

# RW BLE Location and Navigation Profile Interface Specification

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Interface Specification

RW-BLE-LNP-IS

Version 8.0

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## Revision History

Version	Date	Revision Description	Author
0.1	January 16 <sup>th</sup> 2014	Initial draft	CM
1.0	April 3 <sup>rd</sup> 2014	Initial release	CM
1.1	April 14, 2014	Few relevant changes	KY
1.2	May 13, 2014	Feature details, missing tables, corrections	KY
1.3	Oct 13 <sup>th</sup> 2014	Updated for BLE 4.1	CM
7.0	Dec 1 <sup>st</sup> 2014	Version and naming alignment	CM
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# 1 Overview

## 1.1 Document Overview

This document describes the non-standard interface of the RW Bluetooth Low Energy (BLE) Location and Navigation Profile (LANP) implementation. In this document, the interface messages will be referred to as API messages for the profile.

Description will include the rationale behind LNP's design/implementation. This would provide better understanding to the user and/or developer for profile usage from upper layer or the final application.

## 1.2 BLE Location and Navigation Profile Overview

The LANP enables a Location and Navigation Collector to connect, interact and exchange information with a Location and Navigation Sensor for use in localization applications.

This LANP has been implemented as an LE (GATT-based) profile. Within this profile, two roles can be supported: Sensor (LANS) and Collector (LANC). The Collector shall support the GAP's central role and the Sensor shall support the GAP's peripheral role. The profile first requires an LE connection to be established between the two devices before to realize the Location and Navigation functionalities.

The documents edited by the Bluetooth SIG present different use cases for this profile, their GATT, GAP and SM, mandatory and optional requirements. The Location and Navigation Profile specifications have been adopted by the Bluetooth SIG on April 30th 2013 ([1] and [3]). Their related test specifications have been released on the same date.

The profile is implemented in the RW-BLE software stack in two sub-blocks, one for each role. Each sub-block has a plurality of APIs decided after the study of the profile specifications and test specifications. The design is considered to be minimalistic and conceived for future complex application, which would combine the profile functionality with the device's connectivity and security procedures.

The structure of the LN service is defined as shown in the table below:

Characteristic Name	Requirements	Properties	Security	Descriptors
<b>LN Feature</b>	Mandatory	Read	None	None
<b>Location and Speed</b>	Mandatory	Notify	None	Client Characteristic Configuration
<b>Position Quality</b>	Optional	Read	None	None
<b>LN Control Point</b>	Optional	Write/Indicate	None	Client Characteristic Configuration
<b>Navigation</b>	Optional	Notify	None	Client Characteristic Configuration

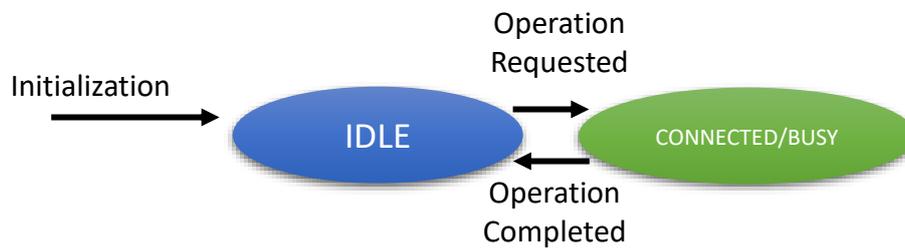


## 2 LANP Sensor Role API

### 2.1 Environment

This role should be activated in every application that a Location and Navigation Sensor is required; the provided API is capable of sending notifications such as several navigation or position quality measurements to the collector. This FW will behave as configured by the Collector in the LNP characteristic. Please, refer to “lans\_task.h” for implementation of this API.

Within the LANS task, two states are defined: **IDLE and CONNECTED/BUSY**.



### 2.2 API Messages

#### 2.2.1 Initialization/Database creation

During the initialization phase of the Location and Navigation Sensor, the memory for this task must be allocated using the message GAPM\_PROFILE\_TASK\_ADD\_CMD provided by the GAPM interface. Apart from the security level, the following parameters should be filled:

Parameters:

Type	Parameters	Description
uint32_t	ln_feature	LN feature value - Not supposed to be modified during the lifetime of the device
uint8_t	prfl_config	Profile characteristic configuration bit field: <b>Bit 0:</b> Enables LN control point characteristic <b>Bit 1:</b> Enables navigation feature

Description: This message shall be used to add one instance of the Location and Navigation Service in the database.

The navigation characteristic will be automatically added if at least one of the following features is supported:

- Number of beacons in solution
- Remaining distance
- Remaining vertical distance
- Estimated time of arrival
- Position status

The LN Control Point characteristic will be automatically added if at least one of the following features is supported:



- Navigation
- Total distance
- Location and speed content masking
- Fix rate setting
- Elevation and elevation setting

### 2.2.2 LANS\_ENABLE\_REQ

Source: TASK\_APP

Destination: TASK\_LANS

Required State: IDLE

Parameters:

Type	Parameters	Description
uint8_t	conidx	Connection index
uint16_t	prfl_ntf_ind_cfg	Characteristic configuration descriptor bit field value for a bonded device: <b>Bit 0:</b> Location and speed characteristic client configuration <b>Bit 1:</b> LN Control point characteristic indication configuration <b>Bit 2:</b> Navigation characteristic client configuration

Response: LANS\_ENABLE\_RSP

Description: This message shall be used after the connection with a peer in order to restore the LNP Sensor bond data Application shall provide the Connection index in order to activate the profile.

### 2.2.3 LANS\_ENABLE\_RSP

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	conidx	Connection index
uint8_t	status	Status of the operation

Description: This message informs the application about the status of the operation.

