CoreRFID Ltd

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RFID

Identify, Assign, Track & Audit

A short guide to the systems, components & business benefits of the technology that provides fast, accurate identification for business solutions.

White Paper

Introduction To RFID

A well established technology with wide ranging application.

Identify, Assign, Track & Audit

There are many technologies that can be used to allow business to identify, assign track and audit. Automating the collection of data about stock, assets, components, and customers reduces costs, increases accuracy and speeds information flow. Radio Frequency Identification (RFID) solutions can be used to help in this.

RFID is widely recognised as an important way to provide fast, accurate identification for business solutions.

RFID is a well established technology. It is a versatile technology. It can be used to tag assets so that information about them can be collected. It can be used to identify individuals in order to allow or prevent access or to provide information about their whereabouts. It can be used as part of systems for logistics and delivery tracking, security or for managing safety inspections.

However, like all technologies, RFID has its strengths and weaknesses. This short guide provides an introduction to the technologies used for RFID applications and highlights some of the factors that affect technology choices and the feasibility of applications.

CoreRFID is a specialist in this field and works with customers, identifying and supplying the best technologies for their requirements. This short guide provides an introduction to the technologies and the applications they can be used for. It also helps those planning to use RFID with a review of some of the issues to be considered when selecting technology and deciding whether RFID is a feasible solution for a particular business problem.

What Is RFID?

Radio Frequency Identification (RFID) is a set of technologies that allow for short range, contact-less reading of information from a low cost, compact, data source.

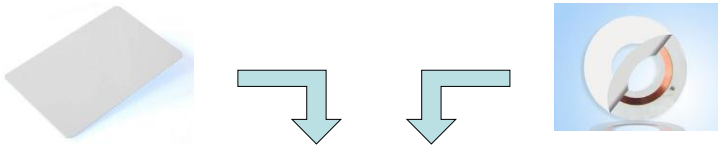
An RFID system will include data-carrying transponders, known as “tags” and devices to access the data on the tags; a “reader” or “reader/writer”.

Tags are attached to the assets being monitored or carried by individuals. A reader is used to collect data from the tags or to detect the tag passing a particular location, for example. The information collected in this way can be used to query or update a database in a system designed to track the location of the asset, to authorise the use of some resource or to automatically cause some piece of equipment to be available for use.

In the following simple example of an RFID enabled application (See Figure 1 below), a DVD Library needs to keep track of which DVD’s have been issued, when and who to. A tag is attached to each DVD case.

Library members are given a membership card which has a RFID tag embedded in it. To borrow a DVD, a member has his details collected by the reader which also collects data from the tags on each DVD case as it is wiped across the reader.

Data about members and DVD’s is used to update records of who has what DVD.



Library members identify themselves with an RFID tag on a credit card.

RFID tags are attached to DVD cases.

Reader detects which DVD was issued to which member when DVD cases are wiped across it as they are checked out & as they are returned.

Issue / return data used to update records.

Figure 1 DVD Library : A Simple RFID Application

The different technologies used for tags affects their storage capacity, cost and the distance over which data can be accessed. As a result applications might not be practical with one class of RFID technology but perfectly possible with another. The design of RFID systems needs to take careful account of the strengths and weaknesses of the various RFID technologies.

Benefits of RFID Solutions

Establishing a business case for the use of RFID technology depends on identifying the relevant business benefits that will result from its deployment. Although RFID has application across retail, logistics, manufacturing, the public sector defence and many other sectors, different benefits will be of different relative importance in different industries.

Benefits delivered by RFID solutions span different business areas.

