# Location and Navigation Service (LNS)

***Bluetooth*®** **Implementation Conformance Statement (ICS) Proforma**

- **Revision:** LNS.ICS.p6
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- **Prepared By:** BTI
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# Contents

# 1   General principles

## 1.1      Implementation Under Test (IUT) identification

Using the Bluetooth SIG qualification tool, the implementer is expected to declare details about what will be implemented.

## 1.2      Enforcement of inter-layer dependencies

This ICS includes one or more tables with inter-layer dependencies (ILDs). ILDs are used for specification requirements that are dependent on other supporting specifications. ILDs can refer to an individual ICS item in a separate layer (individual ILD), or it can refer to the full layer (full-layer ILD).

ILDs residing in an X2Core layer will be enforced from the Bluetooth SIG qualification tool in the following conditions, depending on where the referred ILD is residing:

| Referred ILD resides in | Individual ILD | Full-layer ILD |
|---|---|---|
| Controller layer | Core-Complete configuration, or Referred layer is supported | N/A |
| Lower HCI layer | HCI is supported | N/A |
| Upper HCI layer | Core-Host configuration, or UHCI is supported | N/A |
| Host layer | Core-Host configuration, or Core-Complete configuration, or Referred layer is supported | N/A |
| X2Core layer | Core-Host configuration, or Core-Complete configuration, or Referred layer is supported | Core-Host configuration, or Core-Complete configuration |

*Table 1.1: Enforcement of an ILD within the Bluetooth SIG qualification tool*

# 2   ICS declarations

## 2.1      Versions

**Table 0: X.Y Versions**

| Item | Version | Reference | Status |
|---|---|---|---|
| 1 | LNS v1.0 | [1] | M |

**Table 0a: No longer used**

**Table 0b: X.Y.Z Versions**

| Item | Version | Reference | Status |
|---|---|---|---|
| 1 | LNS v1.0.1 | [3] | O |

## 2.2      Transports

**Table 1: Transport Requirements**

| Item | Transport | Reference | Status |
|---|---|---|---|
| 1 | Service supported over BR/EDR | [1] 1.5 | C.1, C.3 |
| 2 | Service supported over LE | [1] 1.5 | C.2, C.3 |

C.1:    Excluded for this Service IF CORE 41/2 "LE Core Configuration" OR CORE 40/1 "Core-Controller".

C.2:    Excluded for this Service IF CORE 41/1 "BR/EDR Core Configuration" OR CORE 40/1 "Core-Controller".

C.3:    Mandatory to support at least one.

## 2.3      Service requirements

**Table 2: Feature Requirements**

| Item | Capability | Reference | Status |
|---|---|---|---|
| 1 | Instantaneous Speed | [1] 3.2.1.2 | O |
| 2 | Total Distance | [1] 3.2.1.3, 3.4.2.1 | O |
| 3 | Location | [1] 3.2.1.4 | O |
| 4 | Elevation | [1] 3.2.1.5 | O |
| 5 | Heading | [1] 3.2.1.6 | O |
| 6 | Rolling Time | [1] 3.2.1.7 | O |
| 7 | UTC Time | [1] 3.2.1.8 | O |
| 8 | Remaining Distance | [1] 3.5.1.4 | C.1 |
| 9 | Remaining Vertical Distance | [1] 3.5.1.5 | C.1 |
| 10 | Estimated Time of Arrival | [1] 3.5.1.6 | C.1 |
| 11 | Number of Beacons in Solution | [1] 3.3.1.2 | O |
| 12 | Number of Beacons in View | [1] 3.3.1.3 | O |

| Item | Capability | Reference | Status |
|------|-----------|-----------|--------|
| 13 | Time to First Fix | [1] 3.3.1.4 | O |
| 14 | Estimated Horizontal Position Error | [1] 3.3.1.5 | O |
| 15 | Estimated Vertical Position Error | [1] 3.3.1.6 | O |
| 16 | Horizontal Dilution of Precision | [1] 3.3.1.7 | O |
| 17 | Vertical Dilution of Precision | [1] 3.3.1.8 | O |
| 18 | Location and Speed Content Masking | [1] 3.4.2.2 | O |
| 19 | Fix Rate Setting | [1] 3.4.2.7 | O |
| 20 | Elevation Setting | [1] 3.4.2.8 | O |
| 21 | Navigation | [1] 3.5, 3.4.2.3, 3.4.3.4, 3.4.2.5, 3.4.2.6 | O |

C.1:      Optional IF LNS 2/21 "Navigation", otherwise Excluded.

