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Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 8: Location Data Service

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 8 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.1].

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).

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1 Scope

The present document is part of the MirrorLink® specification which specifies an interface for enabling remote user interaction of a mobile device via another device. The present document is written having a vehicle head-unit to interact with the mobile device in mind, but it will similarly apply for other devices, which provide a colour display, audio input/output and user input mechanisms.

The present document specifies location service based on SBP (Service Binary Protocol) framework. The service is used to provide better location data in car environments. Note that this service provides high-level abstraction of location compared to `com.mirrorlink.GPS` service, which focuses on NMEA based GPS data.

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] W3C Geolocation API Specification.

NOTE: Available at http://dev.w3.org/geo/api/spec-source.html.

[2] ISO/IEC/IEEE™ 60559:2011 (IEEE-754-2008): "Information technology -- Microprocessor Systems -- Floating-Point arithmetic".

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.

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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 TS 103 544-1 (V1.3.0): "Publicly Available Specification (PAS); Intelligent Transport Systems (ITS); MirrorLink®; Part 1: Connectivity".

3 Abbreviations

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

GPS Global Positioning System

4 Data Service Definition

4.1 Location Data Service Version 1.0

```
/** The specification defines a high-level interface to location
 *  information provided by the vehicle system. The Location service
 *  API itself is agnostic of the underlying location information
 *  sources. Vehicle system sources can deliver improved location
 *  information inferred from different methods e.g. dead reckoning,
 *  map matching, involvement of vehicle sensors, differential global
 *  position system etc. if available.
 *  @version 1.0
 */
SERVICE com.mirrorlink.location {
/** Structure holding location coordinate. Default value NaN (Not a
 *  Number) is defined in the IEEE standard [2].  All supported
 *  optional elements shall be always present.
 *  Member variables defined in the Coordinates structure have the
 *  same meaning as the member variables defined in Coordinates
 *  interface from W3C's Geolocation API specification [1].
 *  One difference is, that in the present document, member variables
 *  are all optional with the default value of NaN while the W3C API
 *  allows null value for not available data.
 *  When parts of the location object are not available e.g.
 *  due to lost satellite reception, they should be set to NaN.
 *  A MirrorLink Client should not provide map-matched coordinates.
 *  If available, the MirrorLink Client should use a dead-reckoned
 *  position.
 */
STRUCTURE Coordinates {
  /** Geographic latitude; a positive value indicates north, a negative
   *  value south.
   *  @optional, @default NaN, @unit decimal degree,
   *  @range -90 to 90 with North positive, @uid 0x64f8f3f1
   */
  DOUBLE latitude;
  /** Geographic longitude; a positive value indicates east, a negative
   *  value west.
   *  @optional, @default NaN, @unit decimal degree,
   *  @range -180 to 180 with East positive, @uid 0x7581892a
   */
  DOUBLE longitude;
  /** Height of the position above the coordinate system's ellipsoid.
   *  @optional, @default NaN, @unit meter, @uid 0x970e9047
   */
  DOUBLE altitude;
  /** Accuracy level of the latitude and longitude coordinates.
   *  @optional, @default NaN, @unit meter, @uid 0x5ec654de
   */
  DOUBLE accuracy;
  /** Accuracy level of the altitude information.
   *  @optional, @default NaN, @unit meter, @uid 0xc28b9440
   */
  DOUBLE altitudeAccuracy;
  /** Direction of travel. The heading is counting clockwise, relative
   *  to true north.
   *  @optional, @default NaN, @unit decimal degree,
   *  @range 0 to 360, @uid 0x813C675D
   */
  DOUBLE heading;
  /** Magnitude of the horizontal component of current velocity.
   *  @optional, @default NaN, @unit meter per second, @uid 0x23234962
   */
  DOUBLE speed;
  };
/** This is a high-level representation of geolocation data. The
 *  center location of the vehicle's front axle is defined as the
 *  positioning reference point.
 *  @mandatory, @readable, @version 1.0, @uid 0x572a6461
 */
Object GeoLocation {
  /** Location coordinate structure
   *  @mandatory, @uid 0xbad026d0
   */
  STRUCTURE<Coordinates> coord;
```

```
  /** UTC time when the position was acquired. In case the UTC time
   *  associated with the acquisition of the location is unknown, the
   *  Location Data Source shall set the timeStamp value to zero (0).
   *  @mandatory, @uid 0x59413fd1
   */
  TIME timeStamp;
  };
 };
```