In each application area, different systems will demand different technologies depending on the different capabilities required from the tags and the readers but in general RFID applications offer a number of potential business benefits:

- **Lower costs and higher productivity:** RFID applications can automate the collection of information about the movement and location of assets, components, stock or other items; doing this more quickly, more cheaply and with greater accuracy and reliability than is possible with manual methods and with more detail than can be obtained from techniques such as bar-coding. Data collection can be a by-product of other activities, eliminating the need for effort in form filling. Identifying products using RFID is quicker than barcode scanning or manual entry of product details.
- **Increased revenues:** By reducing stock-outs, by avoiding the credibility gap between notional stock available for orders and actual stock present in the warehouse, and by offering improved information on product movements to customers, organisations using RFID can provide a service that creates competitive differentiation and promotes increased customer satisfaction with

the opportunities for higher sales and better margins.

- **Improved quality of data capture**: Use of the contact-less connection RFID approach makes it easier, quicker and more reliable to use than "swipe" type contact reading technologies or laser bar-code reading.
- **Shorter processes:** Because RFID technologies can be integrated with other supply chain technologies (automated pallet handling, stock picking systems, etc) the time from order to despatch and delivery can be reduced.
- **Reduced capital costs:** RFID technologies help to lower inventory costs by providing better stock control and can be used to enable better control of business assets such as test equipment, computing technology and other portable devices.
- **Improved regulatory compliance:** Using RFID to control when devices have been inspected or to restrict their movement can form part of a strategy to address health and safety issues .
- **Better security:** Access control systems using RFID contribute to improved security of business premises, RFID tagging of stock makes it easier to track inventory "shrinkage" and tags can be used to fight against product counterfeiting.
- **More accurate, relevant, current management information:** Because RFID allows data to be captured in real-time as stock or assets are moved detailed, up-to-date, management information is available for planning and operational management purposes.

RFID Applications

RFID is a versatile technology and can be used in a wide range of applications, wherever there is a need to automatically identify items.

RFID lends itself to a wide range of potential applications but deciding if a particular one is practical may well require trial and experimentation.

Examples of application areas where RFID is already widely used include:

- Electronic ticketing in public transport where gateways read the tickets of frequent travellers, charging them for each trip.
- Road tolling, similar to ticketing.
- Tracking pallets and other returnable packaging.
- Security guard patrol monitoring, by providing check in points where a guards RFID tag is used to record the time at which they visited each point.
- Manufacturing work in progress control.
- IT asset management.
- Identifying equipment for planned or preventative maintenance.
- Tracking specimens for experiments
- Ensuring all items required for a particular task are present (configuration management)
- Auditing that regulatory inspections (such as safety equipment inspections) are carried out when required.

In each case the performance of tags and readers will often require an initial trial to determine which RFID approach is best suited to a particular requirement. Since different tags perform differently when attached to different materials and since the orientation and size of the RFID tag's antenna can also affect read speed, distance and success rates

it is usually advisable to carry out a test or trial application. (Unless a very similar application can be seen in use elsewhere.)

Because of the wide range of possible technology solutions and the range of different equipment available within each type of RFID, the mantra "one size doesn't fit all" certainly applies here. Choosing the right combination of tags and readers for an application is most likely to be successful if the choice is made in cooperation with a specialist in the field.

CoreRFID has created a number of case studies for different types of RFID applications and a list of them can be found here.

RFID Technologies

Different applications require different RFID tag technologies.

All RFID systems have in common the idea of contact-less reading of data from transponders known as tags but different types of tags are used for different applications. RFID uses data carrying tags which include a microprocessor, transmitter and a radio antenna that allows data from the tag to be read and written without contact between the reader and the tag.

There are two main classes of RFID technology, one based on tags that contain their own power supply ("active tags") and one (much more widely used) based on tags which use power provided by the presence of a reader ("passive tags").

Choosing the technology for a particular application depends on careful consideration of the different capabilities, costs and performance characteristics of the various RFID technologies in relation to the needs of the application. RFID systems only allow relatively low volumes of data to be stored on the tags (typically less than 2k bits of data = 250 characters or as little as only 8 characters in the case of some active tags). As a result the design of the information to be held on the tag is a critical part of the application.