**Table 3: Service Requirements**

| Item | Capability | Reference | Status |
|------|-----------|-----------|--------|
| 1 | Location and Navigation Service | [1] 2 | M |
| 2 | Location and Navigation Feature Characteristic | [1] 3.1 | M |
| 3 | Location and Speed Characteristic | [1] 3.2 | M |
| 4 | Instantaneous Speed Field of Location and Speed Characteristic | [1] 3.2.1.2 | C.1 |
| 5 | Total Distance Field of Location and Speed Characteristic | [1] 3.2.1.3 | C.2 |
| 6 | Total Distance Field of Location and Speed Characteristic | [1] 3.2.1.4 | C.3 |
| 7 | Elevation Field of Location and Speed Characteristic | [1] 3.2.1.5 | C.4 |
| 8 | Heading Field of Location and Speed Characteristic | [1] 3.2.1.6 | C.5 |
| 9 | Rolling Time Field of Location and Speed Characteristic | [1] 3.2.1.7 | C.6 |
| 10 | UTC Time Field of Location and Speed Characteristic | [1] 3.2.1.8 | C.7 |
| 11 | Navigation Characteristic | [1] 3.5 | O |
| 12 | Bearing Field of the Navigation Characteristic | [1] 3.5.1.2 | C.8 |
| 13 | Heading Field of the Navigation Characteristic | [1] 3.5.1.3 | C.8 |
| 14 | Remaining Distance Field of the Navigation Characteristic | [1] 3.5.1.4 | C.9 |
| 15 | Remaining Vertical Distance Field of the Navigation Characteristic | [1] 3.5.1.5 | C.10 |
| 16 | Estimated Time of Arrival Field of the Navigation Characteristic | [1] 3.5.1.6 | C.11 |
| 17 | Position Quality Characteristic | [1] 3.3 | O |
| 18 | Number of Satellites in Solution Field of the Position Quality characteristic | [1] 3.3.1.2 | C.12 |
| 19 | Number of Satellites in View Field of the Position Quality Characteristic | [1] 3.3.1.3 | C.13 |

| Item | Capability | Reference | Status |
|------|-----------|-----------|--------|
| 20 | Time to First Fix Field of the Position Quality Characteristic | [1] 3.3.1.4 | C.14 |
| 21 | Estimated Horizontal Position Error Field of the Position Quality Characteristic | [1] 3.3.1.5 | C.15 |
| 22 | Estimated Vertical Position Error Field of the Position Quality Characteristic | [1] 3.3.1.6 | C.16 |
| 23 | Horizontal Dilution Of Precision Field of the Position Quality Characteristic | [1] 3.3.1.7 | C.17 |
| 24 | Vertical Dilution Of Precision Field of the Position Quality Characteristic | [1] 3.3.1.8 | C.18 |
| 25 | LN Control Point Characteristic | [1] 3.4 | C.19 |
| 26 | Set Cumulative Value Procedure – Set to zero | [1] 3.4.1, 3.4.2.1 | C.2 |
| 27 | Set Cumulative Value Procedure – Set to non-zero | [1] 3.4.1, 3.4.2.1 | C.2 |
| 28 | Mask Location and Speed Characteristic Content | [1] 3.4.1, 3.4.2.2 | C.20 |
| 29 | Navigation Control Procedure | [1] 3.4.1, 3.4.2.3 | C.8 |
| 30 | Request Number of Routes Procedure | [1] 3.4.1, 3.4.2.4 | C.8 |
| 31 | Request Name of Route Procedure | [1] 3.4.1, 3.4.2.5 | C.8 |
| 32 | Select Route Procedure | [1] 3.4.1, 3.4.2.6 | C.8 |
| 33 | Set Fix Rate Procedure | [1] 3.4.1, 3.4.2.7 | C.21 |
| 34 | Set Elevation Procedure | [1] 3.4.1, 3.4.2.8 | C.22 |
| 35 | Indications for changes of supported features | [3] 3, 3.1.1 | C.23 |

C.1:    Mandatory IF LNS 2/1 "Instantaneous Speed", otherwise Excluded.

C.2:    Mandatory IF LNS 2/2 "Total Distance", otherwise Excluded.

C.3:    Mandatory IF LNS 2/3 "Location", otherwise Excluded.

C.4:    Mandatory IF LNS 2/4 "Elevation", otherwise Excluded.

C.5:    Mandatory IF LNS 2/5 "Heading", otherwise Excluded.

C.6:    Mandatory IF LNS 2/6 "Rolling Time", otherwise Excluded.

C.7:    Mandatory IF LNS 2/7 "UTC Time", otherwise Excluded.

