



« IIDRE: geolocation solution by UWB »

Instruction manual
RTLS by IIDRE

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I. Software installation

The open source software *RTLS* by *IIDRE* allows for supervision and configuration of the geolocation system. It is written in C++ with *Qt5*.

A Framework Qt5 installation

Qt.io supplies an online installation tool which makes *Qt framework* and *QtCreator IDE* installations easier. This tool is available following this link: <https://www.qt.io/download-qt-installer>

B Sources download

The project sources are hosted on *GitHub*. Download is available following this link: <https://github.com/IIDRE/uwbSupervisor>

C Compilation

The project has no third party dependencies. It is automatically compiled with *QtCreator*.



II. Software presentation

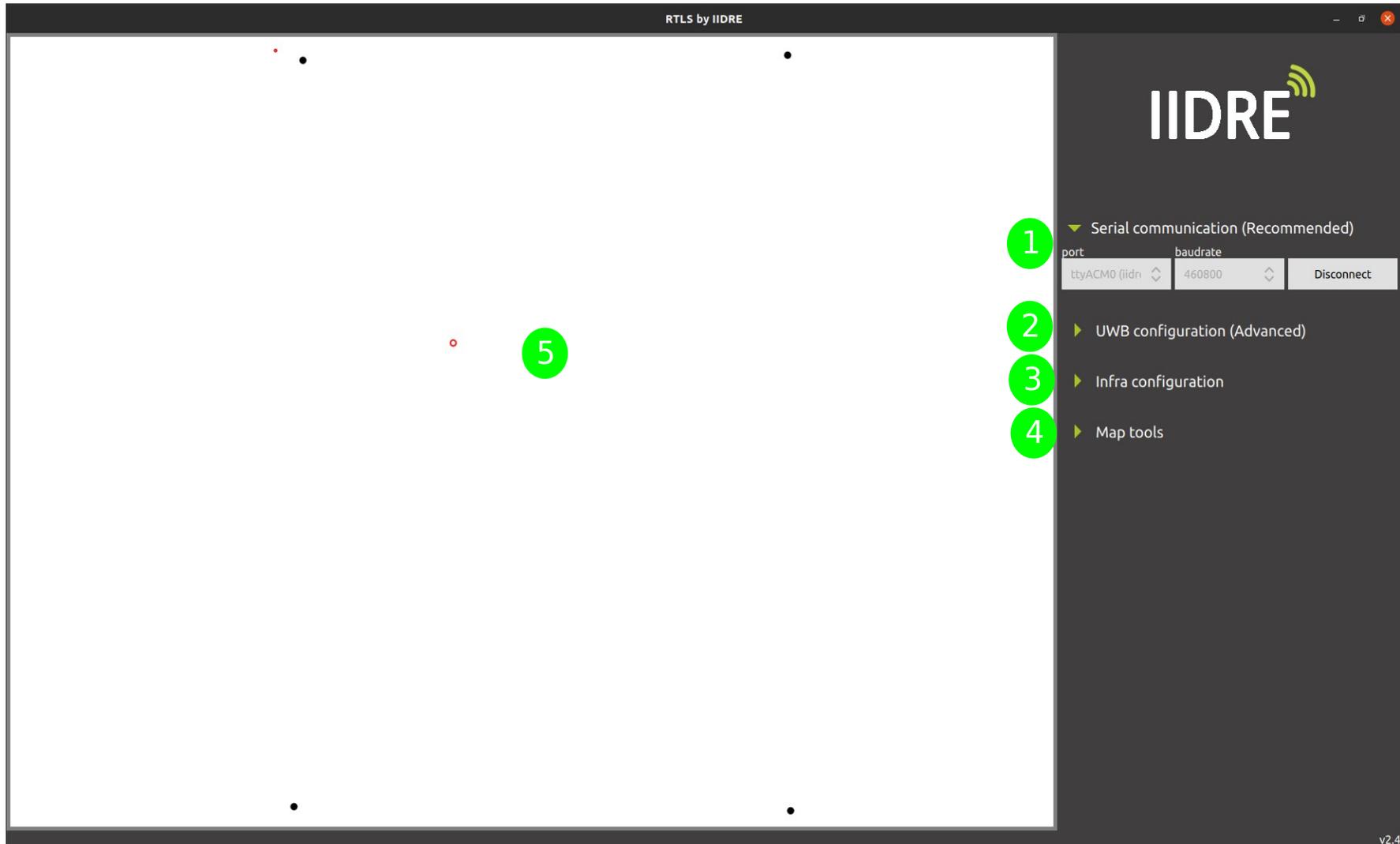


Illustration 1: UWB supervisor user interface

IIDRE software offers features required for a good use of the geolocation solution. The overhead illustration 1 presents the user interface:

