Visualizing of 3D modes in BeSpoon location client tool

Introduction

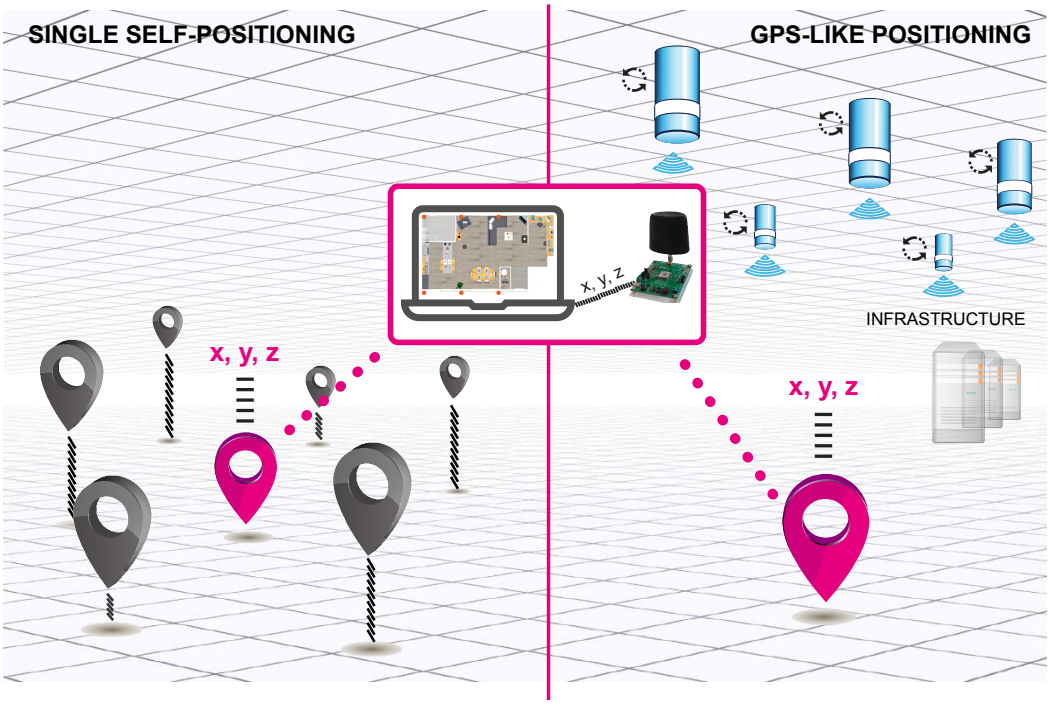
BeSpoon location client (BspLocClient) is conceived as a server frontend for BeSpoon real-time location system (RTLS), for example, to visualize the position of a device on a 2D map in real-time and to record positions. Basic features such as tracking visualization, record, replay, are available on Windows® and Ubuntu®, with or without a server. Advanced features such as Viewer 1D, Calibration 2D, Debug 2D, UWB Stats, Server Stats, and LOS indicator are available on Ubuntu® only and require a server.

If you already use BeSpoon RTLS, BspLocClient is installed on the server PC. If you use B-UWB-MEK1 hardware only, installation files are included in the SDK, in `tools > exe` for Windows®, and `tools > deb` for Ubuntu®. In the application note, BspLocClient is used without any server connection, in two device-centric tracking modes: 3D Single Self-Positioning or 3D GPS-like positioning, as illustrated in Figure 1.

This application note complements the information available in the SDK. It is intended for advanced users already familiar with 3D-single self-positioning mode in the quick start guide and 3D GPS-like positioning mode in the *3D GPS-like positioning within BeSpoon RTLS* application note. The procedures are done with Terminal, BspLocClient, BeSpoon MOD1/MEK1 programming tool, and BeSpoon location server WebUI applications.

The documentation is based on system version 3.x.

Figure 1. Visualization of 3D modes in BspLocClient



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.