### 2.2.4 LANS\_NTF\_LOC\_SPEED\_REQ

Source: TASK\_APP

Destination: TASK\_LANS

Required State: CONNECTED

Parameters:

Type	Parameters	Description
struct lanp_loc_speed	parameters	Structure containing location and speed notification fields



Response: LANS\_NTF\_LOC\_SPEED\_RSP

Description: This message shall be used by the application to send a Location and Speed Measurement notification to every connected device. The profile checks whether the peer device has enabled the sending of notifications in the client configuration descriptor and sends it or not depending on its value.

Note that if the options present in the flags field would not fit to the link/negotiated MTU (default MTU is 23 bytes), the procedure will automatically split the notification into separate ATT PDU notifications and would be sent in succession. The split of notifications is inefficient (waste of extra ATT PDU processing), and highly discouraged. The user can avoid this by proposing a higher link MTU to the peer via GATT MTU exchange procedure.

### 2.2.5 LANS\_NTF\_LOC\_SPEED\_RSP

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	Status	Status of the operation

Description: This message informs the application about the status of the operation.

### 2.2.6 LANS\_NTF\_NAVIGATION\_REQ

Source: TASK\_APP

Destination: TASK\_LANS

Required State: CONNECTED

Parameters:

Type	Parameters	Description
struct lanp_navigation	parameters	Structure containing navigation notification fields

Response: LANS\_NTF\_NAVIGATION\_RSP

Description: This API message shall be used by the application to send a Navigation notification to every connected device. This profile checks whether the peer device has enabled sending of notifications for the characteristic and sends the notification according to the value of the client characteristic configuration.

Note that this feature should be enabled by using the LN Control Point Characteristic, therefore it is mandatory to correctly configure the Navigation Control procedure.

### 2.2.7 LANS\_NTF\_NAVIGATION\_RSP

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	status	Status of the operation

Description: This message informs the application about the status of the operation.



### 2.2.8 LANS\_UPD\_POS\_Q\_REQ

Source: TASK\_APP

Destination: TASK\_LANS

Required State: CONNECTED

Parameters:

Type	Parameters	Description
struct <code>lanp_posq</code>	parameters	Structure containing position quality fields

Response: LANS\_UPD\_POS\_Q\_RSP

Description: This API message shall be used by the application to modify the position quality values.

The profile checks whether the feature has been enabled or not in the current profile configuration. If the data cannot be written, a LANS\_CMP\_EVT message with a PRF\_ERR\_FEATURE\_NOT\_SUPPORTED status will be sent back to the requester.

### 2.2.9 LANS\_UPD\_POS\_Q\_RSP

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	status	Status of the operation

Description: This message informs the application about the status of the operation.

### 2.2.10 LANS\_LN\_CTLN\_PT\_REQ\_IND

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	conidx	Connection index
uint8_t	op_code	Operation code (see Table in 5)
union	value	
uint32_t	cumul_value	Cumulative value (24 bits)
uint16_t	mask_content	Mask content
uint8_t	control_value	Navigation control
uint16_t	route_number	Route number
uint8_t	fix_rate	Fix rate
int32_t	elevation	Elevation

Description: The message is sent to the application when the LN Control Point characteristic is written by the peer device. The application shall answer using the LANS\_LN\_CTLN\_PT\_CFM message.



### 2.2.11 LANS\_LN\_CTLN\_PT\_CFM

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	conidx	Connection index
uint8_t	op_code	Operation code (see Table in 5)
uint8_t	status	Status (see Table in 5)
union	value	
uint16_t	number_of_routes	Number of routes
struct lan_route_name	route_name	Name of route in UTF-8

Description: This message is sent by the application as a response to the LANS\_LN\_CTLN\_PT\_REQ\_IND. It contains the value requested by the profile. In the case where this message is received without a request, it will be dropped.

Note that the number of route has a maximum value defined in LANP\_LAN\_LN\_CTLN\_DATA\_MAX\_LEN, the value by default is set to 128 bytes, but it could be changed up to 255 bytes depending on the maximum route name length.

### 2.2.12 LANS\_CFG\_NTFIND\_IND

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	conidx	Connection index
uint8_t	char_code	Characteristic Code of Location and speed, LN Control Point or Navigation.
uint16_t	ntf_cfg	Notification configuration new value

Description: This message is sent to the application each time a peer device successfully writes the Client Characteristic Configuration descriptor of the Location and speed, Navigation or the LN Control Point characteristics.

### 2.2.13 LANS\_CMP\_EVT

Source: TASK\_LANS

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	conidx	Connection index
uint8_t	operation	Operation code: <ul style="list-style-type: none"> <li>• LANS_NTF_LOC_SPEED_OP_CODE</li> <li>• LANS_NTF_NAVIGATION_OP_CODE</li> <li>• LANS_UPD_POS_Q_OP_CODE</li> <li>• LANS_SET_CUMUL_VALUE_OP_CODE</li> <li>• LANS_MASK_LSPEED_CHAR_CT_OP_CODE</li> <li>• LANS_NAVIGATION_CONTROL_OP_CODE</li> <li>• LANS_REQ_NUMBER_OF_ROUTES_OP_CODE</li> <li>• LANS_REQ_NAME_OF_ROUTE_OP_CODE</li> <li>• LANS_SELECT_ROUTE_OP_CODE</li> <li>• LANS_SET_FIX_RATE_OP_CODE</li> <li>• LANS_SET_ELEVATION_OP_CODE</li> </ul>
uint8_t	status	Status of the operation



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Description: The message is used by the LANS task to inform the sender of a command that the procedure is over and contains the status of the procedure.



## 3 LANP Collector Role API

### 3.1 Environment

Within the LANC task, four states are defined: **FREE, IDLE, DISCOVERING and BUSY**

**Important Note:** The TASK\_LANC task is multi-instantiated, one instance is created for each connection for which the profile will be enabled and each of these instances will have a different task ID. Thus, it is very important for the application to keep the source task ID of the first received LANC\_CMP\_EVT message to be able to communicate with the peer device linked to this task ID once it has been enabled.