1. Configuration of the port and the baudrate of the serial link. Connection is automatically detected when the device is plugged in. Baudrate can be chosen among 115,200 and 460,800 bauds.
2. UWB parameters configuration by using drop-down menus. The device parameters CHAN, PRF and BR are automatically detected at the connection. In order to keep a coherent configuration, values offered by TRXcode, PLEN and PAC drop-down menus evolve according to validated values for CHAN, PRF and BR. All those parameters are detailed in the *user guide*.
3. Infrastructure configuration section allowing the user to send to the tag the anchors coordinates and open a map to see the tag on a plan.
4. Map tools respectively allowing the user to perform map scaling, show items UID and coordinates, show mouse cursor coordinates, trace multilateration circles, adjust map, rotate map, flip map and trace distances hitograms.
5. Map visualization area, anchors will appear as black points whereas real time tags positions in colored points

1. Serial communication

A. Connection

Connect a device to the computer. In the Serial communication section (Illustration 2), the port is automatically detected. Select the baud rate with the drop-down menu and click on the *Connect* button.



Illustration 2: Device connection

B. Disconnection

Disconnect the device with the *Disconnect* button as shown in the Illustration 3.

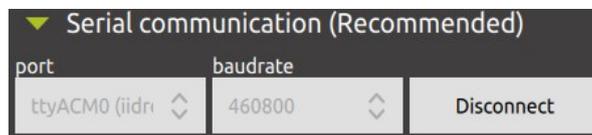


Illustration 3: Device disconnection

2. UWB radio configuration

Although the devices are delivered with a default UWB configuration, the user is free to modify it as wanted. To that end, follow the steps below for each device, after launching the *RTLS by IIDRE* application.

The UWB configuration section is shown on the Illustration 4. The CHAN, PRF, TRXcode and BR parameters currently configured in the device are displayed in drop-down menus, PLEN and PAC parameters depend on BR value. Once all settings are selected, the configuration is updated in the device memory by clicking on the *Configure device* button.

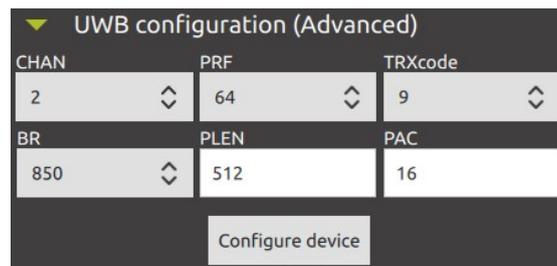


Illustration 4: UWB configuration

3. Infra configuration

After installing the infrastructure composed of at least 3 anchors and collected the coordinates (X; Y) of each one, it is necessary to provide the configuration to the tags in order to compute their positions. To do so, you can use a *.json, a *.csv or a *.dxf file.

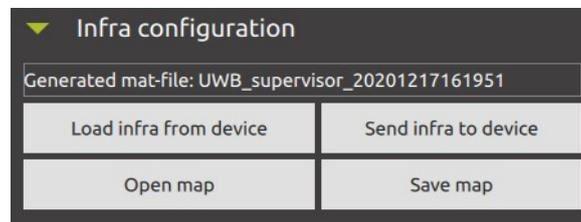


Illustration 5: Infra configuration

A. Configuration with a *.json file

After launching the *RTLS by IIDRE* application, follow the steps described below:

- Plug and connect the tag.
- Click on the *Load infra from device* button (flash). A dialog box will open, choose the log file folder and enter a name with a *.json extension.
- Open this file with a text editor, such as Notepad. The list of N anchors known by the tag displays in a JSON format. The IDs are specific to the kit and the coordinates are initialized to 0.
- Fill up the X and Y coordinates (in cm) of the different anchors (Z could be set to 0).
- Save the file keeping its *.json extension.
- Click on the *Send infra to device* button. A dialog box will open, select the file saved before and click on *Open*. The different anchors coordinates are automatically modified in the tag memory.