The four main types of RFID tag technology are:

- Low Frequency (LF) passive tags
- High Frequency (HF) passive tags
- Ultra High Frequency (UHF) passive tags
- Battery-assisted passive tags
- Active tags

EAS Tags

Also, although not generally considered as RFID technology, there are Electronic Article Surveillance ("EAS") tags. EAS tags are widely used to tag goods in retail theft prevention systems. The tags carry no data but simply respond to a reader that detects the presence of a tag. In a typical application a n alarm would sound if an item tagged with an EAS tag is taken through a doorway.

LF, HF & UHF tags

LF, HF and UHF RFID systems use tags with a relatively low cost, from less than £1 to a few pounds. In the example of the DVD library (See Figure 1) above the labels for the DVD's would cost around £0.75 while the credit cards used for the members would be around £1.10. Tags can be read over distances up to about 3 metres. The three different systems offer different levels of reliability, different speeds and different memory capacities on the tags. LF, HF and UHF RFID systems all use passive tags; that is they do not have their own power source; taking power from the electro-magnetic field produced by the reader. The LF, HF and UHF tags have different transmission properties. UHF tags, for example, allow a greater distance between the reader and the tag but suffer more if the signal is interrupted by packaging between the tag and the reader. Different tags frequencies are used in different applications and have different standards associated with them. For example, the Mifare system, widely used in payment and ticketing systems such as Transport for London's Oyster Card and the Near Field Communication

(NFC) standard are both high frequency systems.

Battery assisted passive tags

Battery assisted passive tags are designed to improve the read speed, read distance and read reliability of passive tags. The more usual passive tag is dependent on power induced by the reader to activate the processor and transmitter / receiver on the tag. In a battery assisted passive tag the signal from the reader simply turns on an on-tag battery which is used to power the processor and transmitter / receiver. Because of the battery these tags are of a larger form factor but respond more quickly and can be read over greater distances than passive tags. Battery assisted tags work with the standard readers for whatever frequency the tag has operates at. They have the disadvantage of additional cost and the limited life (typically around 5 years) of the battery

Active RFID tags

Active RFID systems also use tags with a battery power source that is used to power the integrated circuits and the transmission of data. However the tag is able to transmit data with or without a stimulus from a reader, effectively announcing its presence to its surroundings. This allows there to be a much greater distance between the tag and the reader. An active tag system can work over even greater distances than can be achieved with battery assisted passive tags with distances of up to 100 metres between the tag and the reader being possible. Active tags are more bulky, more expensive (up to around £20), have a limited data capacity, and they have a life time limited by their battery life (typically up to 5 - 10 years, but this depends on how often the tag "announces" itself). Active tags may also have sensors integrated with them allowing them to collect data on temperature, vibration, or radiation, for example. This data, as well as tag identifying data can then be collected by the reader.

Types of Tags

As well as being available for the different technologies, RFID tags are available in a number of different versions, with a wide range of different types of tag for different applications. The ability of RFID tags to be embedded in a wide range of housings is one of the reasons for the wide use of this technology. Tags also come in different housings.

Different formats for tags support different applications.

Examples include:

- Key-ring fob tags
- Disk tags (can be drilled for mounting using screws or bolts)
- Wrist band mounted tags
- Self-adhesive label tags, 30mmx26mm, flat, mounted on plastic
- Tamper-proof label tags (attempted removal makes the tag useless)
- "Credit Card" style tags
- "Laundry" tags (temperature, chemical and heat resistant)
- Glass mounted tags usable in extreme environments with water or chemical exposure, for example.
- Tags with a backing label for over printing.
- Strips of roll-mounted tickets with embedded tags, designed for printing and encoding at the time of issuing.

Different types of tags have different data capacities. Typically tags have 224 bits to circa 1k bits of user memory for LF tags, or 2k bits for HF tags. The relatively low capacity of data that can be held on tags means that applications need to be carefully designed and generally involve linking data held on the tag with data held on an external database.

Figure 2 : Wristband mounted RFID tags can be used in access control applications.

Tags can be read only (supplied with pre-coded identity data only) or writable, allowing for limited updating of information on the tag.