The term TASK\_LANC\_IDX will be used in the rest of the document to refer to any instance of the Location and Navigation profile Collector Role Task. The term TASK\_LANC will refer to the first instance of this task.

### 3.2 API Messages

#### 3.2.1 Initialization

During the initialization phase of the Location and Navigation Collector, the memory for this task must be allocated using the message GAPM\_PROFILE\_TASK\_ADD\_CMD provided by the GAPM interface.

#### 3.2.2 LANC\_ENABLE\_REQ

Source: TASK\_APP

Destination: TASK\_LANC

Required State: IDLE

Parameters:

Type	Parameters	Description
uint8_t	con_type	Connection type
struct lanc_ins_content	lans	Service structure previously discovered in the database of the peer device.

Response: LANC\_ENABLE\_RSP

Description: This API message is used for enabling the Collector role of the LANP.

The connection type may be PRF\_CON\_DISCOVERY (0x00) for discovery/initial configuration or PRF\_CON\_NORMAL (0x01) for a normal connection with a bonded device. Application shall save this information to reuse them for other connections. During normal connection, previously discovered device information can be reused.

For a normal connection, the response to this request is sent right away after saving the LANS content in the environment and registering LANC in GATT to receive the notifications for the known attribute handles in LANS that would be notified.

For a discovery connection, discovery of the peer LANS is started and the response will be sent at the end of the discovery with the discovered attribute details.



### 3.2.3 LANC\_ENABLE\_RSP

Source: TASK\_LANC

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	status	Status of the operation
struct lanc_ins_content	lans	Service structure previously discovered in the database of the peer device.

Description: This message informs the application about the status of the operation.

### 3.2.4 LANC\_READ\_CMD

Source: TASK\_APP

Destination: TASK\_LANC\_IDX

Parameters:

Type	Parameters	Description
uint8_t	operation	Operation code
uint8_t	read_code	Read code: <ul style="list-style-type: none"> <li>• LANC_RD_LN_FEAT</li> <li>• LANC_RD_POS_Q</li> <li>• LANC_RD_WR_LOC_SPEED_CL_CFG</li> <li>• LANC_RD_WR_LN_CTLN_PT_CFG</li> <li>• LANC_RD_WR_NAVIGATION_CFG</li> </ul>

Response: LANC\_VALUE\_IND and LANC\_CMP\_EVT

Description: The API message shall be used to read the value of an attribute in the peer device database.

### 3.2.5 LANC\_CFG\_NTFFIND\_CMD

Source: TASK\_APP

Destination: TASK\_LANC\_IDX

Required State: IDLE

Parameters:

Type	Parameters	Description
uint8_t	operation	Operation code
uint8_t	desc_code	Descriptor code: <ul style="list-style-type: none"> <li>• LANC_RD_WR_LOC_SPEED_CL_CFG</li> <li>• LANC_RD_WR_LN_CTLN_PT_CFG</li> <li>• LANC_RD_WR_NAVIGATION_CFG</li> </ul>
uint16_t	ntffind_cfg	NTF/IND configuration

Response: LANC\_CMP\_EVT

Description: This API message is used to configure sending of notification/indication in the peer device database.



### 3.2.6 LANC\_LN\_CTLN\_PT\_CFG\_REQ

Source: TASK\_APP

Destination: TASK\_LANC\_IDX

Parameters:

Type	Parameters	Description
uint8_t	operation	Operation code
struct lan_ln_ctln_pt_req	ctln_pt	Control point request

Description: This message allows writing the value of the LN Control Point characteristic.

If the LN Control Point characteristic has not been found in the peer device database during the discovery procedure, a LANC\_CMP\_EVT message is sent back to the requester with a PRF\_ERR\_INEXISTENT\_HDL error status.

### 3.2.7 LANC\_LN\_CTLN\_PT\_RSP

Source: TASK\_LANC\_IDX

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
struct lanp_ln_ctln_pt_rsp	rsp	Control point response structure

Description: This message is sent to the application when a new value is received from the LN control Point indication.

### 3.2.8 LANC\_VALUE\_IND

Source: TASK\_LANC\_IDX

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	att_code	Attribute code: <ul style="list-style-type: none"> <li>• LANC_NTF_LOC_SPEED</li> <li>• LANC_NTF_NAVIGATION</li> <li>• LANC_RD_LN_FEAT</li> <li>• LANC_RD_POS_Q</li> <li>• LANC_RD_WR_LOC_SPEED_CL_CFG</li> <li>• LANC_RD_WR_LN_CTLN_PT_CFG</li> <li>• LANC_RD_WR_NAVIGATION_CFG</li> </ul>
<b>union</b>	value	
uint32_t	ln_feat	LN feature
struct lanp_loc_speed	loc_speed	Location and speed
struct lanp_posq	pos_q	LN position quality
struct lanp_navigation	navigation	Navigation
uint16_t	ntf_cfg	Client characteristic configuration descriptor value

Description: This message is sent to the application when a new value is received from the peer device within a read response or a notification.



### 3.2.9 LANC\_CMP\_EVT

Source: TASK\_LANC\_IDX

Destination: TASK\_APP

Parameters:

Type	Parameters	Description
uint8_t	operation	Operation code: <ul style="list-style-type: none"><li>• LANC_ENABLE_OP_CODE</li><li>• LANC_READ_OP_CODE</li><li>• LANC_CFG_NTF_IND_OP_CODE</li><li>• LANC_CTLN_PT_CFG_WR_OP_CODE</li><li>• LANC_CTLN_PT_CFG_IND_OP_CODE</li></ul>
uint8_t	status	Status

Description: The message is used by the LANC task to inform the sender of a command that the procedure is over and contains the status of the procedure.

