Exafore Ltd
Sales: Aki Korhonen +358 44 544 7357 aki.korhonen@exafore.com

The Exafore Horizon Advantage

Exafore Horizon

Key Technologies

Exafore Horizon is a Real-Time Locating System (RTLS) consisting of stationary devices (base stations) and mobile devices (tags), which use Ultra-Wideband (UWB) radio technology for transporting data and making distance measurements between each other. Tags also include a 6-axis inertial sensor which is used for increasing position fix quality and availability, and for reducing the power consumption of the tag.

UWB is a short-range radio technology for data communication that uses long sequences of nanosecond-level RF pulses to create a signal with a wide bandwidth. With suitable transceiver hardware it is possible to measure the timing of these pulses with sub-nanosecond accuracy and therefore measure distances with decimeter level accuracy, one nanosecond being about thirty centimeters at RF signal propagation speed i.e., the speed of light. This provides for its use in positioning systems and applications. The UWB signaling is standardized in the IEEE 802.15.4 standard.

Features and Benefits

Exafore Horizon has several functionality and performance characteristics which cater to a wide variety of indoor positioning applications. These range from continuous one fix per second real-time position tracking to one fix per hour asset tracking and offline data analysis. Here is a shortlist:

Positioning capability

- The system provides decimeter level positioning accuracy independent of range, using hybrid UWB+inertial positioning for best accuracy and fix availability.
- Since the UWB signal can be measured through obstacles such as partition walls, furniture, pallets of goods etc., a visible line of sight between base station and tag is not required. Consequently, positioning can also work in rooms where there are no base stations, for example.
- The system natively supports 3D operation with X, Y and Z coordinate output. Altitude/height aided 2D operation is also possible.
- Since the system measures real range between tags and base stations it can also be used for proximity detection with base stations installed in key locations.

Architectural characteristics

- The system includes a local server with a single easy-to-use network API, supporting positioning and measurement data delivery, system state monitoring, configuration, and all other user operations. The API has built-in user role and access management, and it is straightforward to integrate with other systems, in the cloud or otherwise.
- The measurement data generated by base stations is transported to the server over an Ethernet interface for the best robustness and stability. The base stations have a master/slave architecture where each slave base station delivers data to its master over UWB, and each master delivers the data to the server over Ethernet. Consequently, only master base stations need to be connected to Ethernet, minimizing cabling need.
- Each base station can be powered with either USB or PoE (Power over Ethernet), providing for flexibility in power supply arrangements.
- The system is self-contained, and its operation does not depend on connection to the internet, or cloud. It can therefore also be used in environments where such connectivity is not desired, e.g., for security reasons.
- The system is resistant to interference from narrowband radio systems, since each one of them affects only a small portion of the whole UWB signal spectrum.
- The tag has IP67 class ingress protection: it is fully dust-tight and can withstand short-term immersion in water. The standard indoor base station has an IP40 protection class, and an IP67 base station is also available for harsher environments. The system can therefore be used even in challenging environments.

Installing the system

- The system includes a multi-purpose Android GUI application for all parts of system commissioning: configuration, control, visualization, and testing
- Base stations can be installed in any orientation, making installing them easy compared to systems based on angle measurements, e.g., angle-of-arrival (AoA) systems
- No RF fingerprinting is required during installation or when radio environment changes, as the positioning method used is not based on fingerprinting

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Tag

- Battery life up to over a year depending on operating mode and fix rate
- Accelerometer-based movement detection in tags provides for lower power consumption
- Tag transmission and reception times can be relatively short, reducing power consumption significantly
- Small and lightweight tag design

Summary

Exafore Horizon offers multiple advantages over other positioning systems and technologies. It can support many different kinds of indoor positioning needs and different indoor environments – from factory floors and warehouses to office buildings. Its system design allows flexible deployment and the optimization of each system configuration for the relevant application requirements.

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