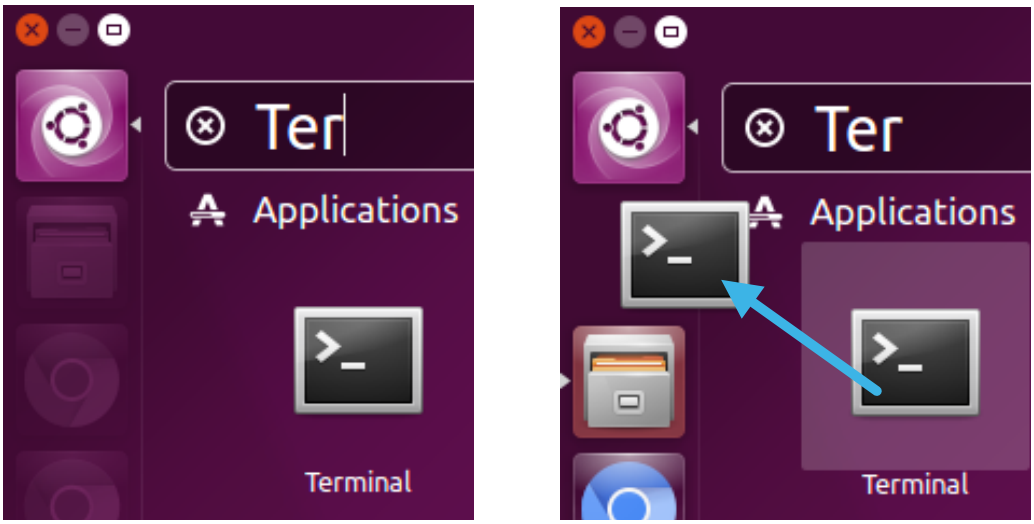
2 Install BspLocClient

On Windows®, the application can be started directly from the `.exe` file. In the SDK package, just open `tools > exe` and click on `bsplocclient_basic_X. XX.X_amd64.exe` to start BspLocClient.

On Ubuntu® (not needed if BeSpoon RTLS server is installed on the PC, as the client application is part of the server package):

Step 1. Search [**Terminal**] by typing "Terminal" in the Ubuntu® search tool.
The application icons can be dragged and dropped to the left menu bar for quick access.

Figure 2. Dragged and dropped application icons to the left menu bar for quick access



Step 2. Open [**Terminal**].

Step 3. Ensure the computer is connected to the Internet, to ensure the automatic download of the execution applications Qt packages from the Linux® software repository.

Step 4. Enter the following command (installing Qtx.x.x packages):

```
sudo apt-get install qt5-default libqt5svg5 libqt5serialport5
libqwt-qt5-6
```

The programming tool displays a progress bar and device information.

Step 5. Check if a previous version is installed:

- No previous version installed: skip to step 6.
- Previous version installed:
  a. Save the old client configuration files.
  b. Uninstall previous packages with the following command:

```
sudo dpkg --purge bsplocclient libbsptransport bsploclibrary
```

Step 6. Access the deb directory in the SDK by using the Linux® command cd ("change directory") and entering the corresponding path.

In the example below, the user is navigating from the home directory and the SDK directory is stored on the desktop:

```
cd Desktop/mod1_SDK_3.x.x_REVISION/tools/deb
```

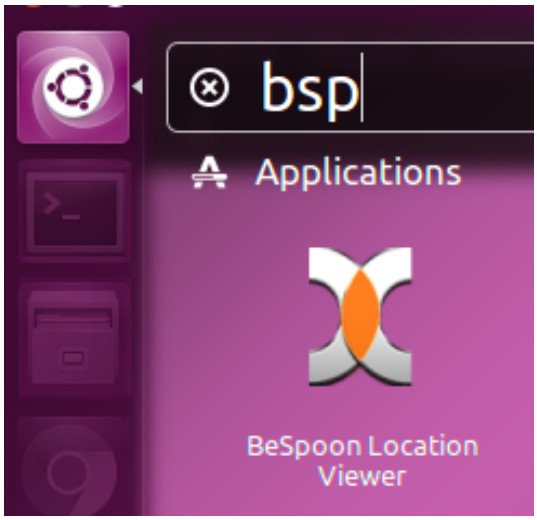
Step 7. Install the BspLocClient with the following command:

```
sudo dpkg -i *.deb
```

Step 8. To check the installation, start typing “bsp” or "BeSpoon" in the search tool.

It displays an icon labeled as "BeSpoon Location Viewer".

Figure 3. BeSpoon Location Viewer icon



3 Configure the topology (optional)

Note: Skip this section if you want to visualize the mobile device only.

