GPS-like positioning within BeSpoon real-time location system

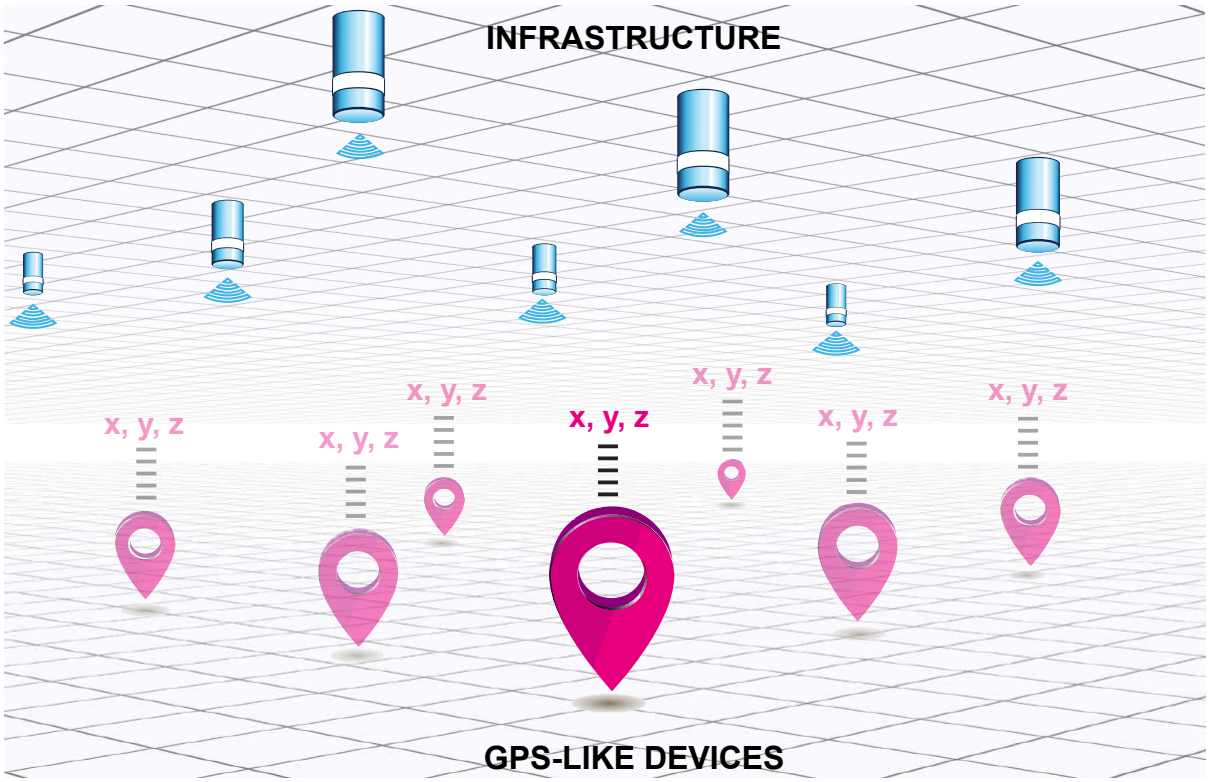
Introduction

This application note details how the software development kit (SDK) supports the GPS-like positioning mode for additional B-UWB-MEK1 boards within a previously installed BeSpoon real-time locating system (RTLS), built with several anchors and one server.

The GPS-like positioning mode is device-centric, meaning that the position of a device is computed by the device itself, which simply analyzes the ultra-wideband (UWB) synchronization signals used by the infrastructure. GPS-like devices are only receivers, meaning that they never transmit any signal.

This application note complements the information available in the SDK. It is intended for advanced users already familiar with the quick start guide and with BeSpoon RTLS use. It is based on system version 3.x.

Figure 1. GPS-like devices using a real-time locating system infrastructure



1 General information

B-UWB-MEK1 embeds the B-UWB-MOD1, which features the STM32L476JE 32-bit microcontroller based on the Arm® 32-bit Cortex®-M4 processor.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

Definitions

Table 1 presents the definition of acronyms that are relevant for a better understanding of this document.