Different tags have the ability to cope with different physical environments, shock and vibration, exposure to magnetic fields, moisture and chemicals and so on. The size of different tags will also determine antenna size and performance. The size (and in some cases the orientation) of the tag's antenna can affect read ranges, read response times and read reliability rates. As a result it is important to consider the performance of the tag in a particular application before selecting the tags to be used.

Applications requiring writing to the tags need to be carefully designed since write performance is relatively slow.

Types of Tag Readers

Readers can cost as little as £20

RFID readers are available in a range of formats and with different capabilities. Readers are almost always dedicated to a particular frequency range so that the choice of tags and readers is tied very much together.

Figure 3 : The I-Poll RFID Data Collector can be used to collect data from tags without the need to carry a computer of any kind.

There are two main classes of reader devices. There are dedicated, stand-alone readers that can be used independently of any other devices and there are readers that can be plugged in to some other device such as a point of sale terminal, lap top or desk top computer or to a hand held computer or PDA.

RFID readers range in cost from less than £20 for a simple reader that can be wired to other components, £40 to £50 for a pen like reader that will plug into a PC's USB port, £100 to £120 for an SD Card Format reader that plugs into a PDA to over £1000 for a reader embedded in a PSION Workabout Pro handheld computer.

Readers vary in their speed of operation, the distance that they can be from the tag (partly dependent on the technology used) and the

speed and reliability of operation.

Readers are typically only able to read tags of a given type. So that a reader of Low Frequency tags would not be able to read High Frequency or UHF tags as well.

Examples of stand-alone readers include devices such as:

- Pen style, lightweight (50g) devices that can scan and hold data from up to 1000 tags before data is transferred the using a blue-tooth link to another computer.
- Ruggedised portable data collection "baton" designed for one-button operation in security guard and similar applications.
- Animal tag reader with integral 2x16 character display of data.

Different types of stand-alone readers have different storage capacities and different connection mechanisms for transferring the data collected to another computer system.

Some stand-alone readers will possess an LCD display allowing the operator to immediately see data stored on the tag being read.

Simple, low cost readers may only work well when held close to the tag (1cm to 3cm) whereas more powerful (and usually more expensive) units will be able to read tags from up to 10cm away or further depending on the tag technology in use, making them easier to work with for some applications. As a general rule it is a good idea to try the combination of the tag and reader technology in the real world environment where it will be expected to perform since many factors can combine to affect whether or not a systems will perform as desired.

Readers can be found to suit a wide range of applications

Figure 4 : This stand-alone reader can collect data from up to 1000 tags, display the tag data values and upload the information in its memory via a Bluetooth link.

Plug-in readers are designed to connect to a computer or Electronic Point Of Sale (EPOS) device. They are available in a range of formats and with interface connectors that allow them to be connected to most common types of computing devices from Smart Phones up to desktop computers. These range from the simplest sort of pen-style devices that can plug straight into a USB port, delivering their results via a simple keyboard simulator to more complex devices with a complex set of commands allowing the application to control just how and when the reader should be activated. Examples of plug-in reader devices include:

- USB or RS232 plug in reader/writer. Typically used in point-of sale or issuing desk applications, these can be connected to EPOS tills as an alternative to or for use alongside bar code laser scanners.
- Compact blue-tooth connected RFID reader/writer for linking to desk top or laptop computers.
- Flat-bed type reader for check-out type applications
- SD reader writer able to plug into the SD slot of a PDA or SmartPhone
- CF reader writer able to plug into the Compact Flash slot of a PDA or SmartPhone
- Combined fingerprint / RFID reader for biometric verification applications
- Special purpose access control reader with numeric and function keypad for additional access control functions.
- Reader / writer and high performance antenna in a wall mounting enclosure for car parking applications.

Reader writers are also available embedded within general purpose portable computing devices such as M3 portable, Nordic Morphic or the PSION Workabout Pro. These hand-held devices are usually selected on the basis of the work needed to be carried out by the user or depending on the nature of the environment in which the work is being carried out. Devices are available with a wide range of protection, making them suitable for use in wet or dusty environments or in applications where they are likely to receive vibration or shocks. The tag reader adds as little as 30g to the weight of the hand-held device, making it easy to use without affecting other tasks.