BspLocClient can display the mobile device together with the fixed devices used to track it:

- Fixed MEK1 boards in 3D single self-positioning
- Anchors in 3D GPS-like positioning within a BeSpoon RTLS.

To take this topology into account, the application needs a file named `base_position.ini`.

The following procedure shows how to create this file and import it into BspLocClient.

Step 1. Retrieve the topology:

- 3D_SELF: In `MOD1/MEK programming tool > Localization > INFRA`, select [**Export To Ini**].
- 3D_GPS: In `BeSpoon Loc Server WebUI > DEVICES > Devices management`, click on [**Export devices**].

Step 2. Get the file path.

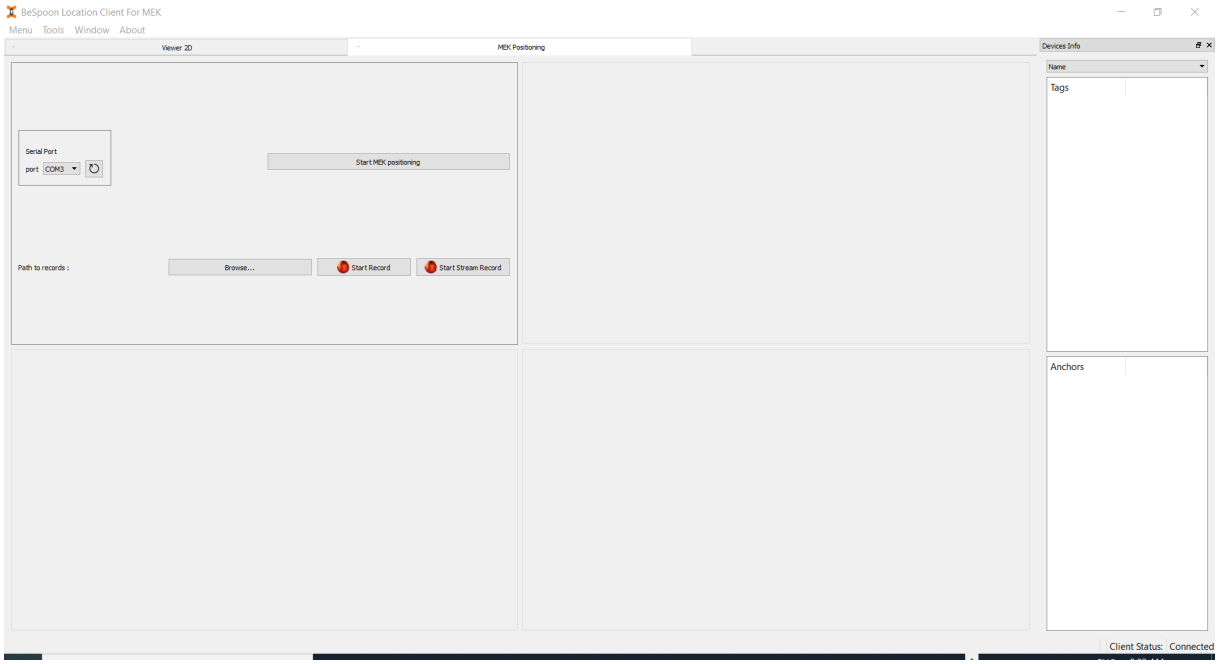
Step 3. Rename the file `base_position.ini` and move it into the right system administration directory (`/etc/BeSpoon`) . On Ubuntu®, use the following command:

```
sudo mv FILEPATH /etc/BeSpoon/base_position.ini
```

4 Set BspLocClient for MEK positioning

On Windows®, the application directly starts with preferences adapted to MEK1 positioning, as shown in Figure 4.

Figure 4. Application preferences adapted to MEK positioning



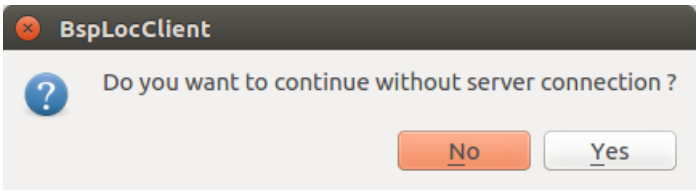
On Ubuntu®:

Step 1. Open BspLocClient.

Step 2. In the start window, select [**Local File**].

