rover", as opposed to the stationary reference station(s). RTK makes use of the carrier phase measurements, both in the reference station and in the rover, and this technique allows the ambiguities affecting these accurate measurements to be resolved.

NOTE 2: If the reference station is at an accurately known location, the rover can compute its accurate geodetic (or absolute) location. Alternatively, if the reference station's geodetic location is only roughly known, RTK can still provide high accuracy, but only on a relative and not absolute basis.

reference receiver: receiver placed at a known and surveyed position used for differential GNSS technique

NOTE: A reference receiver is an essential component of a reference station.

reference station: station placed at a known and surveyed position aiming at determining and sharing the systematic errors of at least one GNSS constellation

security: function of a location system that aims at ensuring that the location-related data is safeguarded against unapproved disclosure or usage inside or outside the *location system*, and that it is also provided in a secure and reliable manner that ensures it is neither lost nor corrupted

spoofing: transmission of signals intended to deceive location processing into reporting false location target

time-to-alert: time from when an unsafe integrity condition occurs to when an alerting message reaches the user

User Differential Range Error (UDRE): 1-sigma estimate of the pseudorange correction range error

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	3 rd Generation Partnership Project
A-GNSS	Assisted GNSS
DGNSS	Differential GNSS
D-GNSS	Differential GNSS
EGNOS	European Geostationary Navigation Overlay System
EMI	Electro-Magnetic Interference
EN	East/North
E-UTRA	Evolved - UMTS Terrestrial Radio Access
FFS	For Further Study
FM	Frequency Modulation
GBLS	GNSS based Location System
GIC	GNSS Integrity Channel
GLONASS	Global Navigation Satellite System (Russian based system)
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSM	Global System for Mobile communications
HDOP	Horizontal Dilution of Precision
HPE	Horizontal Positioning Error
HPL	Horizontal Protection Level
IALA	International Association of Lighthouse Authorities
IM	Integrity Monitor
IMO	International Maritime Organization
INS	Inertial Navigation Sensor
ITS	Intelligent Transport Systems
LoS	Line of Sight
LTE	Long-Term Evolution
n/a	Not Applicable
NRTK	Network RTK
OS	Open Service
OTDOA	Observed Time Difference of Arrival
PL	Protection Level

PPP	Precise Point Positioning
PVT	Position, Velocity and Time
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radio Frequency
RMS	Root Mean Square
RTCM	Radio Technical Commission for Maritime Services
RTK	Real Time Kinematic
SF	Scale Factor
TSP	Total Spoofing Power
TTFA	Time To Fix Ambiguity
TTFF	Time-To-First-Fix
UDRE	User Differential Range Error
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
Wi-Fi	Wireless Fidelity
WPAN	Wireless Personal Area Network

4 Overview of GNSS based Location System Performance Features and Classes

4.1 GNSS based Location System (GBLS)

The present document defines the performance requirements applicable to GNSS based Location System (GBLS) location-related data.

GBLS Functional Requirements and Reference Architecture in ETSI TS 103 246-1 [7] and ETSI TS 103 246-2 [8] shall apply. A GBLS intends to provide one or more users with location-related data associated with one or more location targets. Figure 1.A is an extract of ETSI TS 103 246-2 [8] and depicts the GBLS high level architecture, level 1, and Figure 1.B depicts the level 2 architecture.