Figure 5 : This M3 handheld computer is available with an built in RFID tag reader to enable data collection applications where the user needs computing capability for other aspects of their work.

Hand held devices such as these can also have integrated cameras, GPS and mobile phone functionality, making them powerful data collection devices, especially in safety inspection or maintenance management applications.

A number of mobile phones are now becoming available with RFID reader capability. These have mainly been designed to make use of the NFC (near field communications) standard and so can only be used together with NFC compatible (High frequency) tags.

Fixed readers allow RFID capability to be integrated with production or logistic processes.

Readers can also be installed in fixed locations, monitoring the identity of tags passing them. Fixed readers are often used in manufacturing or production line applications, to monitor work in progress or to control which steps or processes an individual item on the production line is to go through. They can also be configured to monitor a door way or passage between two areas in a factory, for example.

Figure 6 : A portal reader designed to check UHF tags passing through a doorway or loading dock.

These "portal" readers need tuning to the particular requirements of an installation, taking account of the tags and the items that they are attached to. Fixed point readers can be connected to their controlling systems in a number of ways. Some use the popular USB connection standard (useful where the reader is positioned close to a desktop computer or other counter top device). Others can be connected using Ethernet or similar local area networks.

Fixed readers often have separate antennas (sometimes multiple antennas) to allow them to be configured precisely to the requirements of the installation.

Component modules can be built in to other equipment.

For hardware integrators, reader writer component modules and antennae can be built in to other devices. These embedded devices are intended to RFID enable the other piece of equipment. Examples of equipment with embedded RFID readers include drinks vending machines (where RFID is used to check that drink cartridges are valid), platform access gate mechanisms, industrial scales, machinery that needs to identify an authorised operator. These readers will often be quite simple devices, using the power supply of the host equipment and connected using simple data exchange protocols. A number of suppliers offer RFID readers designed to be integrated with other equipment as components in an overall RFID enabled device.

Codes For RFID Tags

Tags can be manufactured with a wide range of data carrying capacities and with different processor capabilities on the tag. However, where tags are used in multi-company environments for example supply chain applications) standardisation on the format of codes stored on the tags and the rules used to query and alter data on the tags becomes important.

The RFID user community have come together to create a standard (see below) for data stored on tags that enables this type of application.

The EPC (Electronic Product Code), Tag Data Standard, defines what information should be held on an EPC compliant RFID data tag and the binary format that the information should be held in.

The 96 bit EPC, for example, is a standard for data formats on RFID tags in applications that replace barcodes. An EPC-96tm code is made up of:

1. A version number (8 bits) for the tag type, e.g., 96-bit EPC Class 1
2. A manager number (28 bits) defining who is responsible for administering the tag code, e.g., "Acme Soft Drinks Co"
3. The object class (24 bits) specifying the type of product the RFID tag is attached to, e.g., "12 Pack Diet Cola"
4. A unique identifier (36 bits) that, together with the other EPC elements, uniquely specifies the tag (and the object it is attached to).

A tag also holds two data elements that cannot be read externally. These are a 16-bit cyclic redundancy code check sum used to identify transmission errors, and a PIN, that is used to allow operations such as "killing," i.e., permanent disablement of the tag for privacy enforcement.

Standards & Industry Bodies

Because RFID applications span a number of areas needing standardisation (electrical, radio frequency, inter-device protocols, and coding amongst others), standards for the RFID world are set by a number of bodies. As a result care is needed by any organisation planning a system that will span multiple countries or multiple organisations.

Electrical standards and protocol standards relating the exchange of information between tags and readers are governed by standards defined and published by **ISO** (the International Standards Organisation) and, in Europe, by **CEN** (European Committee for Standardisation). Details of a useful guide to standards relating to RFID and the bodies concerned with establishing them can be found in More Information / Other Resources below.