Step 3. As the application doesn't find any connection to a BeSpoon RTLS server, it asks to confirm that BspLocClient is used without a server.

Figure 5. Use of BspLocClient without server connection



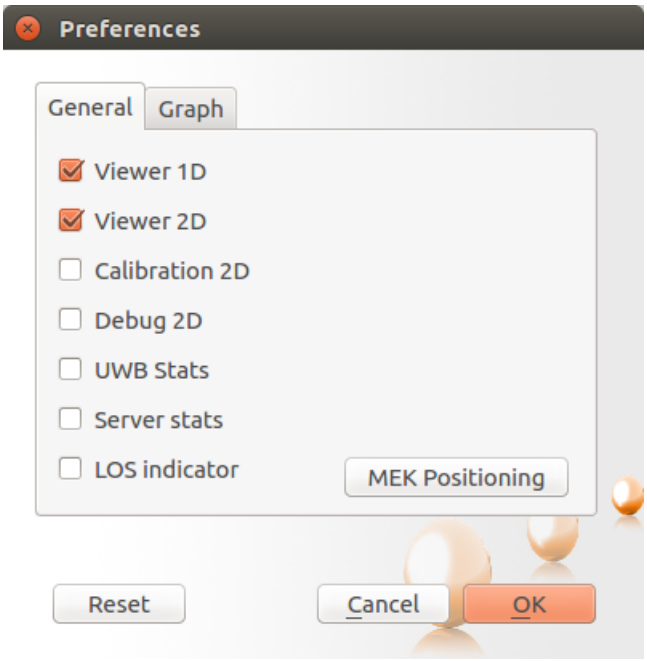
Click on [**Yes**]

The application first opens as a standard interface for BeSpoon RTLS use.

Step 4. In the main menu, select [**Tools > Preferences**].

Step 5. In the Preferences window, select [**MEK positioning**] and confirm by clicking on [**OK**].

Figure 6. MEK positioning choice in the Preferences menu



Step 6. Close and re-open BspLocClient.

5 Configuring the map

Step 1. In the [**Tools > Preferences**] window, open the [**Graph**] tab.

Step 2. Set the visualization options:

a. Upload a floor plan image by clicking on the [**Browse**] button Formats allowed: `.bmp`, `.gif`, `.jpg`, `.jpeg`, or `.png`.

b. Specify the offset and the scale on X and Y axes, as shown in Figure 7.

Figure 7. Specify the offset and the scale on X and Y axes

c. Confirm by clicking on [**OK**].

d. Restart BspLocClient.

The displayed information depends on the choice in Section 3 :

– No topology imported:
  - [**Devices info > Anchors**] is empty.
  - The [**Viewer 2D**] tab displays the floor plan only.

– Topology imported (`base_position.ini` file loaded):
  - [**Devices info > Anchors**] displays the ID of the fixed devices (MEK1 boards or anchors).
  - The [**Viewer 2D**] tab displays purple anchor icons with the ID of the fixed devices on the floor plan.

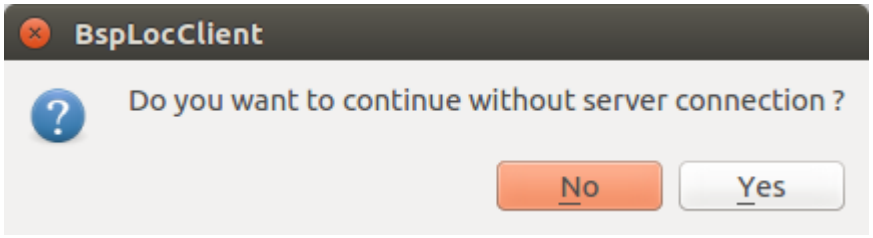
6 Start tracking

Step 1. Connect the mobile board to the computer.

Step 2. Open BspLocClient.

