



1 The Value of Visibility of People Movement

The management of campuses revolves around the movement of people. Whether the target market is schools or universities, the ability to monitor the presence and movement of students provides valuable information for a variety of reasons:

- **Security:** We live in a world that is increasingly characterised by security threats, not only on a macro scale but also at the level of the individual. Automated visibility of pupils will give parents the comfort that their kids have arrived safely at school, as well as inform emergency services about the number of people present in a building under threat.
- **Facilities utilisation management:** There is increasing economic pressure to optimally utilise educational facilities. The most relevant indicator is the actual level of usage on a daily basis, i.e. the movement of people through the facility.
- **Attendance monitoring:** While class attendance may no longer be compulsory at most institutions, monitoring the correlation between student performance and class attendance remains a valuable tool in managing the effectiveness of teaching programmes.

The challenge is to reconcile these value-added functions with the normal operation and typical lay-out of campus building facilities. As campus access control systems are often either totally absent or restricted to campus entrances, it will clearly be beneficial if presence detection applications can rely on the ability to monitor the unrestricted flow of people in hands-free mode. Which brings us to the use of long read range passive RFID.



2 IPico's Unique Offering to Campus Management

The use of proximity read RFID has become commonplace in access control systems over the last decade, with such systems typically being based on the Mifare technology operating in the high frequency band. This technology can however not provide the read ranges required to implement hands-free tracking of people through standard doorways.

More recently long read range UHF RFID technology has received much attention as the future solution for tracking physical goods from manufacturing to retail, to improve visibility and thereby creating higher levels of efficiency in the value chain. This includes products

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based on the so-called EPC Gen 2 standard. Unfortunately UHF RFID does not provide a solution for the tracking of people, as UHF waves are absorbed by the human body. Even if line-of-sight between tag and reader can be guaranteed, most read range is lost for UHF tags carried close to the human body, e.g. in a pocket or wallet, making a reliable hands-free solution impossible.

To address the need for free-flow people tracking IPICO has developed the revolutionary new Dual Frequency passive RFID technology. Dual Frequency, or DF, combines the best features of low frequency (LF) and high frequency (HF) technology, to achieve long read ranges that are not affected at all by the presence of the human body. This allows a DF based tag to be read through a double doorway when carried anywhere on the person. Even if 50 or more tagged people should move through the doorway at the same time, all tags will still be read.

DF technology has now been integrated into standard sized credit cards, allowing DF tags to be combined with student or personnel cards. The same plastic token can contain both a DF tag and a magnetic stripe card, a Smartcard or a Mifare card. It is furthermore possible to design DF readers to read cards at either close range or long ranges, e.g. covering a double doorway. This allows proximity read based access control to be combined with hands-free tracking using the same token, to enable an extended concept for access and presence management.

The tag in the card, carried anywhere on the person, is detected once the person enters a gate or lecture hall using a reading device that is integrated into the entrance. This concept works even if several people use the entrance simultaneously. By placing more readers at critical points inside buildings, the movement of students through a facility can be detected totally hands-free, enabling a variety of management functions. DF is the only RFID technology in the world today that can reliably support this combination of capabilities. Alternatively the DF tag can be combined with a Mifare card, using the latter to support existing access control functions.



3 Example Application 1: School Systems

In the case of school systems the focus is on two primary issues: security and utilization management.

- Security is an obvious requirement, in affluent as well as less privileged communities, given that pupils of young age often have to use public transport to get to school. The need is for parents to be informed if children did not arrive at school at the expected time, and to be alerted should children leave the school premises at unexpected times.

- In less affluent communities that heavily rely on state subsidies, there is much pressure to ensure that subsidized facilities are optimally utilized. A typical requirement is for all children that attend schools to be counted on a daily basis, in order to calculate the level of subsidies that each institution qualifies for. As most schools are not equipped with turnstile type of access control systems, any automated system will have to be hands-free.

Both of the above applications can be addressed using a DF based system comprising the following components:

1. A pupil tag that is embedded either into the child's clothing (typically being stitched behind the badge on the school blazer) or into the book case, preferably in an unobtrusive position to limit the chances that an abductor will notice and remove the tag.
2. A gate reader, either with antenna embedded into the ground at the school entrance, or installed as a portal on both sides of the gate, covering the area through which children must move to enter or exit the premises.

The reader is linked to a software application that maintains an up to date count of which pupils entered and left the premises. This application can be programmed to alert parents or security services, typically via SMS, should an exception be detected. DF RFID provides not only the required free-flow spotting capability, but also a high integrity identification mechanism that will eliminate most attempts at defrauding the system.



4 Application 2: University Systems

University systems have to deal with grown-ups that are allowed much more freedom of movement; in this case the focus is primarily on measuring the utilization of specific lecture halls, as well as monitoring class attendance:

- Providing large lecture halls equipped with multi-media facilities is a big cost driver for tertiary academic institutions. While lecture halls are usually reserved based on the number of students enrolled for a course, the actual attendance figures are often a small fraction of that. If attendance figures are monitored automatically on a regular basis, it will be possible to satisfy the real needs more cost-effectively.

- Given the trend to allow students more liberties, the formal implementation of roll call systems may be something of the past. That however does not mean that there may not be a strong correlation between class attendance and student performance, and perhaps an even more interesting link between average class attendance and the quality of lectures. The ability to automatically monitor class attendance will provide decision-makers with a useful tool to pro-actively manage the quality of interaction between students and lecturers.

5 iPico's Product Portfolio for Campus Management Systems

iPico offers the following DF products that are ideally suited to read scenarios encountered in Campus Management systems:

DF Readers

- Short Range DF Reader (mounting holes, Master/Slave for portal coverage, network connectivity) used for the registration of tags;
- Medium Range DF Reader to cover single doorways;
- Long Range DF Reader (mounted or free-standing, separate antennas), in portal format to cover double doorways.

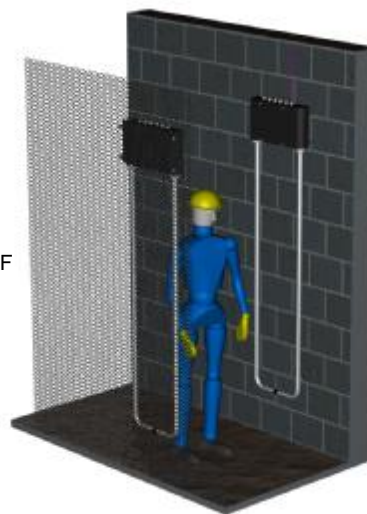
DF Tags

- Credit card sized tags used for tracking purposes only;
- Tags combined with Smartcards or Mifare cards to support dual functionality.



DF Credit Card tag

Person moving through DF reader portal



6 The Future of RFID in Campus Management Systems

Dual Frequency RFID is the technology of the future to create new value in the educational sector by:

- Providing real-time security monitoring without infringing upon freedom of movement of pupils or students;
- measuring the level of utilisation of building facilities without requiring the installation of expensive turnstile systems;
- enabling and supporting non-intrusive presence detection to allow educational institutions to pro-actively manage the performance of students and the quality of teaching programmes.