Some of the ISO standards governing RFID systems are:

Principal ISO Standards

- ISO 14223/1 : Air interface standard for radio frequency identification of Animals using advanced transponders
- ISO 14443 : HF (13.56 MHz) standard used for RFID-enabled passports under ICAO 9303
- ISO 15693 : HF (13.56 MHz) standard, used for non-contact smart payment and credit cards.
- ISO 18000-7 : UHF (433 MHz) standard for all active RFID products, mandated by the U.S. Department of Defense, and

NATO.

- ISO 18185: UHF standard for electronic "seals" used for tracking cargo containers.

Important industry bodies

At a higher level, the RFID industry and user community has founded **EPC Global**. This is a not-for profit organisation whose purpose is to develop and publicise standards which allow for the creation of RFID based applications that span companies and countries. An indication of the need for standardisation can be seen, for example in UHF systems where the standard frequency band used in the USA does not overlap with those used in Europe, so that tags on items shipped via US based system would not be readable in a European RFID application. EPC Global includes on its governing council representatives of major users of RFID systems such as US Department of Defense, Hewlett Packard, DHL - Exel, Dow Chemical, Wal-Mart, Cisco Systems.

In the UK, the EPC initiative is led by **GS1 UK**. With over 19000 members, GS1 UK develops UK agreed standards on the use of codes for bar coding, RFID and e-commerce, allowing different businesses to use one another's coded items in their systems. For trading networks, GS1 UK also operates the UK Data Pool, a shared repository of product data codes to support catalogue maintenance and order management across groups of trading partners.

The European Union has established **CE RFID** to coordinate European efforts in promoting the use of RFID in the value chain. Amongst other activities, CE RFID is responsible for developing a research program for Europe in this field. Details of these projects are available at the Cluster of European RFID Projects web page within the CE RFID web site (see below).

Another industry standard is the **Near Field Communications** (NFC) standard which was developed to allow mobile phones to interact with contactless smartcards and with one another over a simple two way communication protocol. The NFC standard has been adopted by a number of credit card and mobile phone providers and may lead to widespread availability of (high frequency) RFID reader capability in mobile phones.

Challenges For RFID Systems

Like all technologies, RFID has its limitations and these limits have to be respected in the design of successful RFID applications. Because of the impact that an RFID solution can have on one or many organisations, care needs to be taken in order to make sure that issues that might prevent success are considered at the earliest stage of systems design.

Some of the challenges relate to the practicality / feasibility of applications and some to public acceptance which can affect the take-up of applications that use the technology.

Amongst the most important issues to be considered are:-

Practicality and technical feasibility issues need to be addressed in the early stages of application design.

- Problems of readers discriminating between signals from multiple transponders if a number of tagged items are close to the reader.
- Security issues surrounding the data held on the tags and the signal between the tag and the reader. Issues surrounding the fraudulent altering of data on the tags or the production of counterfeit tags may need to be solved.
- Choice of tag / reader technology depending on desired distance between the reader and the tag, the material the tag is mounted on and any intervening material that might interfere with reception.
- Environmental considerations including chemical, vibration, shock, moisture or electrical interference that might prevent successful reading of tag data.
- Human factors, including ease of use of the readers, and ease of access to tags.
- Tag data design taking in to account limited storage on tags and the need to conform to coding standards.
- Agreements between all organisations involved in the use of the system (perhaps including public consultation)
- Integration factors including appropriate validation of data and its use in updating other systems.
- Issues of consumer concern about privacy, security, radiation hazards, etc.

All of these factors and others need to be considered as part of the design of a successful RFID system. Many can be explored by the use of a pilot system to examine practical issues before deciding on the approach to be adopted for a full scale roll-out.

In any case success is more likely to be achieved by working with a partner that is familiar with the technology and with the problems of your industries and especially one which has had the experience of implementing solutions, making them work and then supporting them.