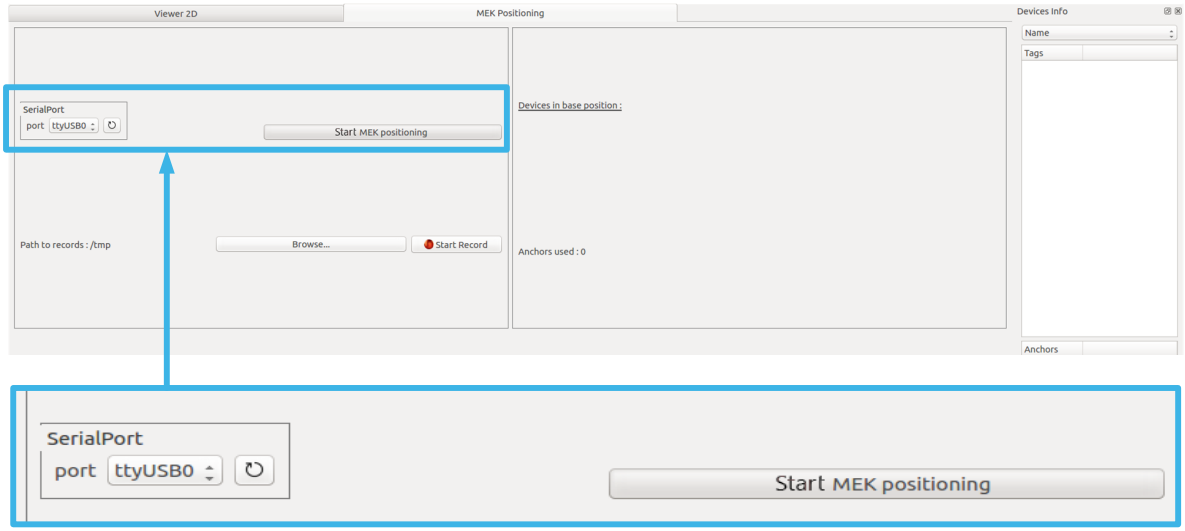
Step 3. As described in Section 5 , select [**Local File**] at the start and confirm that the application is used without server connection as shown in Figure 7.

Figure 8. Request to continue without server connection



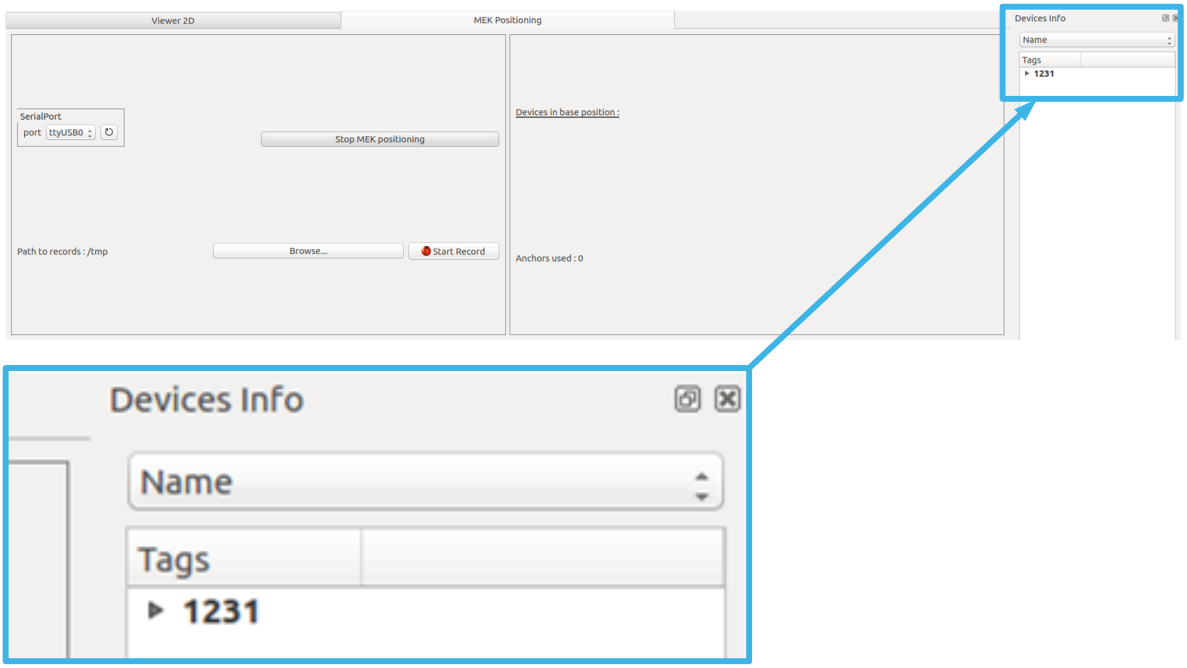
Step 4. In the [**MEK Positioning**] tab, select the USB port if several ones are available and click on [**Start MEK positioning**].