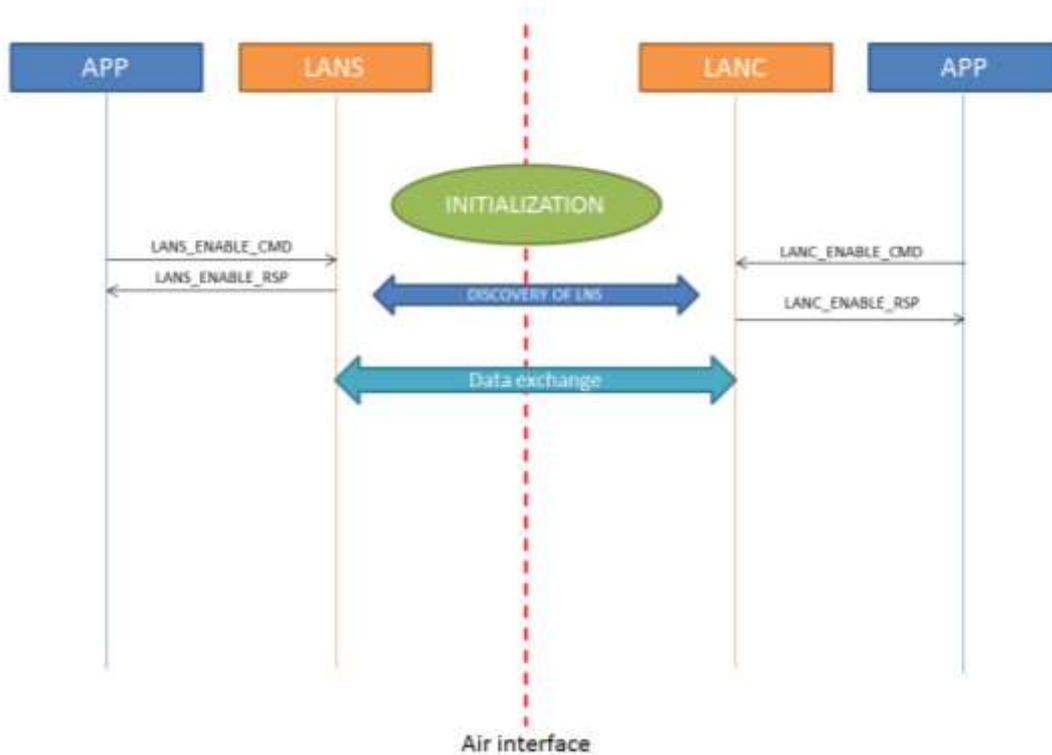


## 4 Message Sequence Charts (MSCs)

This part describes the different procedure that can be used within the Location and Navigation profile.

In these MSCs, it is supposed that two RW stacks (one with the server role of the profile and one with the client role) are connected together and both tasks created and allocated using GAPM procedures.

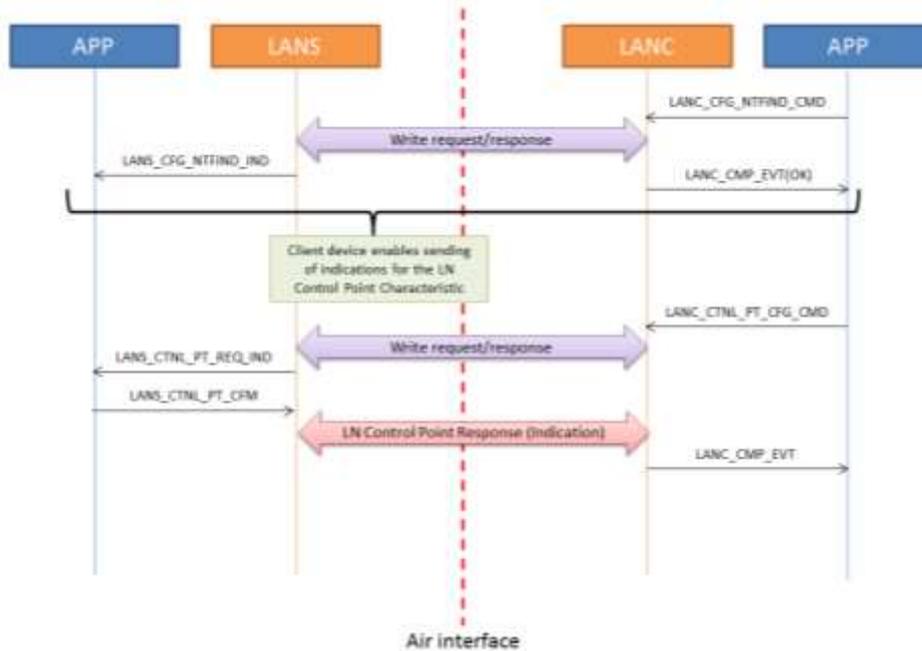
### 4.1 Device Initialization





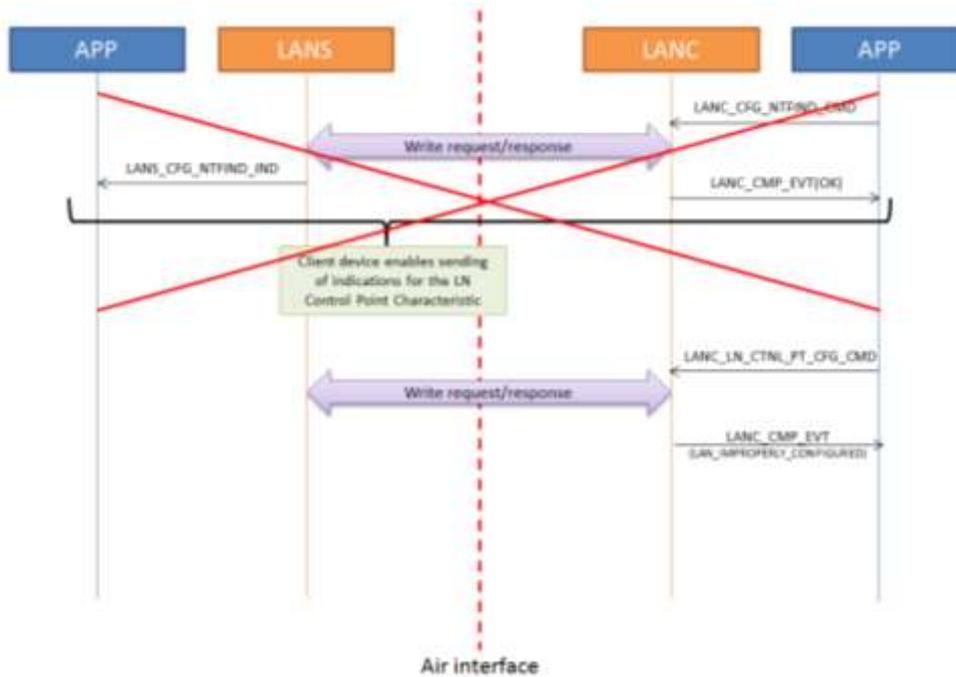
## 4.2 LN Control Point Characteristic Usage

