

# Indoor Localization

## White Paper

An Indoor Localization System, also called Indoor Positioning System (IPS) or Real-time Location System (RTLS) is like a GPS, but for indoor environments.

Because GPS receivers cannot receive the transmitted GPS signals from satellites indoors, the receivers cannot locate themselves. This is different in indoor localization systems. An indoor localization system has its own "satellites" which are often called "anchors". The mobile receivers are called "tags" and can locate their position based on the available anchors inside the buildings. Each person or object carrying a tag can be localized.

This paper draws typical applications for indoor localization systems and explains the localization technologies and their differences in detail. It compares existing indoor location systems and helps the reader to select the best technology for his application.

## Table of Contents

1. Typical applications for indoor localization .....	3
2. Technologies .....	5
2.1. Wifi and Bluetooth.....	5
2.2. RFID.....	6
2.3. UWB .....	7
2.4. Comparison.....	8
3. Localization principles.....	10
3.1. Distance and angle measurement .....	10
RSSI .....	10
Time of arrival and time difference of arrival.....	10
Symmetrical Two-way ranging (TWR).....	11
Angle of arrival.....	11
Comparison.....	11
3.2. Position estimation .....	12
4. Localino Indoor Localization .....	14
Backend and Frontend.....	14
Accuracy.....	15
Battery Lifetime .....	15
Scalability to large spaces .....	16
Number of tags .....	16
Abbreviations.....	17