Figure 9. USB port selection and MEK positioning start



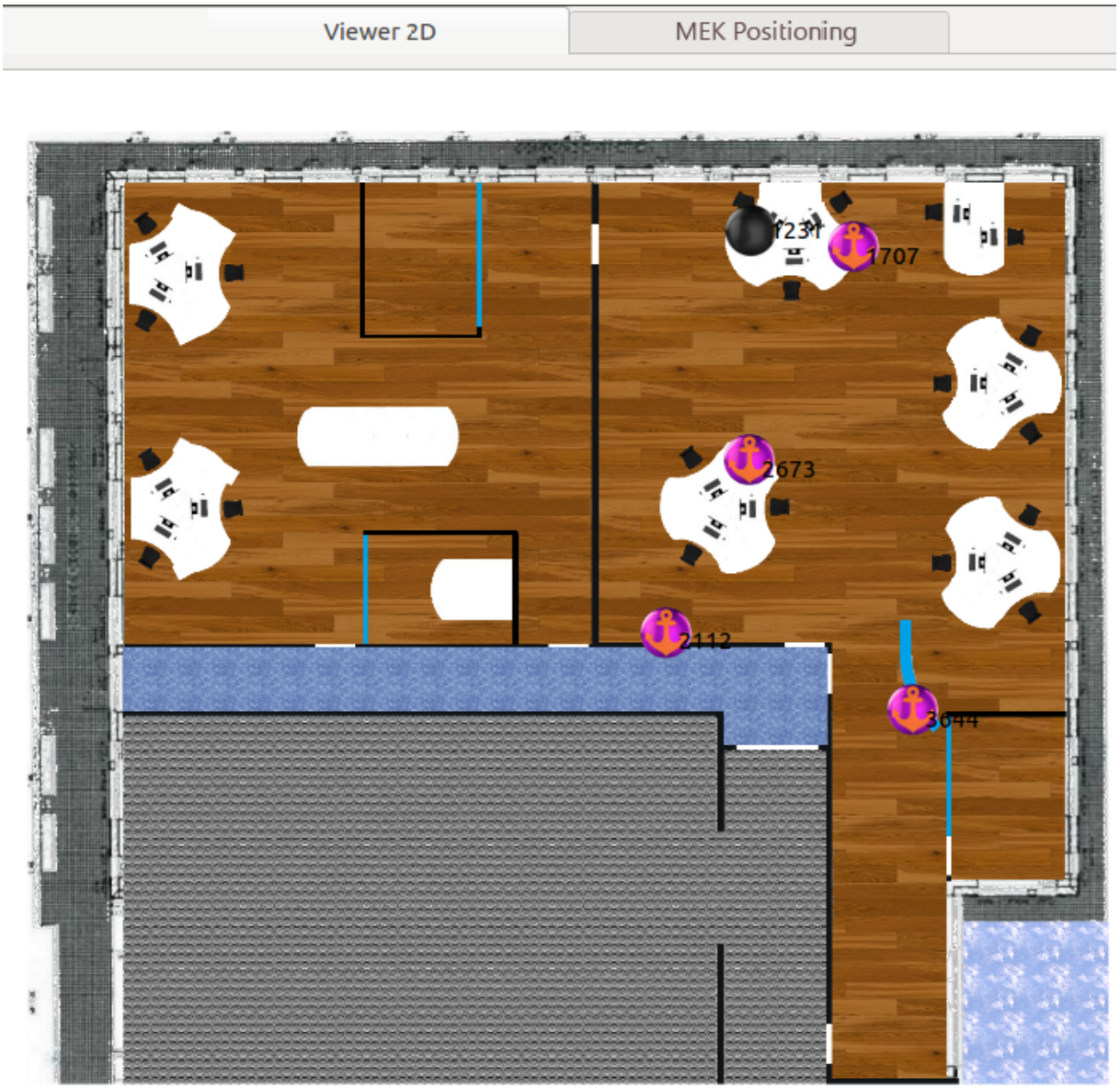
The ID of the mobile device appears in [**Devices info > Tags**].