### 4.2.1 Normal Procedure



### 4.2.2 LANP Improperly Configured Error

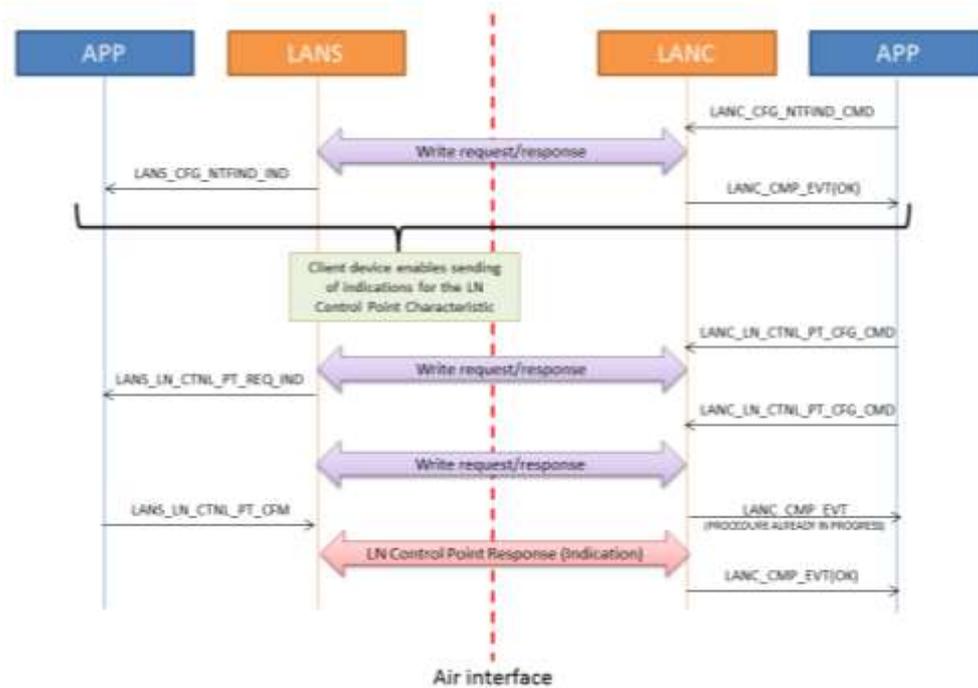
If the client device has not enabled sending of indications to the peer, the server device will answer with a `LANP_ERROR_IMPROPERLY_CONFIGURED` error.





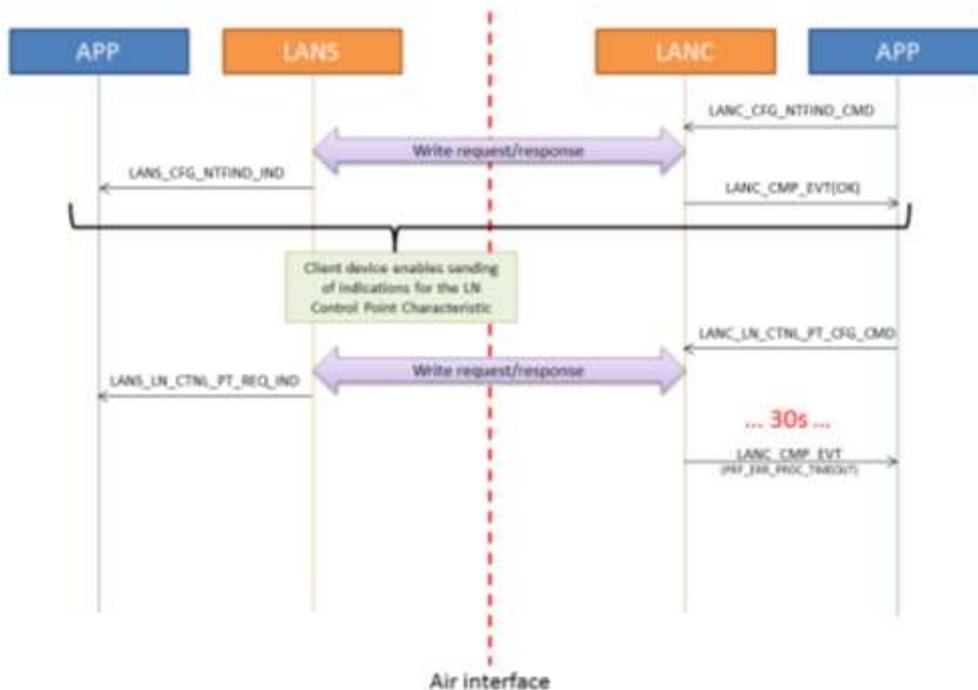
### 4.2.3 Procedure Already in Progress Error

If the client device writes the Control Point characteristic while the previous procedure is not over, the server will answer with a **PROCEDURE\_ALREADY\_IN\_PROGRESS** error.



