



Key facts/data:
PervasID Ltd

Technology: **UHF RFID Reader**

Established: **2011**

Type: **Spinout**

Location: **Cambridge**

Employees: **n/a**

CEO: **Dr Sabesan Sithampanathan**

Sabesan read a BEng (Hons) Electronic Engineering at Sheffield University in 2004, where he was awarded the Sir William Siemens Medal for being among the UK's top 18 science and technology students. Sabesan worked on RFID since beginning his PhD on the subject at Cambridge University in 2007, and was elected to a Research Fellowship at Girton College, Cambridge University in 2011. Prior to his PhD, he worked at ARM as an Electronics Engineer.

Low cost, long distance sensing of passive RFID tags has long been an unmet need in the retail, logistics and other industries.

University background

Cambridge University is a pioneering centre for research on many aspects of communications; for this reason Dr Sabesan Sithampanathan, the co-founder and CEO of PervasID, chose the University to do his PhD, taking as the subject of his thesis, the 'Passive RFID real time sensing system for intelligent infrastructure'. Prior to starting the PhD in 2007 he was working at ARM Semiconductor in Cambridge, having graduated with a degree in Electronic Engineering from the University of Sheffield in 2007.

PervasID is the commercial realisation of Sabesan's PhD thesis as part of TINA (The INtelligent Airport) project completed in 2010 in collaboration with the co-founders - Dr Michael Crisp (a fellow PhD candidate and now a lecturer at the University) - and his supervisors, Professors Ian White and Richard Penty, both of whom also have considerable experience of spinning out companies in the communications field (notably Zinwave, acquired in 2014 by a US company).

Attraction

What attracted Sabesan to choose RFID for his thesis was the strong level of interest in the technology from industry at the time, which the market had failed to satisfy. It presented a commercial opportunity since, as he admits, he is at heart an entrepreneur. His goal was to develop a passive UHF RFID reader which could offer low cost and reliable reading of standard, off-the-shelf passive UHF RFID tags.



Problem

In the 'real world', says Sabesan, there are many dead spots, or 'nulls' where radio coverage is poor due to reflections. As a result, the UHF reader does not detect the tags in every location rendering the value of the technology limited. To address this problem required looking at it completely afresh, he says, and taking a "completely new and fundamentally different approach to solving it".

New approach

Conventional passive UHF RFID systems typically offer a lower useful read range, as well as lower reliability. Read accuracy usually degrades at a distance of about three meters or more, and interrogating signals can be cancelled due to reflections, thereby leading to null spots within the radio environment. In PervasID's system, nulls are eliminated via the use of a Distributed Antenna System (DAS) network, as well as advanced RF techniques and multiple antennas. This leads to accurate wide area interrogation without relying on narrow pinch points or hand held readers.

Accuracy

The distributed antenna system (DAS) consists of an array of antennas that capture tag data IDs within the reader's zone. One RFID controller (reader) feeds four sets of bistatic antennas via coaxial cables and captures the presence of an RFID tag, with a read rate of nearly 100 percent over wide-area. This level of accuracy has never been achieved before using passive UHF, says Sabesan. The technology achieves near 100 per cent detection over areas of up to 400 square meters using a single reader and can scale up to much larger areas such as retail outlets and warehouses.

Patent

A patent on the technology was filed initially by the University in 2010 which covers the EU, USA and China and has been recently granted in the USA and China and accepted in the EU. It covers the fundamental approach adopted by the researchers

Initial application

The decision to establish PervasID was taken in 2011, the year after it had filed its patent and when it had demonstrated that its technology worked in trials with early adopters. The first application was in airport security, which had been the application area for Sabesan's PhD. The INtelligent Airport, as the project was called, was designed to capture UHF RFID data and to carry other wireless services that might be present in an airport.

Document tracking

The researchers then developed a method to detect the presence of RFID tags on files in places such as medical or legal offices. The system allows users to know, in real time, in which room (or in which part of a very large room) a file may be located.



Space Ranger 9100 RFID Reader

The technology was trialed by a documents management company, Civica UK, and demonstrated that tagged files in a room that was 8 meters x 17 meters could be accurately read.

Retail stores

While the researchers had initially expected airport security would be the earliest adopter, it has turned out to be the retail sector that has adopted it first. Here PervasID's system is being tested in one high end blue chip retailer which has installed PervasID's readers within a 45,000-square-foot area that covers the goods receiving area, storage, sales and fitting-room areas, spanning two floors and more than 100,000 tagged items. The successful demonstration of the initial trial helped to release the first seed round of finance in September 2016.