Figure 10. Devices info display



Step 5. Switch to [**Viewer 2D**] for visualization.

Figure 11. Viewer 2D vizualization



Step 6. Customize the information on the map using [**View**] in the main menu. The 3D-single self-positioning mode and the 3D GPS-like positioning mode are compatible with the options listed below.

– [**View Anchors**] (*Keyboard shortcut: a*): Anchor icon and ID of the fixed devices. To activate it, close and re-open the application.

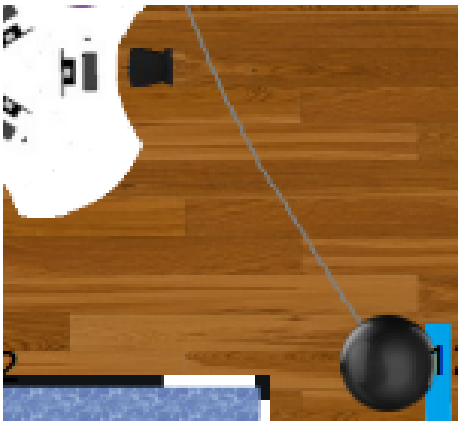
Figure 12. View Anchors

– [**View Label**] (*Keyboard shortcut: l (lowercase L)*): Device ID of the mobile device

Figure 13. View Label

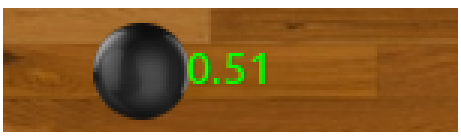
– [**Trace**] (*Keyboard shortcut: t*): Trace of the mobile device. Adjustments: dots/line displaying, three pre-set lengths, and customizable width

Figure 14. Trace



– [**View elevation**] (*Keyboard shortcut: e*): Real-time position of the mobile device on the z-axis

Figure 15. View elevation

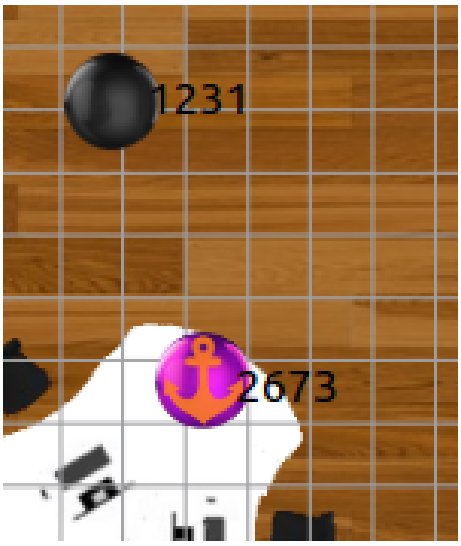


– [**View coordinates**] (*Keyboard shortcut: k*): Real-time x, y, and z coordinates of the mobile device

Figure 16. View coordinates

– [**Show grid**] Scalable grid

Figure 17. **Show grid**



7 Record a tracking trace

BspLocClient provides the possibility to record the tracking data transmitted from the mobile device to the computer via the USB connection (UART link) in a `.csv` file.

Step 1. Check tracking is running as described in Section 6 .

Figure 18. Tracking ready to be recorded

Step 2. In the [**MEK Positioning**] tab, click on [**Browse**] to select where the `.csv` file may be saved.

Step 3. Click on [**Start Record**].

Step 4. Click on [**Stop Record**] at the end of the sequence.

A `.csv` file is created in the directory specified at step 2. It contains timestamps in nanoseconds and x, y, and z coordinates in meters. An example is given in Figure 19.

Figure 19. Tracking trace in tabular format

	A	B	C	D
1	#Type: Tag	Local: en	Date: 16/05/2019	
2	#nbTag:1			
3		hash#1		
4	timestamp_ns	X1	Y1	Z1
5	152456000	5.84	7.98	0.27
6	152532000	5.88	8.05	0.27
7	152608000	5.92	8.13	0.27
8	152684000	5.96	8.2	0.27
9	152836000	6.05	8.34	0.27
10	152912000	6.1	8.4	0.27
11	152988000	6.15	8.46	0.27
12	153064000	6.21	8.53	0.27
13	153140000	6.26	8.59	0.27
14	153216000	6.32	8.65	0.27
15	153292000	6.37	8.71	0.27

8 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