Table 1. List of acronyms

Term	Definition
3D_SELF	3D single self-positioning
BLR	Beacon-listening rate
HF	Hyperframe
PHS	Protocol hyperframe size
PSN	Protocol slot number
PSS	Protocol slot size
RTLS	Real-time locating system
RV	Rendez-vous (slot and zone)
SF	Superframe
SFI	Superframe information
TDMA	Time-division multiple access
UWB	Ultra-wideband

References

Refer to the following documents for an introduction to the B-UWB-MEK1 and B-UWB-MOD1 products in indoor location systems:

- Ultra-wideband module for high-precision indoor location (DB4404)
- Evaluation kit for the B-UWB-MOD1 ultra-wideband module (DB4392)
- B-UWB-MEK1 quick start guide (UM2798)
- SDK advanced documentation

Demonstration software

Contact the local STMicroelectronics sales office or distributor (refer to *www.st.com*) for the latest software and associated documentation.

2 GPS-like positioning with B-UWB-MEK1 boards

Step 1. Open [**BeSpoon Loc Server WebUI**].

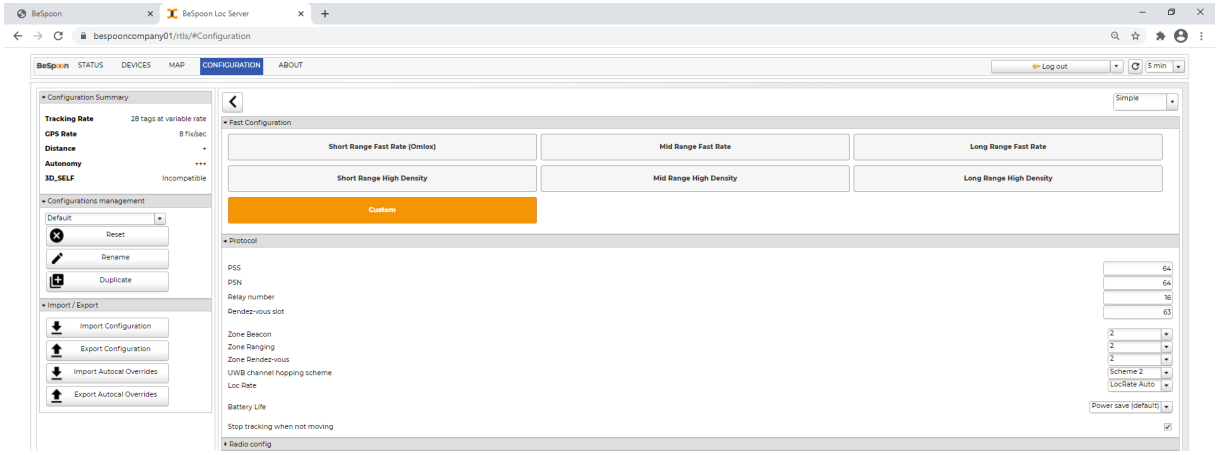
Step 2. Retrieve the infrastructure topology:

- Open the [**DEVICES**] tab.
- In [**Devices management**], on the left pane, click on [**Export devices list**].
- Save the `devicelist.ini` file on the computer.

Step 3. In [**CONFIGURATION > Fast configuration**], check the rate:

- Predefined rates: [**Short Range Fast Rate**] (omlox), [**Mid Range Fast Rate**], [**Long Range Fast Rate**], [**Short Range High Density**], [**Mid Range High Density**], [**Long Range High Density**], or
- [**Custom**] rate: [**CONFIGURATION > Protocol**] opens and displays the detailed superframe parameters.

Figure 2. Specific parameter display selecting sfi in filtering menu section



Step 4. On the B-UWB-MEK1 board, set the mode switch to the Master position.

Step 5. Connect the board to the computer.

Step 6. Check that the trace tool is closed.

Step 7. Open BeSpoon MOD1/MEK1 programming tool and turn the board ON.