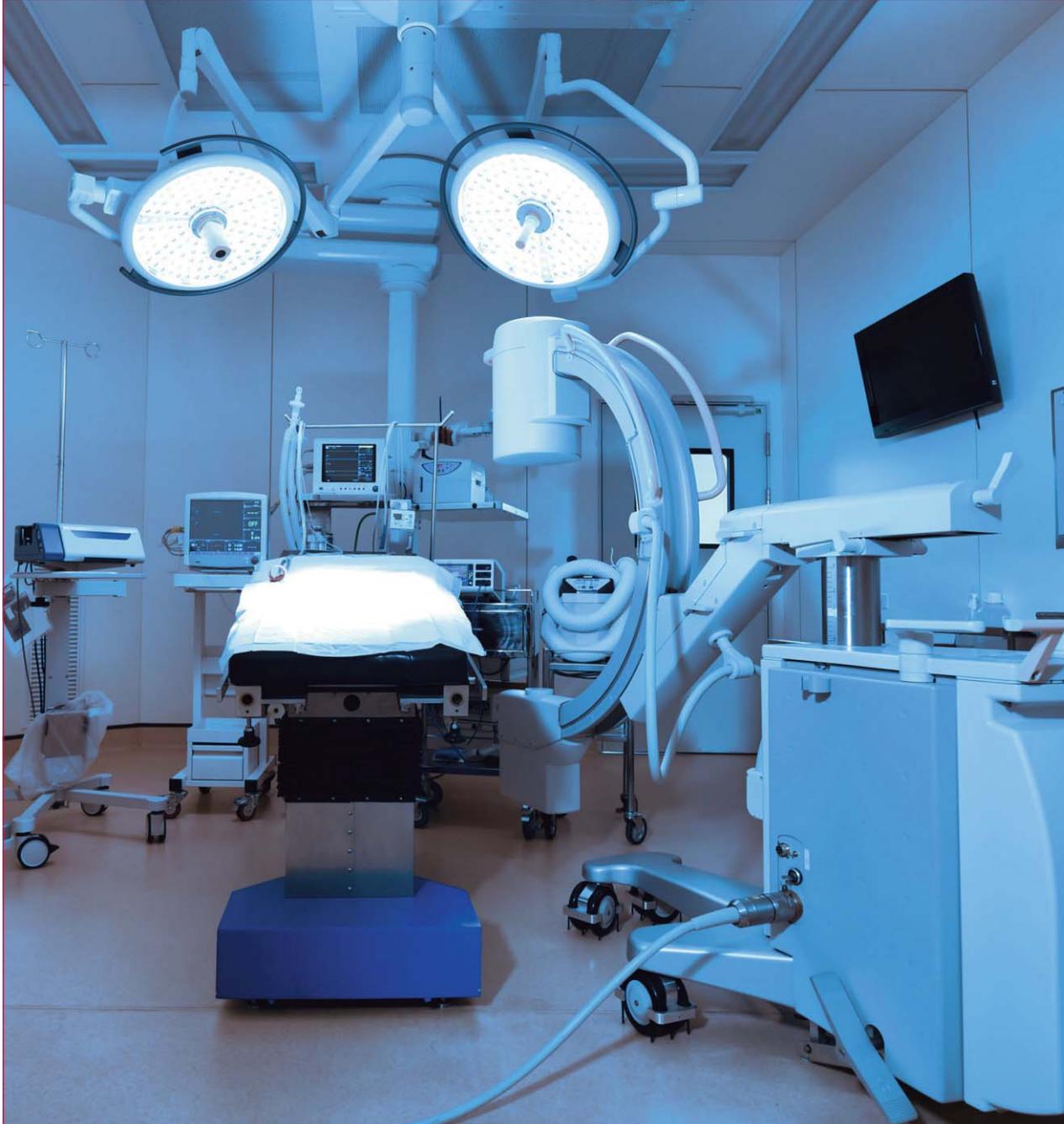
Benefits to the retailer

The ability of the PervasID technology to provide almost 100%

stock control in a clothing shop as compared with only 60% for a bar code reader system makes it very powerful as a management tool. The quality of information for high end retailers especially overcomes the extra cost of deploying tags (which cost around 5p each) against the lower cost of a bar code system. This is because the near 100% accuracy of data tagging allows a retailer to see exactly how shoppers interact with merchandise: for example, it lets them see whether customers buy before fitting, or how many times they try on clothes before buying them or not. It can also reduce the rate of theft and stock shrinkage by improving the way the stock is tracked.

Another reason retailers are interested in the technology is that increasingly customers 'click and collect' merchandise online, which makes efficient stock control more important still. The PervasID system offers a cost-effective, accurate real-time stock inventory for the first time.





Hospitals

An example of the use of the technology in hospitals is to track staff and patients which can reveal how to deploy resources more effectively and to reduce waiting time; it can also reveal how efficiently staff are managing their time. Trials are currently underway in a hospital environment. It is not likely to be a major market says Sabesan but is likely to be one of the earlier adopters.

Product launch

At the end of 2016, PervasID launched its second-generation product, the Space Ranger 9100. The new reader consists of an overhead reader with four pairs of external ceiling-mounted antennas: it has a higher read rate and longer range, and it can be installed with 60% fewer readers in a given deployment, resulting in an approximately 70% lower installation cost. The reader is able to cover 4,500 square feet in low-density read areas (where RFID-tagged items are not densely packed) or 450 square feet for high-density reads in which many tagged items are located within a small area and a user requires nearly 100% tag detection.

The company also released an RFID portal known as the Gate Ranger 9100 that can interrogate tags with high accuracy and detect the direction at which each tag moves through the portal. The device is intended for entrances, exits, loading areas and other strategic locations.

Entrepreneur-in-training

Sabesan says that from the start he wanted to see the technology commercialised, and to bring it to market himself. To equip him to do this he was able to avail himself of the many courses and programmes on offer from the University of Cambridge [see as

well our article on Sensor Hut, Issue 20]. He also took advantage of the mentoring and training service offered by the Enterprise Hub at the Royal Academy of Engineering (RAE) [see too the article on Medisieve in Issue 20]. The cost of these training programmes was covered by an RAE Fellowship seed grant (not equity linked) so that he could continue to work inside the University while setting up the company.

Mentor

According to Sabesan, the most valuable aspect of the RAE Fellowship programme for him was the mentoring, where he was able to draw on the experience of Prof Andy Hopper, head of the Computer Lab at Cambridge University, and the leading figure in the Cambridge computer field over the last 30 years. Among the companies Prof Hopper has helped spin out is Ubisense, now a world leader in location tracking, or what it calls 'enterprise tracking intelligence'. The company is publicly listed on the AIM stockmarket, a goal that Dr Sabesan would like to replicate. ■

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