B. Configuration with a *.csv or a *.dxf file

It is possible to transfer the anchors coordinates with a measurement tool which features CSV or DXF format. To that end, after launching the *RTLS by IIDRE* application, follow the steps described below:

- Click on the *Open map* button. A dialog box will open, select the file *.csv or *.dxf created before and click on *Open*. Points described in the file are displayed in the visualization area of the map.
- Click on a point, a window allows to specify the type of this point (Anchor or Map) according to radio buttons. In anchor case, select its ID in the drop-down menu and click on *OK*. Check the

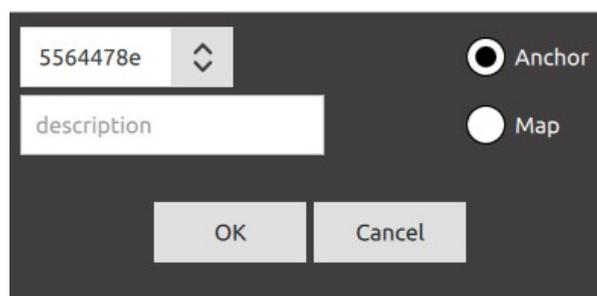


Illustration 6: UWB supervisor, configure point of map

- Repeat the previous step for each point.
- Click on the *Save map* button. A dialog box opens, choose the folder and the file name. Save the file with *.json extension.
- Click on the *Send infra to device*. A dialog box opens, select the file previously saved and click on *Open*. The different anchors coordinates are automatically modified in the tag memory.

4. Map tools

The last section allows the user to access to several features to manage the map display, view measured values or multilateration principle.



Illustration 7: Map tools

A. Map scaling

The RTLS by IIDRE application allows the user to load a map file in order to visualize the tag on a plan.

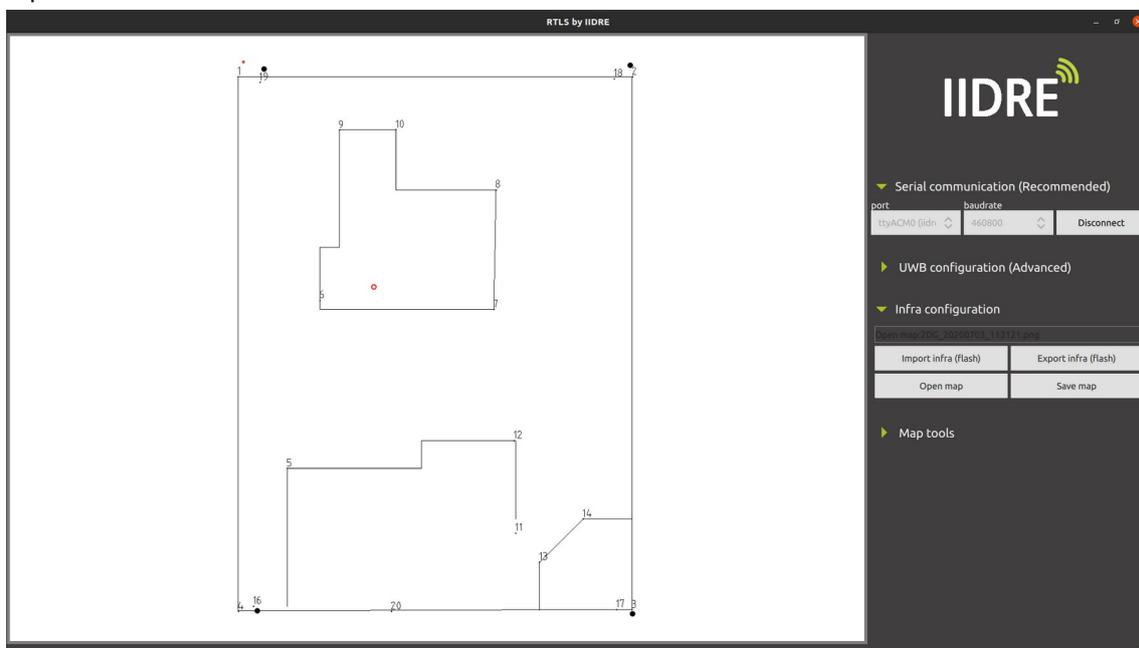


Illustration 8: Tag position visualization on a plan

To do so, the user needs to click on the *Open Map* button in the Infra configuration section, choose a png, jpeg or pdf file and perform the map scaling by using the icon . To that end, double-click on each map position of the anchors used to create the log file. Once one position selected, the following pop-up is shown in order to select the ID of the anchor.

