Hospital Bed Trial

Consultancy Brief: Practical Asset Tracking

Management of assets within the NHS is a critical factor affecting success in diagnosing, treating and caring for patients and in managing waiting lists and treatment times. Recently, CoreRFID was asked to explore the feasibility of using UHF RFID tags as a way of controlling the whereabouts of hospital beds.

Success in the deploying RFID depends on taking account of a number of factors, including the technology capability, the implementation environment and the working practices that the technology will interact with (so-called "situated factors").

CoreRFID has considerable experience in the implementation of RFID and is well placed to help organisations investigating the implementation challenges that they will face. This is one of a series of Consultancy Briefs from CoreRFID which show how companies can benefit from our RFID expertise.

Controlling the whereabouts of assets is a challenge in a high pressure environment like a hospital.

RFID In A Clinical Environment

The use of radio frequency identification (RFID) in a clinical environment means that application architects have to confront a a number of issues not faced in other commercial or industrial applications. Fortunately concerns over the possible interference with other clinical equipment and over the effects of radio frequency emission have now been resolved (see our fact sheet: RFID & Public Health) and recent initiatives by the standards body GS-1 have made a great contribution to providing a standardised framework for the coding systems needed to support RFID exploitation within clinical environments, and in particular the UK's National Health Service.

However, system designs have to take account the way in which technology will be used in the workplace and the physical factors that affect its deployment. Because work within healthcare inevitably focuses on the patient and the clinician the use of technology needs to be designed in such a way as to be incidental to other work activities but once these issues are considered it is also necessary to take account of the physical factors affecting the use of readers and tags in a ward or operating theatre environment.

Some of the physical factors that need to be considered include:-

- The reader design, antenna(s) and their orientation relative to the tag
- The tag design and its antenna.
- The material to which the tag is attached.
- The extent to which the tag orientation can be controlled.
- The required success rate.
- The extent to which the environment can be controlled.

Changes to any one of these will result in changes to the achievable read distance and success / read accuracy rates.

"This study demonstrated that UHF technology is potentially useful for this application providing a solid basis for future planning."

Munsoor Ali, Managing Director CoreRFID Ltd.

Proposed Application

The trial was to evaluate RFID technology for tracking beds, in a hospital environment. To be practical the application needed to be able to read RFID tags automatically, at distance, without any intervention from the hospital staff. One challenge in this is that the main construction of the bed is metal which could potentially distort RFID signals and cause false readings. To achieve the required read distance Ultra High Frequency (UHF) RFID was utilised. The read range achievable with UHF tags is sufficient to allow the beds to be automatically identified passing through doorways. A tag designed to operate on metal surfaces, was used to ensure that signals could be received at distance without interference from the metal bed frame.

Trial Results

The trial was conducted using a Thing Magic Astra UHF RFID reader with an additional antenna (used to provide one reading antenna either side of a doorway) and Confidex Ironside RFID tags. Tests were conducted using a measure of the effectiveness of tag response which could provide data on the risk of misreads as well as failed reads and were designed to replicate typical bed movements. Tests were designed to see whether orientation of the bed towards the reader or to its auxiliary antenna made a significant difference to success and whether moving the bed through the doorway at a walking or running pace affected read successes. Two tests were included to check whether the presence of someone moving between the reader and the tag as it passed the reader affected the results.

A summary of the results achieved is shown below. For the Average tag Index, a figure of greater than 80 indicates a successful trial..

Test Nr.	Reader Power / Obstructions	Tag Orientation	No: of Tags	Average Tag Read Index
1	Max. power (30dBm)	Towards Reader	Walk	103.0
2	Max. power (30dBm)	Towards Antenna	Walk	94.5
3	Max. power (30dBm)	Towards Reader	Run	100.5
4	Max. power (30dBm)	Towards Antenna	Run	93.0
5	Max power with obstruction	Towards Reader	Walk	100.5
6	Max power with obstruction	Towards Antenna	Walk	93.0

A further series of tests were carried out to establish the level of confidence in the results by reducing the read power until read failures exceeded successes. These tests indicated that a signal level of 26dBm could still be used to give the same success rates as at 30dBm.

Lessons Learned

Using this simple set of tests it was possible to draw some initial conclusions that have helped to shape the next steps in the planning of this project. Firstly it was clear that the application scenario, as envisaged for the hospital could work successfully from a technical perspective. However other factors need to be explored before being sure that a cost benefit analysis for a planned installation could be constructed.

These factors include such factors as approach to and costs of tag attachment, reader installation and networking costs, optimum antenna positioning, optimum tag location. While none of these issues are likely to place the technical solution in jeopardy, they could affect the implementation costs and so the potential return on investment when assessed over the many floors and wards of the hospital concerned.

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