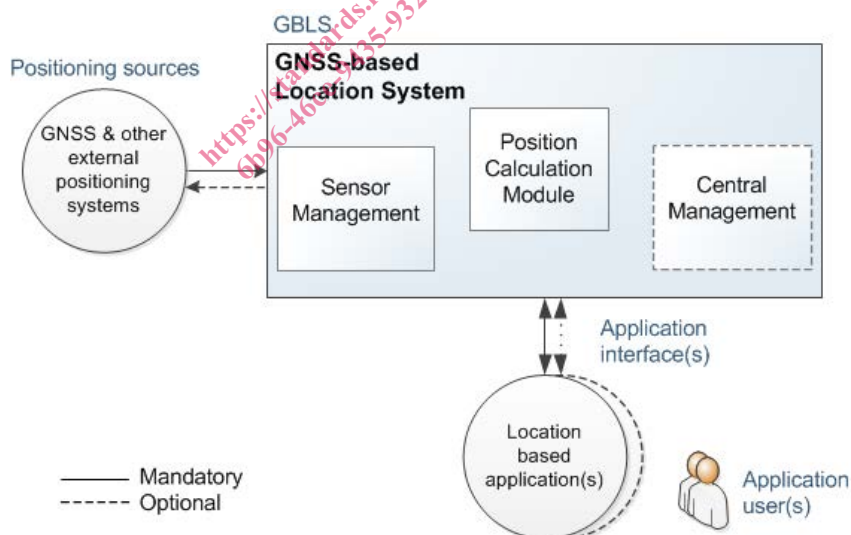


Figure 1.A: GNSS based Location System (GBLS) Architecture (level 1)

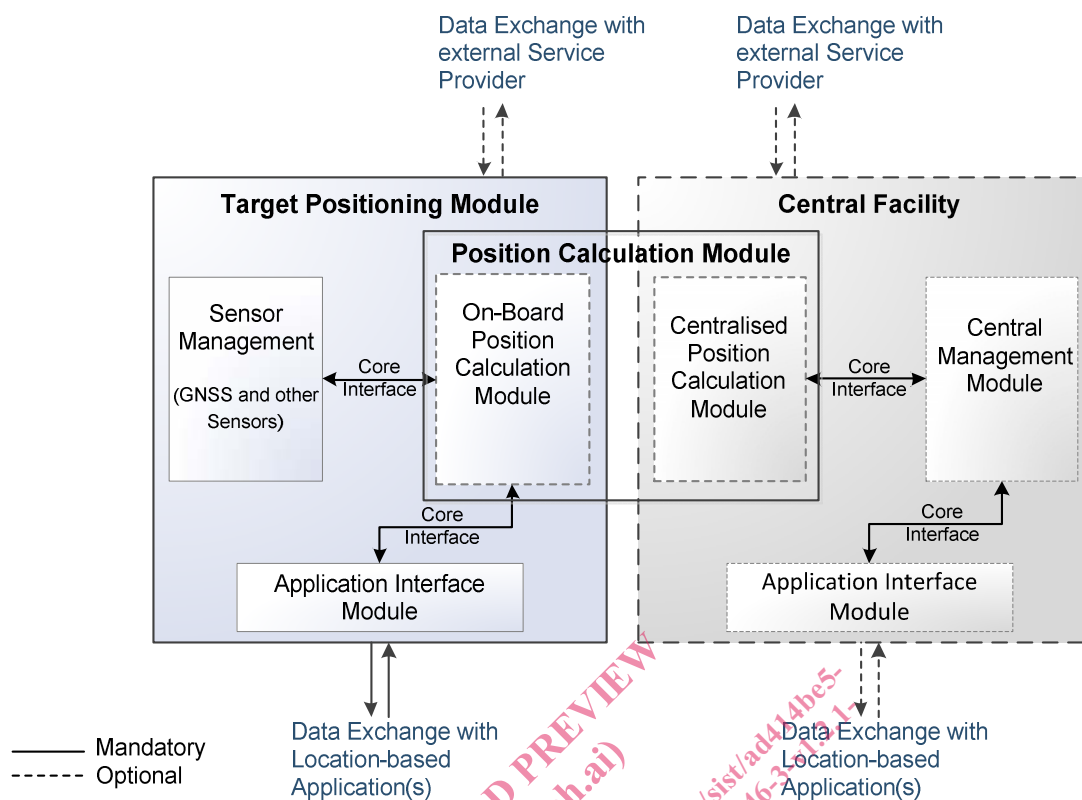


Figure 1.B: GNSS based Location System (GBLS) Architecture (level 2)

4.2 Performance Features

Location-related data delivered by a GNSS based Location System is required to meet a number of performance requirements, derived from GBLS Functional requirements ETSI TS 103 246-1 [7]. These performance requirements are grouped in categories called Performance Features.

A detailed definition of each Performance Feature with its attributes and metrics is given in clause 5. Table 1 lists the Performance Features included in this technical specification and other additional features identified but left for further study (FFS).