One important issue that needs to be addressed early in the design of application sis the selection of the particular technology to be used. Each of the main RFID technologies has its own benefits and drawbacks, requiring a careful match between the needs of the application and the technology used.

An overview of the features of the most commonly used passive tag technologies appears in the table below.

Figure 5 : The different capabilities of passive tag technologies make each suited to different applications.

Passive Tags

Format	EAS Tags	LF Tags	HF Tags	UHF Tags
Transmission Frequency	8.2MHz	125 – 135KHz	13.56MHz	868-928MHz
Typical Read Range	Up to 1 metre	20 to 100 cm	10 to 20cm	3 to 10 metres
On-Tag Memory	None	64 - 1024 bytes	8k – 128k bytes	64 – 256 bytes
Read Speed	N/A	200bps	25kbps	28kbps
Typical Applications	Retail Theft Detection	Animal ID Manufacturing	Parcel Tracking Library, Rental	Logistics Asset Tracking

More Information / Other Resources

Supply of RFID Components

This guide was developed by CoreRFID Ltd, specialists in the supply and implementation of RFID technologies. CoreRFID are well placed to help organisations to make the right choices in relation to the selection of technologies, providers and solution design.

RFID components and systems elements: www.rfidshop.com

CoreRFID Ltd. web site: www.corerfid.com

There are many web sites providing useful information on RFID applications and solutions. The following web site links were all operational at the time of going to press. CoreRFID is not responsible for the content of these web sites.

Promoting the use of RFID

Various organisations are concerned with promoting the use of RFID, standardisation and the development of research programmes. More details on the Electronic Product Code initiative are available as follows:

Information on RFID applications by EPC Global: www.discoverrfid.org

Information on the EPC initiative from EPC Global: www.epcglobalinc.org/home/

The home page of GS1 UK (EPC's UK representative): www.gs1uk.org

EU & ISO Standards

Details on international standards and the work of the European Union in promoting the use of RFID and extending the applications for which it can be used can be found at:

Guide to RFID standards from ISO & CEN, etc. : http://tinyurl.com/368bxsn

CE RFID – the EU promoting RFID use: www.rfid-in-action.eu/public/

EU research programmes in RFID: www.rfid-in-action.eu/cerp

About CoreRFID Ltd.

CoreRFID works with over 1500 customers across the UK, Europe, the USA and the rest of the world, providing them with the systems and support they need for their applications.

Users of CoreRFID solutions are found in transport, finance, broadcasting, construction, defence, government and telecommunications, in leisure and entertainment and in the academic community. Customers include the Ainscough Crane Hire, BAA, BBC, British Aerospace, Capita, Channel Tunnel, Costain Group, Nokia, Norwich Union, Thames Water and Thomas Cook Airlines.

CoreRFID specialises in the complete range of technologies for track, trace, audit and control applications, assisting customers in making the right choices for business critical applications. As well as delivering complete turnkey applications with a particular focus on the safety systems and the manufacturing / logistics systems sectors, CoreRFID provides customers with:-

- RFID tags, sourced worldwide or custom manufactured
- Tag reader / scanner devices.
- Tag Printers
- Design and development of RFID software.
- Hand held computers
- Training and implementation.

Experts In Identify, Track, Trace, & Audit

In a field where new developments make new applications practical, CoreRFID keeps in touch with the latest advances and makes it easy for our clients to get the benefit of them.

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CoreRFID works with leading suppliers of RFID technology and implements software solutions that make it quick and easy to introduce RFID technology within your business. These solutions are developed using the Microsoft .Net Framework making it easy to integrate track, trace audit and control applications with other back office systems.

CoreRFID has strategic partnerships with providers of Ultra High Frequency components, active RFID, and other RFID technologies, making it possible for CoreRFID's clients to exploit this technology.

Our Organisation

CoreRFID was founded to create a business focused on the needs of RFID technology users. The CoreRFID team of experienced engineers and its sales and administration centre is based in Warrington, in the North West of England.

CoreRFID is backed by Enterprise Ventures and NatWest Bank.

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