### 4.2.4 Procedure Timeout

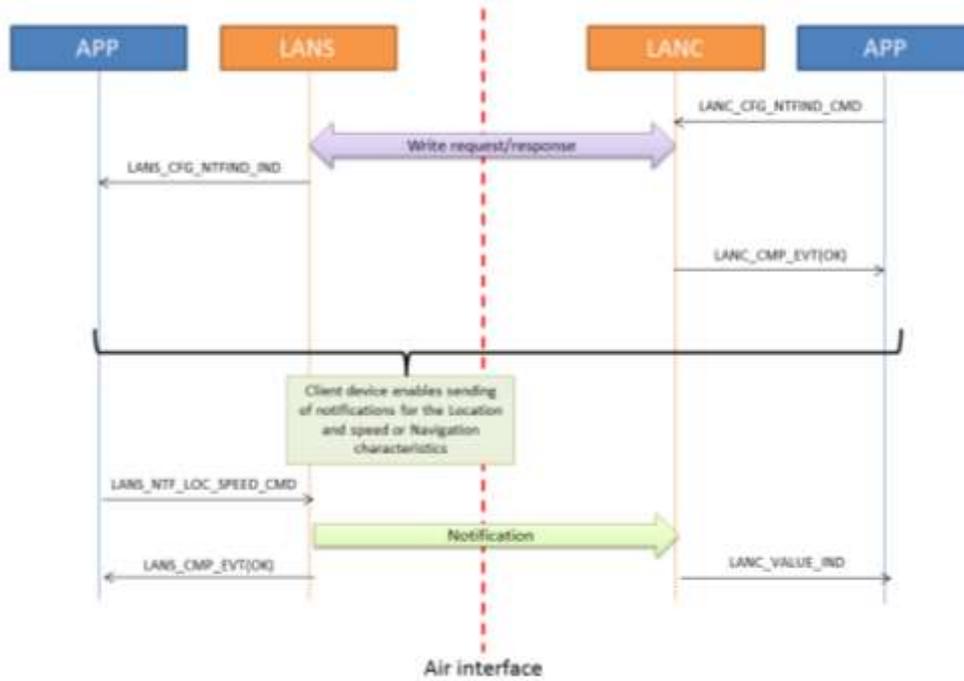
If the client device does not receive a Control Point response within 30s after reception of the write response, a procedure timeout error will be raised.





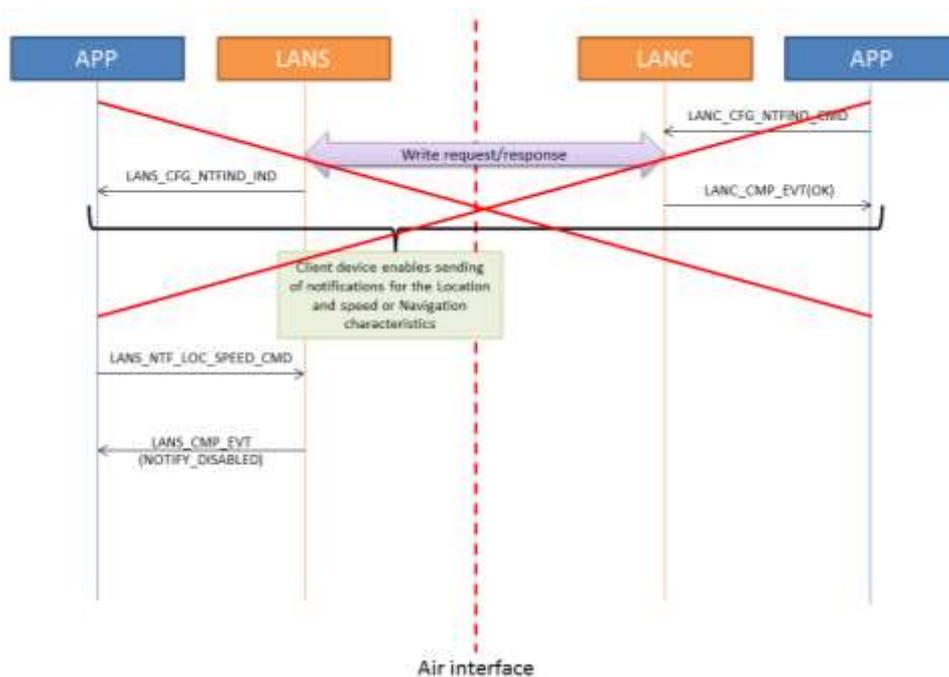
### 4.3 Sending / Receiving of Location and Speed or Navigation Notifications