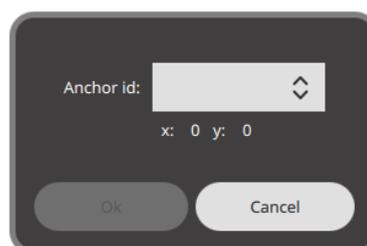


Illustration 9: Anchor ID selection

The scaling is correctly performed once the pop-up below appears:

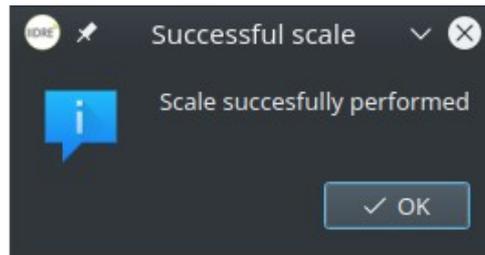


Illustration 10: Successfully performed scaling popup

B. Information display and anchors coordinates

When highlighted, the icon  allows the user to display IDs, coordinates and reception level (in dBm) of the last received signal. Check the Illustration 11: UWB supervisor, coordinates and reception level.

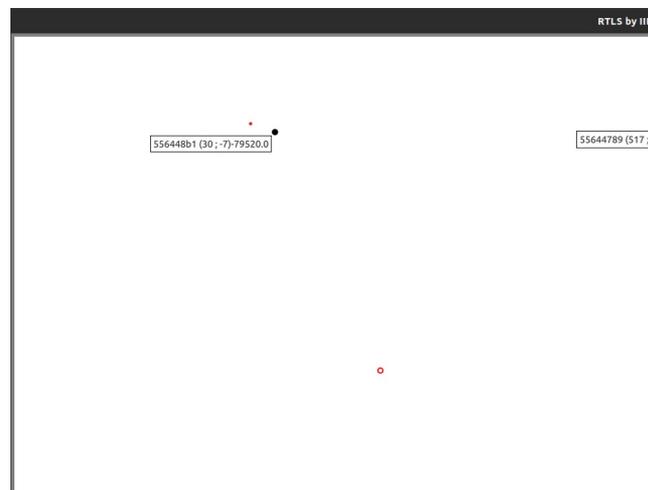


Illustration 11: UWB supervisor, coordinates and reception level

C. Display of the pointer coordinates

When highlighted, the icon  allows the user to display the mouse pointer coordinates on the visualization area.

D. Visualization of the multilateration

When highlighted, the icon  allows the user to illustrate multilateration principle in the embedded system. Thus, centred on each anchor position, a circle whose radius is equal to the last distance measured is drawn. The tag position is at the intersection of those different circles. Check the Illustration 12: UWB supervisor, multilateration visualization