4.2 Location Data Service Version 2.0

```
/** The new version of the Location Data Service is based on the 1.0
 *  version, but introduces a set of new objects.
 *  @version 2.0
 */
SERVICE com.mirrorlink.location : @version 1.0 {
ENUM<INT> definedCoordinateSystem {
  /** WGS-84 coordinate system
   *  @mandatory
   */
  CS_WGS84 = 0x00000001;
  /** GCJ-02 coordinate system
   *  @optional
   */
  CS_GCJ02 = 0x00000002;
  /** GCJ-02 coordinate system
   *  @optional
   */
  CS_Proprietary = 0x80000000;
  };
/** This object returns bit flags of supported coordinate systems
 *  from the Location Data source.
 *  @mandatory, @readable, @version 2.0, @uid 0x6f1c2428
 */
Object availableCoordinateSystems {
  /** Bit wise OR of all supported coordinate systems by the data
   *  source. Possible coordinate systems are defined in the
   *  definedCoordinateSystem enumeration.
   *  This object should be accessed before accessing any of the other
   *  objects. A location data source shall support WGS-84, unless the
   *  device is operating in China.
   *  @mandatory, @uid 0x0885cf07
   */
  int coordinateSystems;
  };
/** This object contains the currently used coordinate system from the
 *  Location Data source. The object can be set from data sink to
 *  change the coordinate system.
 *  It should be accessed before subscribing to the GeoLocation
 *  object. The object's default value should be cs_WGS-84, unless the
 *  device is operating in China, where it may be cs_GCJ02.
 *  If the object is set to a coordinate system, unknown or not
 *  supported, the location data source shall indicate the location
 *  as not being available.
 *  The coordinate system SHALL NOT be changed, after subscription
 *  to the GeoLocation object. The location data sink may change the
 *  coordinate system if it has not subscribed to the GeoLocation
 *  object.
 *  The data source shall honor the selected coordinate system.
 *  @mandatory, @configurable, @version 2.0, @uid 0x17ab51db
 */
Object currentCoordinateSystem {
  /** Provide coordinate system, the source is currently using.
   *  @mandatory, @uid 0xd2394c6c
   */
  ENUM<definedCoordinateSystem> coordinateSystem;
  };
};
```

4.3 Location Data Service Version 3.0

```
/** The new version of the Location Data Service is based on the 2.0
 *  version, but changes location obligation within the Coordinates
 *  structure.
 *  @version 3.0
 */
SERVICE com.mirrorlink.location : @version 2.0 {
/** STRUCTURE holding location coordinate.
 *  Obligation change for latitude and longitude elements, otherwise
 *  identical to Version 2.0.
 */
STRUCTURE Coordinates {
  /** Geographic latitude.
   *  Obligation change, otherwise identical to Version 2.0.
   *  @mandatory, @default NaN, @unit decimal degree,
   *  @range -90 to 90 with North positive, @uid 0x64f8f3f1
   */
  DOUBLE latitude;
  /** Geographic longitude.
   *  Obligation change, otherwise identical to Version 2.0.
   *  @mandatory, @default NaN, @unit decimal degree,
   *  @range -180 to 180 with East positive, @uid 0x7581892a
   */
  DOUBLE longitude;
  /** Height of the position above the coordinate system's ellipsoid.
   *  Identical to Version 2.0.
   *  @optional, @default NaN, @unit meter, @uid 0x970e9047
   */
  DOUBLE altitude;
  /** Accuracy level of the latitude and longitude coordinates.
   *  Identical to Version 2.0.
   *  @optional, @default NaN, @unit meter, @uid 0x5ec654de
   */
  DOUBLE accuracy;
  /** Accuracy level of the altitude information.
   *  Identical to Version 2.0.
   *  @optional, @default NaN, @unit meter, @uid 0xc28b9440
   */
  DOUBLE altitudeAccuracy;
  /** Direction of travel. The heading is counting clockwise, relative
   *  to true north.
   *  Identical to Version 2.0.
   *  @optional, @default NaN, @unit decimal degree,
   *  @range 0 to <360, counting clockwise; 0° being true North
   *  @uid 0x813c675d
   */
  DOUBLE heading;
  /** Magnitude of the horizontal component of current velocity.
   *  Identical to Version 2.0.
   *  @optional, @default NaN, @unit meter per second, @uid 0x23234962
   */
  DOUBLE speed;
  };
/** This is a high-level representation of geolocation data. The
 *  center location of the vehicle's front axle is defined as the
 *  positioning reference point.
 *  Object is IDENTICAL to the version 1.0 object besides the
 *  following requirement on error behavior:
 *    In case, the GPS signal is temporarily unavailable
 *    or dead reckoning is not available,
 *    the data service shall send an SBP response message with an
 *    "Not available" error code.
 *  @mandatory, @readable, @version 3.0, @uid 0x572a6461
 */
Object GeoLocation {
  /** Location coordinate structure
   *  @mandatory, @uid 0xbad026d0
   */
  STRUCTURE<Coordinates> coord;
  /** UTC time when the position was acquired. In case the UTC time
   *  associated with the acquisition of the location is unknown, the
   *  Location Data Source shall set the timeStamp value to zero (0).
   *  @mandatory, @uid 0x59413fd1
   */
  TIME timeStamp;
  };
```

```
};
```