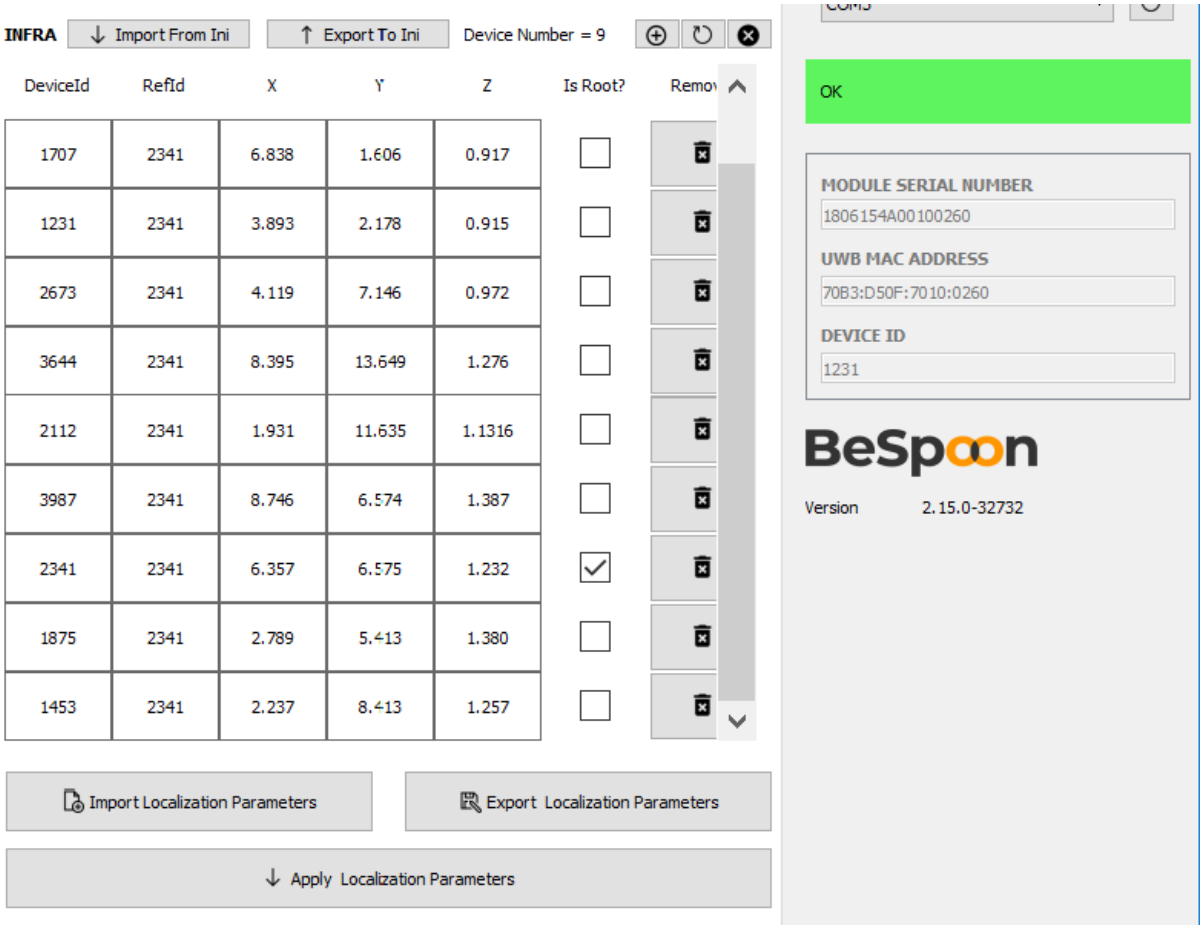
Step 8. In the menu on the right, select the board's serial port.
The programming tool displays a progress bar and device information.

Step 9. In [**Localization > TYPE**], select [**3D_GPS**].
The INFRA fields open.

Step 10. In [**INFRA**], import the infrastructure device list:

- Click on [**Import From Ini**].
- Upload the `*.ini` file saved at the third point of step 2, to view a table listing the devices, as in Figure 3.

Figure 3. Device list example



- Click on [**Apply Localization Parameters**].

Step 11. In [**Settings > PROTOCOL RATE**], adjust the parameters:

- Predefined rate: select the rate checked at step 3, or
- Custom rate:
  - Go to [**PROTOCOL CONFIGURATION**] and select [**Advanced**], to open the advanced setting fields.
  - Select [**Custom**] and set the [**PROTOCOL RATE**] parameters manually by following the values displayed at step 3.

Step 12. Click on [**Apply Settings**].

Step 13. Wait until the progress bar displays OK.