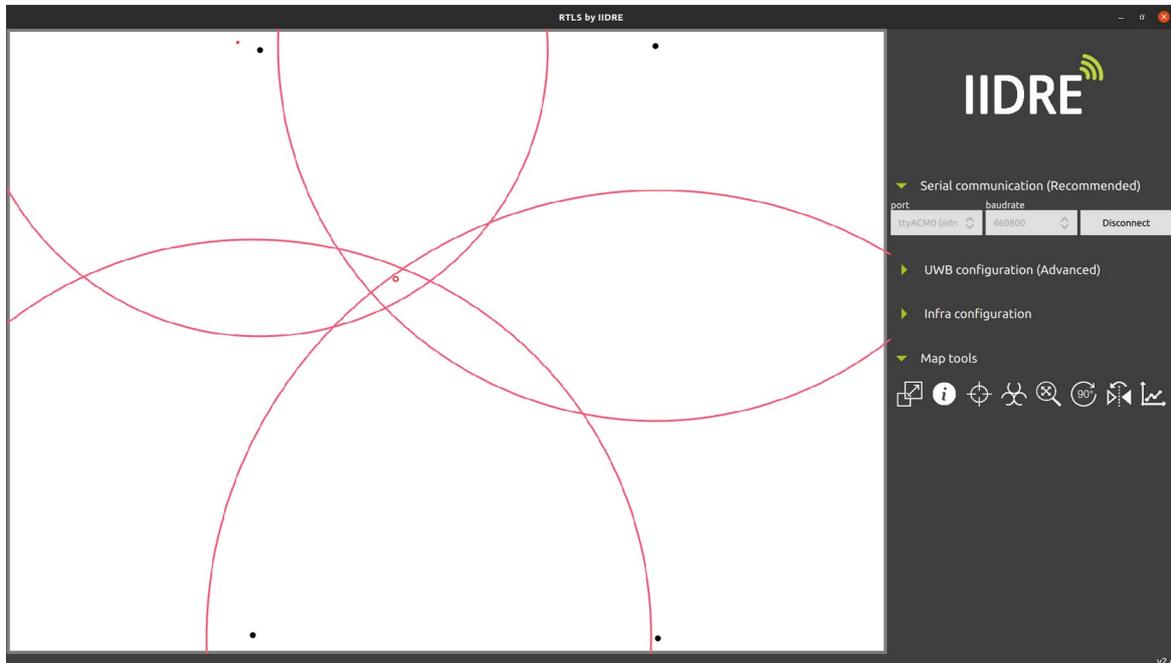


Illustration 12: UWB supervisor, multilateration visualization

E. Adaptation of the visualization area of the map

A single click on the icon  allows the user to adjust the visualization area map, after having zoomed in or out with mouse wheel for instance.

A single click on the icon  rotates the visualization area by 90° clockwise.

A single click on the icon  applies a mirror effect to the visualization area.

F. Visualization of distances and power reception

A single click on the icon  allows the user to open a new window acting as a dashboard where you can find distances histograms of all anchors as well as a summary of the UWB communications in progress. For each anchor, display of the distance in real time (Dist) and first-path (Radio) reception level. Display also of the change between low and high values on a 30 seconds interval (dDist and dRadio). This tool is dedicated to check the good reception of the anchors by looking at the standard deviation during a motionless test.

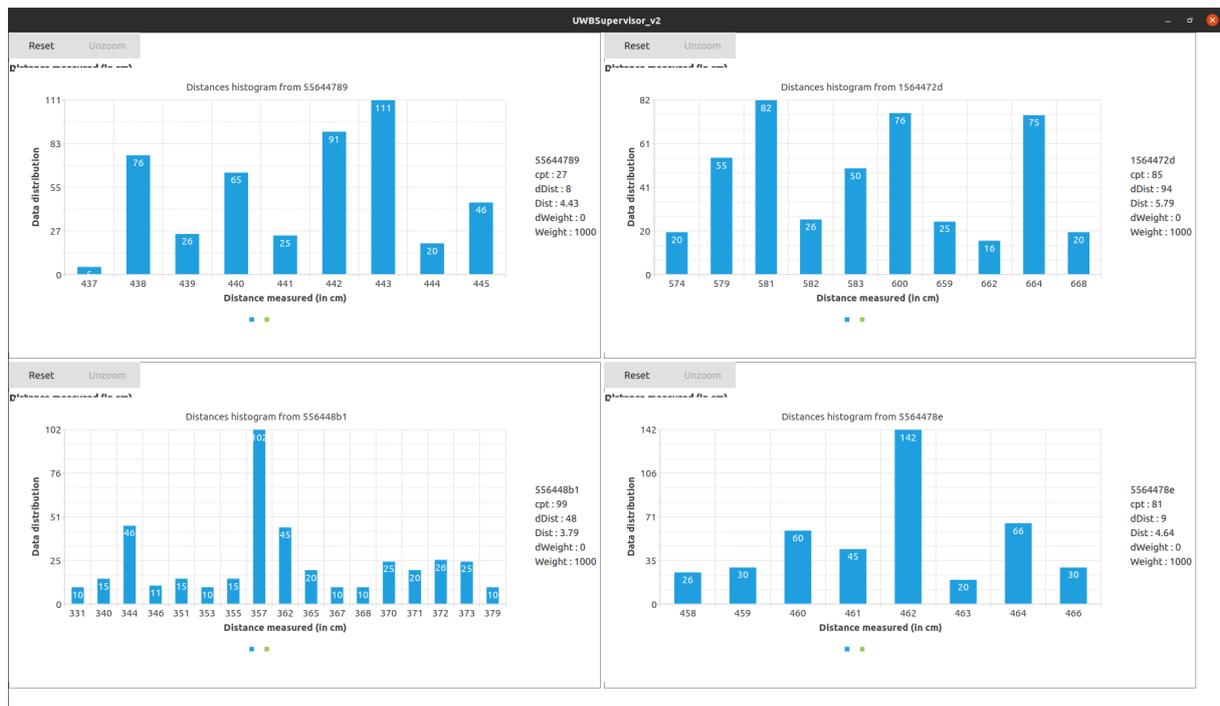


Illustration 13: Distances histograms from each anchor