C.8:    Mandatory IF LNS 2/21 "Navigation", otherwise Excluded.

C.9:    Mandatory IF LNS 2/8 "Remaining Distance", otherwise Excluded.

C.10:   Mandatory IF LNS 2/9 "Remaining Vertical Distance", otherwise Excluded.

C.11:   Mandatory IF LNS 2/10 "Estimated Time of Arrival", otherwise Excluded.

C.12:   Mandatory IF LNS 2/11 "Number of Beacons in Solution", otherwise Excluded.

C.13:   Mandatory IF LNS 2/12 "Number of Beacons in View", otherwise Excluded.

C.14:   Mandatory IF LNS 2/13 "Time to First Fix", otherwise Excluded.

C.15:   Mandatory IF LNS 2/14 "Estimated Horizontal Position Error", otherwise Excluded.

C.16:   Mandatory IF LNS 2/15 "Estimated Vertical Position Error", otherwise Excluded.

C.17:   Mandatory IF LNS 2/16 "Horizontal Dilution of Precision", otherwise Excluded.

C.18:   Mandatory IF LNS 2/17 "Vertical Dilution of Precision", otherwise Excluded.

C.19:   Mandatory IF LNS 2/2 "Total Distance" OR LNS 2/18 "Location and Speed Content Masking" OR LNS 2/19 "Fix Rate Setting" OR LNS 2/20 "Elevation Setting" OR LNS 2/21 "Navigation", otherwise Excluded.

C.20:   Mandatory IF LNS 2/18 "Location and Speed Content Masking", otherwise Excluded.

C.21:   Mandatory IF LNS 2/19 "Fix Rate Setting", otherwise Excluded.

C.22:     Mandatory IF LNS 2/20 "Elevation Setting", otherwise Excluded.

C.23:     Optional IF LNS 0/1 "LNS v1.0" AND NOT LNS 0b/1 "LNS v1.0.1", otherwise Mandatory.

#### Table 3a: Indications for changes of supported features

*Prerequisite: LNS 3/35 "Indications for changes of supported features"*

| Item | Capability | Reference | Status |
|------|------------|-----------|--------|
| 1 | Changeable LNS Feature | [3] 3 | O |
| 2 | LNS Feature characteristic indication | [3] 3.1.1 | C.1 |

C.1:     Mandatory IF LNS 3a/1 "Changeable LNS Feature" AND (LNS 6/1 "Bondable mode (BR/EDR)"
         OR LNS 6/2 "Bondable mode (LE)"), otherwise Excluded.

## 2.4     GATT requirements

#### Table 4: GATT Requirements

| Item | Capability | Reference | Status | Inter-Layer Dependency |
|------|------------|-----------|--------|------------------------|
| 1 | No longer used | N/A | N/A | N/A |
| 1a | GATT Server over BR/EDR | [1] 1.4 | C.2 | [2] GATT 1a/4 |
| 1b | GATT Server over LE | [1] 1.4 | C.3 | [2] GATT 1a/3 |
| 2 | Write Characteristic Value | [1] 1.4 | C.1 | [2] GATT 4/14 |
| 3 | Single Notification | [1] 1.4 | M | [2] GATT 4/17 |
| 4 | Indication | [1] 1.4 | C.1 | [2] GATT 4/18 |
| 5 | Read Characteristic Descriptor | [1] 1.4 | M | [2] GATT 4/19 |
| 6 | Write Characteristic Descriptor | [1] 1.4 | M | [2] GATT 4/21 |

C.1:     Mandatory IF LNS 3/25 "LN Control Point Characteristic", otherwise not defined.

C.2:     Mandatory IF LNS 1/1 "Service supported over BR/EDR", otherwise not defined.

C.3:     Mandatory IF LNS 1/2 "Service supported over LE", otherwise not defined.

## 2.5     SDP requirements

#### Table 5: SDP Requirements

*Prerequisite: LNS 1/1 "Service supported over BR/EDR"*

| Item | Capability | Reference | Status |
|------|------------|-----------|--------|
| 1 | SDP record present for LNS | [1] 4 | M |
| 2–3 | No longer used | N/A | N/A |

## 2.6    GAP requirements

**Table 6: GAP Requirements**

| Item | Capability | Reference | Status | Inter-Layer Dependency |
|------|-----------|-----------|--------|------------------------|
| 1 | Bondable mode (BR/EDR) | [1] 3 | O | [4] GAP 1/7 |
| 2 | Bondable mode (LE) | [1] 3 | O | [4] GAP 24/2 |
| 3 | Bonding procedure | [1] 3 | C.1 | [4] GAP 24/3 |

C.1:    Mandatory IF LNS 6/2 "Bondable mode (LE)", otherwise not defined.