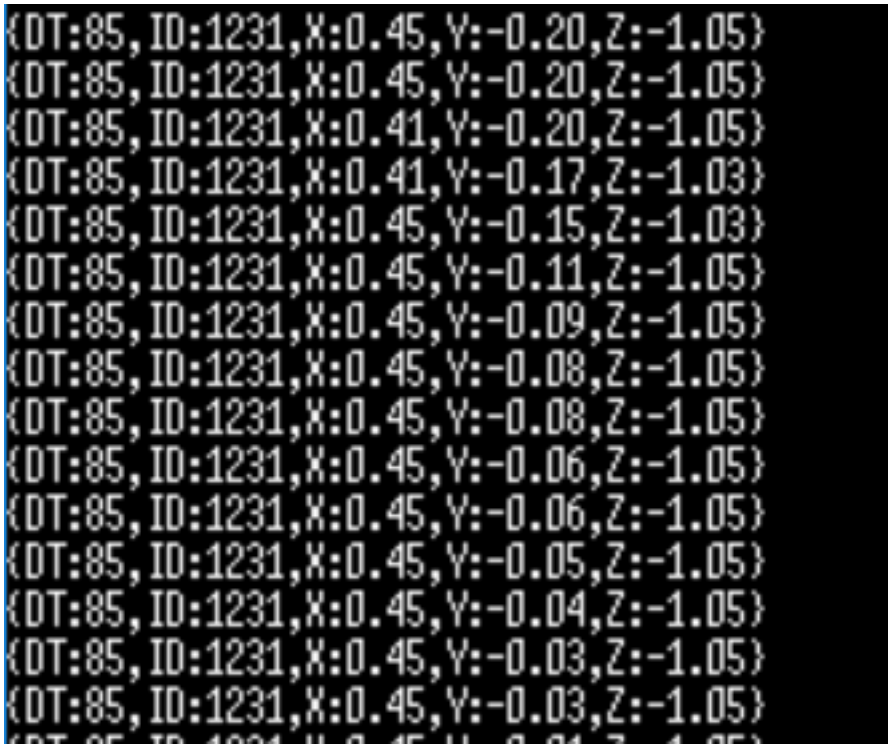
Step 14. In the trace tool, open a new connection.

Step 15. Reset the board.

The terminal displays 3D GPS-like positioning logs. as in Figure 4:

- DT (Delta): The time between measures in milliseconds. (until the decimal point),
- ID: Device ID of the MEK1 board being located,
- X, Y, and Z, 3D coordinates of the B-UWB-MEK1 board in meters.

Figure 4. 3D GPS-like positioning logs example



3 Switch to other configurations

A board used as a GPS receiver for GPS-like positioning must be reconfigured before operating as a secondary board in other configurations.

Caution: Otherwise, the board cannot range properly, even if the green LED behaves as if it is doing so.

Step 1. Set the mode switch to the opposite position to Master.

Step 2. Connect the board to the computer.

Step 3. Open BeSpoon MOD1/MEK1 programming tool and turn the board ON.

Step 4. In the menu on the right, select the board's serial port.
The programming tool displays a progress bar and device information.

Step 5. In [**Localization > TYPE**], select [**1D_FILT**], [**1D_RAW**], or [**3D_SELF**].

Step 6.

- For [**1D_FILT**] or [**1D_RAW**]:
  - Click on [**Apply Localization Parameters**],
- For [**3D_SELF**]:
  - In [**Localization tab > INFRA**], click on the plus icon to add the secondary boards to the configuration:
  - [**DeviceID**]: enter the Device ID of the secondary boards
  - [**x**], [**y**], and [**z**]: enter the coordinates of the secondary boards
  - Click on [**Apply Localization Parameters**].

Step 7. Wait until the progress bar displays OK.

Step 8. Disconnect the board from the computer.

Step 9. Supply it and, if applicable, other secondary boards with 5 V power.

Step 10. Connect the master board to the computer.

Step 11. In the trace tool, open a new connection.

Step 12. Reset the master board.
The terminal displays 1D or 3D traces.

4 Ask for support

Additional information is available from the documents listed in References. All documents may be updated without notice to individual users beforehand.

For up-to-date support or information about standardized as well as customized solutions, refer to the UWB and product pages on *www.st.com*, or to the nearest STMicroelectronics office.

Revision history

Table 2. **Document revision history**

Date	Revision	Changes
20-Apr-2021	1	Initial release.

Contents

List of tables

List of figures