5 SBP Binding

The Location Data Services uses the following objects and their access capabilities:

Object Name	Access Type	Subscription Type
GeoLocation	READABLE	ON_CHANGE, REGULAR, or AUTO
availableCoordinateSystems	READABLE	NONE
currentCoordinateSystem	CONFIGURABLE	NONE

A SBP Sink endpoint shall be able to access the *GeoLocation* object using SBP *Subscribe* and *Get* commands. A SBP Source endpoint shall support the of regular interval and on-change SBP subscription types. In case of on-change, it is up to Data Source to decide on the minimum distance triggering a new notification.

If the SBP Source endpoint's geolocation sensor is temporarily not available, the SBP Source endpoint shall handle show the following behaviour within the SBP protocol:

- The SBP Source endpoint shall return an SBP *response* message with an `"Not available"` SBP error code in response to a SBP *Get* command to the *GeoLocation* object.
- The SBP Source endpoint shall send an SBP *response* message with an `"Not available"` SBP error code when the SBP Sink endpoint has subscribed to the *GeoLocation* object, either once in case of on-change subscription, or in regular intervals in case of interval subscription. The SBP Source shall provide a valid *GeoLocation* object, as soon as the geolocation sensor becomes available again.
- The SBP Source endpoint shall send an SBP *response* message with an `"Not available"` SBP error code in response to a SBP *Subscribe* command to the *GeoLocation* object. The SBP Sink endpoint should then send a new *Subscribe* command again not earlier than 5s and not later than 30s to receive notifications again.

The version 2.0 of the Location data service adds a set of new objects, which are not available in version 1.0 version of the service. The SBP protocol can handle this. The following describes the specified behaviour:

- If a version 2.0 location SBP Sink endpoint sends an SBP *Subscribe*, *Get* or *Set* command to a version 2.0 object, a version 1.0 location SBP Source endpoint shall send an SBP *response* message with the recoverable SBP Error `"Unknown Object UID"`.
- If a version 1.0 location SBP Sink endpoint sends an SBP *Subscribe* or *Get* command to the *GeoLocation* object, when the version 2.0 location SBP Source endpoint cannot provide WGS-84 coordinates, the SBP Source endpoint shall send an SBP response message with SBP error code `"Not available"`.

The version 3.0 of the Location data service changes the obligation of the *longitude* and *latitude* elements within the *Coordinates* structure to mandatory. The following describes the backward compatibility behaviour:

- If a version 3.0 location data service sink is requesting the *GeoLocation* object from a version 1.0 or 2.0 location data service source, the source may either exclude the *longitude* and *latitude* elements from the *Coordinate* structure, or set them to NaN.
- There are no backward compatibility constraints for a version 3.0 location data service source, connected to a version 1.0 or 2.0 location data service sink.

Annex A (informative): Authors and Contributors

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History

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