# 3  References

[1]    Location and Navigation Service Specification, Version 1.0 or later

[2]    ICS Proforma for Generic Attribute Profile (GATT)

[3]    Location and Navigation Service Specification, Version 1.0.1

[4]    ICS Proforma for Generic Access Profile (GAP)

# 4 Revision history and acknowledgments

*Revision History*

| Publication Number | Revision Number | Date | Comments |
|---|---|---|---|
| 0 | 1.0.0 | 2013-04-30 | Release for publication. |
| | 1.0.1r00 | 2014-10-06 | TSE 5641: Removed references to CSA in the Core Specification Version table (0a) and Core Specification Reference [1]. |
| 1 | 1.0.1 | 2014-12-05 | Prepare for TCRL 2014-2 publication |
| | 1.0.2r00 | 2015-05-10 | TSE 5998: Revised statuses and conditionals in Table 3 to remove duplicate entries |
| | 1.0.2r01 | 2015-06-04 | Deleted Section 1.2 (Global Statement of Conformance) per current ICS template standards. |
| | 1.0.2r02 | 2015-06-09 | Review by Alicia Courtney. Converted to current document template. |
| 2 | 1.0.2 | 2015-07-14 | Prepared for TCRL 2015-1 publication. |
| | 1.0.2 edition 2r00 | 2018-11-26 | Editorial changes only. Template updated. Revision History and contributors moved to the end of the document. |
| | 1.0.2 edition 2 | 2020-01-07 | Updated copyright page and confidentiality markings to support new Documentation Marking Requirements, performed minor formatting updates, and accepted all tracked changes to prepare for edition 2 publication. |
| | p3r00 | 2022-03-23 | TSE 18674 (rating 1): Removed Table 0a because it is no longer used.<br>TSE 18721 (rating 1): Editorials to align the document with the latest ICS template in anticipation of a future .Z release.<br>Editorials, including assigning publication number 2 to previous v1.0.2, consistency checker updates, and aligning the copyright page with v2 of the DNMD. |
| 3 | p3 | 2022-06-28 | Approved by BTI on 2022-05-31. Prepared for TCRL 2022-1 publication. |
| | p4r00 | 2023-10-05 | TSE 23670 (rating 2): Resolved GATT and SDP inter-layer dependencies. In Table 4, marked Item 4 as no longer used and added Items 1a and 1b and conditionals C.2 and C.3. In Table 5, deleted the ILD column, updated the Capability and Reference values for Item 1, and marked Items 2 and 3 as no longer used. Updated the references.<br>Made editorial edits to align the document with the latest ICS template, including updates to section and table titles. |
| 4 | p4 | 2024-07-01 | Approved by BTI on 2024-04-21. Prepared for TCRL 2024-1 publication. |

| Publication Number | Revision Number | Date | Comments |
|---|---|---|---|
| | p5r00–r04 | 2024-08-02 – 2024-08-28 | TSE 16707 (rating 4): Per E16267, added Tables 0b and 3a. Added Item 3/35 and C.23 to Table 3. Added new section and Table 6 for GAP requirements. Updated the references list and the acknowledgments.<br><br>TSE 25580 (rating 1): Per E16267, E16268, and E18753, added new X.Y.Z version as part of the .Z release. Added a reference for Location and Navigation Service Specification, Version 1.0.1. |
| 5 | p5 | 2024-10-08 | Approved by BTI on 2024-09-11. LNS v1.0.1 adopted by the BoD on 2024-10-01. Prepared for TCRL 2024-2-addition publication. |
| | p5ed2r00 | 2025-07-10 | TSE 27330 (rating 1): Updated the Status for LNS 1/1 and LNS 1/2, added conditions C.1 and C.2, and renumbered the previous C.1 as C.3. Updated the Capability for LNS 4/3. |
| | p5 edition 2 | 2025-08-05 | Approved by BTI on 2025-08-05. Prepared for edition 2 publication. |
| | p6r00–r01 | 2025-12-04 – 2026-01-09 | TSE 28169 (rating 1): Updated the conditions in the transport table to make sure the layer is excluded when the design is an implementation of the Core-Controller Configuration by adding "OR CORE 40/1 "Core-Controller"" to an already excluded transport based on Core Configuration support. |
| 6 | p6 | 2026-02-17 | Approved by BTI on 2026-01-21. Prepared for TCRL pkg102 publication. |