#### 4.3.1 Normal Procedure



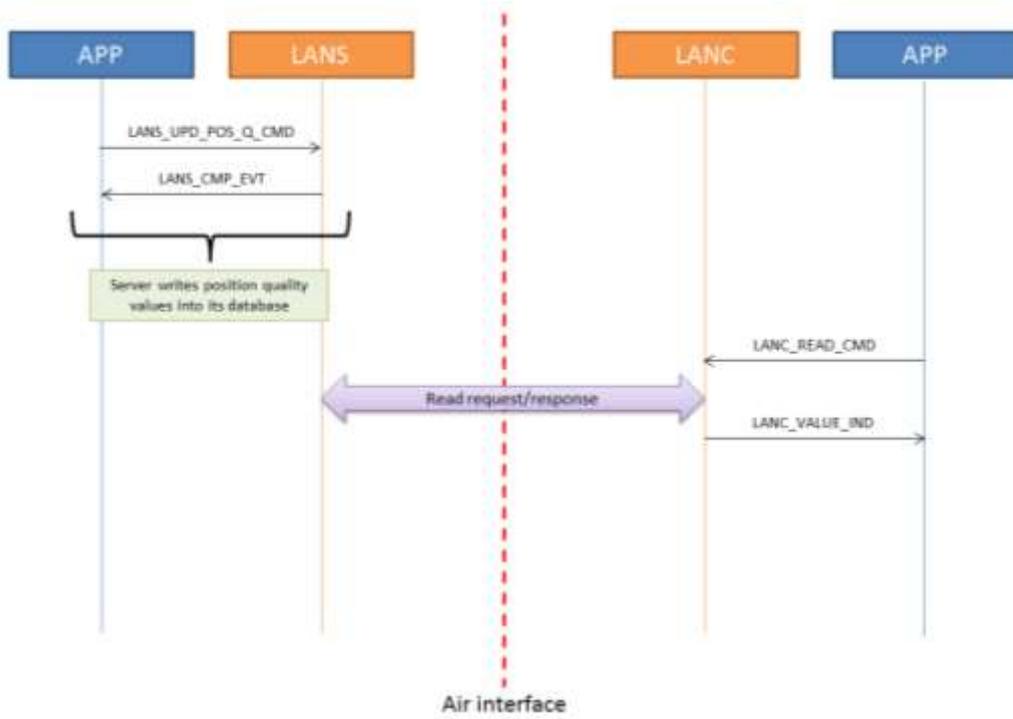
#### 4.3.2 Sending of Notifications Disabled

If sending of notifications has not been enabled by the collector device, the server device won't be able to send measurements, a `PRF_ERR_NOTIFY_DISABLED` error will be sent back to the application.





#### 4.4 Position Quality Read/Write Usage





## 5 Miscellaneous

Name	Value	Description
LANP_FEAT_INSTANTANEOUS_SPEED_SUPP	0x0001	Instantaneous Speed Supported
LANP_FEAT_TOTAL_DISTANCE_SUPP	0x0002	Total Distance Supported
LANP_FEAT_LOCATION_SUPP	0x0004	Location Supported
LANP_FEAT_ELEVATION_SUPP	0x0008	Elevation Supported
LANP_FEAT_HEADING_SUPP	0x0010	Heading Supported
LANP_FEAT_ROLLING_TIME_SUPP	0x0020	Rolling Time Supported
LANP_FEAT_UTC_TIME_SUPP	0x0040	UTC Time Supported
LANP_FEAT_REMAINING_DISTANCE_SUPP	0x0080	Remaining Distance Supported
LANP_FEAT_REMAINING_VERTICAL_DISTANCE_SUPP	0x0100	Remaining Vertical Distance Supported
LANP_FEAT_ESTIMATED_TIME_OF_ARRIVAL_SUPP	0x0200	Estimated Time of Arrival Supported
LANP_FEAT_NUMBER_OF_BEACONS_IN_SOLUTION_SUPP	0x0400	Nb of Beacons in Solution Supported
LANP_FEAT_NUMBER_OF_BEACONS_IN_VIEW_SUPP	0x0800	Number of Beacons in View Supported
LANP_FEAT_TIME_TO_FIRST_FIX_SUPP	0x1000	Time to First Fix Supported
LANP_FEAT_ESTIMATED_HOR_POSITION_ERROR_SUPP	0x2000	EHPE Supported
LANP_FEAT_ESTIMATED_VER_POSITION_ERROR_SUPP	0x4000	EVPE Supported
LANP_FEAT_HOR_DILUTION_OF_PRECISION_SUPP	0x8000	HDOP Supported

Table 1 – LN Feature supported bit flags

Name	Value	Description
LANP_LSPEED_INST_SPEED_PRESENT	0x00000001	Instantaneous Speed Present
LANP_LSPEED_TOTAL_DISTANCE_PRESENT	0x00000002	Total Distance Present
LANP_LSPEED_LOCATION_PRESENT	0x00000004	Location Present
LANP_LSPEED_ELEVATION_PRESENT	0x00000008	Elevation Present
LANP_LSPEED_HEADING_PRESENT	0x00000010	Heading Present
LANP_LSPEED_ROLLING_TIME_PRESENT	0x00000020	Rolling Time Present
LANP_LSPEED_UTC_TIME_PRESENT	0x00000040	UTC Time Present
LANP_LSPEED_POSITION_STATUS_LSB	0x00000080	Position Status LSB
LANP_LSPEED_POSITION_STATUS_MSB	0x00000100	Position Status MSB
LANP_LSPEED_SPEED_AND_DISTANCE_FORMAT	0x00000200	Speed and Distance format
LANP_LSPEED_ELEVATION_SOURCE_LSB	0x00000400	Elevation Source LSB
LANP_LSPEED_ELEVATION_SOURCE_MSB	0x00000800	Elevation Source MSB
LANP_LSPEED_HEADING_SOURCE	0x00001000	Heading Source

Table 2 – Location and Speed present parameters bit flags

Name	Value	Description
LANP_POSQ_NB_OF_BEACONS_IN_SOLUTION_PRESENT	0x0001	Number of Beacons in Solution Present
LANP_POSQ_NUMBER_OF_BEACONS_IN_VIEW_PRESENT	0x0002	Number of Beacons in View Present
LANP_POSQ_TIME_TO_FIRST_FIX_PRESENT	0x0004	Time to First Fix Present
LANP_POSQ_EHPE_PRESENT	0x0008	EHPE Present
LANP_POSQ_EVPE_PRESENT	0x0010	EVPE Present
LANP_POSQ_HDOP_PRESENT	0x0020	HDOP Present
LANP_POSQ_VDOP_PRESENT	0x0040	VDOP Present
LANP_POSQ_POSITION_STATUS_LSB	0x0080	Position Status LSB
LANP_POSQ_POSITION_STATUS_MSB	0x0100	Position Status MSB

Table 3 – Position quality present parameters bit flags

Name	Value	Description
LANP_LN_CTLN_PT_SET_CUMUL_VALUE	0	Set Cumulative Value
LANP_LN_CTLN_PT_MASK_LSPEED_CHAR_CT	1	Mask Location and Speed Characteristic Content
LANP_LN_CTLN_PT_NAVIGATION_CONTROL	2	Navigation Control
LANP_LN_CTLN_PT_REQ_NUMBER_OF_ROUTES	3	Request Number of Routes
LANP_LN_CTLN_PT_REQ_NAME_OF_ROUTE	4	Request Name of Route
LANP_LN_CTLN_PT_SELECT_ROUTE	5	Select Route
LANP_LN_CTLN_PT_SET_FIX_RATE	6	Set Fix Rate



LANP_LN_CTLN_PT_SET_ELEVATION	7	Set Elevation
LANP_LN_CTLN_PT_RESPONSE_CODE	32	Response Code

**Table 4 – LN Control Point Operation Code Keys**

Name	Value	Description
LANP_LN_CTLN_PT_RESP_SUCCESS	1	Success
LANP_LN_CTLN_PT_RESP_NOT_SUPP	2	Operation Code Not Supported
LANP_LN_CTLN_PT_RESP_INV_PARAM	3	Invalid Parameter
LANP_LN_CTLN_PT_RESP_FAILED	4	Operation Failed

**Table 5 – LN Control Point Response Value Keys**

Name	Value	Description
LANP_NAVI_REMAINING_DIS_PRESENT	0x0001	Remaining Distance Present
LANP_NAVI_REMAINING_VER_DIS_PRESENT	0x0002	Remaining Vertical Distance Present
LANP_NAVI_ESTIMATED_TIME_OF_ARRIVAL_PRESENT	0x0004	Estimated Time of Arrival Present
LANP_NAVI_POSITION_STATUS_LSB	0x0008	Position Status lsb
LANP_NAVI_POSITION_STATUS_MSB	0x0010	Position Status msb
LANP_NAVI_HEADING_SOURCE	0x0020	Heading Source
LANP_NAVI_NAVIGATION_INDICATOR_TYPE	0x0040	Navigation Indicator Type
LANP_NAVI_WAYPOINT_REACHED	0x0080	Waypoint Reached
LANP_NAVI_DESTINATION_REACHED	0x0100	Destination Reached

**Table 6 – LN Control Point Response Value Keys**

Type	Parameters	Description
uint16_t	flags	Flags
uint16_t	inst_speed	Instantaneous Speed
uint32_t	total_dist	Total distance
int32_t	latitude	Location - Latitude
int32_t	longitude	Location - Longitude
int32_t	elevation	Elevation
uint16_t	heading	Heading
uint8_t	rolling_time	Rolling time
struct prf_date_time	date_time	UTC Time

**Table 7 – Location and Speed Structure (struct lanp\_loc\_speed)**

Type	Parameters	Description
uint16_t	flags	Flags
uint16_t	time_first_fix	Time to First Fix
uint32_t	ehpe	EHPE
uint32_t	evpe	EVPE
uint8_t	n_beacons_solution	Number of Beacons in Solution
uint8_t	n_beacons_view	Number of Beacons in view
uint8_t	hdop	HDOP
uint8_t	vdop	VDOP

**Table 8 – Position quality Structure (struct lanp\_posq)**

Type	Parameters	Description
uint16_t	flags	Flags
uint16_t	bearing	Bearing
uint16_t	heading	Heading
uint32_t	remaining_distance	Remaining Distance (24 bits)
uint32_t	remaining_ver_distance	Remaining Vertical Distance (24 bits)
struct prf_date_time	estimated_arrival_time	Estimated Time of Arrival

**Table 9 – Navigation Structure (struct lanp\_navigation)**



Type	Parameters	Description
uint16_t	year	Year time element
uint8_t	month	Month time element
uint8_t	day	Day time element
uint8_t	hour	Hour time element
uint8_t	min	Minute element
uint8_t	sec	Second element

**Table 10 – Date time Structure (struct prf\_date\_time)**

Type	Parameters	Description
uint8_t	length	Length of the name
uint8_t [ _ARRAY_EMPTY]	name	Name array

**Table 11 – Route Name (struct lan\_route\_name)**



## 6 Abbreviations

Abbreviation	Original Terminology
API	Application Programming Interface
BLE	Bluetooth Low Energy
GAP	Generic Access Profile
GATT	Generic Attribute Profile
LANP	Location and Navigation Profile
LANS	Location and Navigation Sensor Role
LANC	Location and Navigation Collector Role
LANS	Location and Navigation Service
LN	Location and Navigation
MSC	Message Sequence Chart
RW	RivieraWaves SAS
SM	Security Manager



## 7 References

<b>[1]</b>	<b>Title</b>	LOCATION AND NAVIGATION PROFILE SPECIFICATION		
	<b>Reference</b>	LNP_SPEC_V10		
	<b>Version</b>	V10r00	<b>Date</b>	2012-30-04
	<b>Source</b>	Bluetooth SIG		

<b>[2]</b>	<b>Title</b>	LOCATION AND NAVIGATION PROFILE TEST SPECIFICATION		
	<b>Reference</b>	LNP.TS.1.0.1		
	<b>Version</b>	1.0.1	<b>Date</b>	2012-30-04
	<b>Source</b>	Bluetooth SIG		

<b>[3]</b>	<b>Title</b>	LOCATION AND NAVIGATION SERVICE SPECIFICATION		
	<b>Reference</b>	LNP_SPEC_V10		
	<b>Version</b>	V10r00	<b>Date</b>	2012-30-04
	<b>Source</b>	Bluetooth SIG		

<b>[4]</b>	<b>Title</b>	LOCATION AND NAVIGATION SERVICE TEST SPECIFICATION		
	<b>Reference</b>	LNS.TS.1.0.1		
	<b>Version</b>	1.0.1	<b>Date</b>	2012-30-04
	<b>Source</b>	Bluetooth SIG		