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RFID based Asset Management

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Large business organizations deal with an enormous number of movable assets which keep circulating within and outside the business premises. Added to the sheer quantum of such assets, the assets often carry vital internal business information on them. This picture is further complicated by the changing nature of the ownerships of those assets within the business organization.

Tracking, monitoring and managing the assets, their movements and their ownerships is often dependent heavily on the human element, wherein there is ample scope for errors and deliberate deviations.

The management of various assets currently, is a predominantly manual job, where the tracking monitoring and managing of the assets is done manually. This has definite potential for intentional misuse (security) or manual errors. Neither case is desirable and can sometimes prove catastrophic for organizations. This process is also inconvenient for audits and controls.

There is a need today for a cost-effective and non-intrusive solution which can address the above concerns and help in minimizing the human element for a 24x7 solution that tracks, monitors and manages assets for businesses.

Introduction to RFID:

The Radio Frequency Identification (RFID) is a part of Auto Identification and Data Capture (AIDC) technology that was developed by the British during World War II as a tool to identify friend or foe (IFF). RFID is a proven technology that's been around for many years. But up until now, it has been too expensive to be practical for many commercial applications. It has come a long way in the last 50+ years and is now making inroads into everyday life.

RFID tags can be read electronically even when obscured or disoriented, this was a major drawback with the barcodes. Since RFID uses radio frequencies (RF) to communicate, the tags can be read electronically without direct contact or line-of-sight requirement and can also read multiple tags simultaneously. Bar codes on the other hand are inexpensive and effective for certain tasks, RFID and bar codes will coexist for many years to come. Today, RFID label tags often have a UPC barcode imprinted on the label to that it can be tracked using either technology.

An RFID system consists of three main components: Reader (interrogators), Tags (transponder) and Middleware. The object of any RFID system is to carry data in RFID tags, and to retrieve data by RFID readers wirelessly by sending out electromagnetic waves.

RFID uses radio frequencies inductive coupling to power the passive tags and read the information on the tags, each tag incorporates a unique identifying number (UID) at the time of manufacture. The Tag is made up of a microchip with an antenna.

RFID systems can be either active or passive.

Active RFID tags have a battery, which is used to run the microchip's circuitry and to broadcast a signal to a reader at long distances and communicates via propagation coupling.

Passive tags have no battery and draw power from the reader, which sends out electromagnetic waves that induce a current in the tag's antenna to power itself & broadcast the information on the tag and communicate via inductive coupling.

The RFID tag is usually attached to a physical object, such as an item, case, pallet, or containers filled with some products or even incorporated in Personal ID badges.

The Middleware is the brains behind the system and sits between the data collection and control hardware like barcodes, RF, RFID, GPS, SCADA, PLCs, Microprocessors, etc. and the enterprise application environments like ERP's (SAP, Oracle, etc.), BI, CRM,
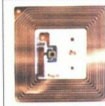
Reporting tools, etc.

The new age RFID/ AIDC middleware's like SkandSoft Technologies SETU(TM) are more than just a bridge connecting the hardware to the enterprise software. They facilitate multiple Solution/ Application development like, asset management, visitor management, document management, ePharma, warehouse management (WMS), supply chain management (SCM), etc. for multiple industry verticals like Retail, Pharma, Hospitals, Manufacturing, Logistics, Banking, etc. The Middleware can even enable feedback, through machine to machine (M2M) interaction. e.g. If an unauthorized movement is detected the system can notify a PLC to lock the access point. Further, these web-enabled

Identification & Location of tagged items like man & material. RFID is a matured technology and is highly accurate; RFID enabled indoor location systems can provide accurate location information from a few meters for a standard RFID-RTLS system to as accurate as 6 inches for the RFID UWB-RTLS (Ultra wideband Real-time location systems).

Radio frequency identification (RFID) devices cover a wide range of frequencies and applications. Different frequencies have different characteristics that make them more useful for different applications.

Low-frequency (LF) RFID systems (30 KHz to 300 KHz) and High-frequency (HF) RFID systems (3 MHz to 30 MHz) also typically have short transmission ranging from generally

transmission ranging from several feet to more than 90 feet; they are primarily used for Supply Chain (SCM), Airline Baggage tracking, etc.

Microwave frequencies (1 GHz and above) also provide very long transmission ranging from several hundred feet or more, they are primarily used for highway toll tags, fleet management, yard management, etc.

The internet of things is here; with our capability of attaching an electronic identity to a physical object like man or material effectively extends the Internet (virtual world) into the physical world, turning physical objects into an "Internet of Things" just like in the movie AI (Artificial Intelligence). By doing this we no longer require the human interaction to track humans, animals, assets, products, goods in our house, etc. These real-time applications will be able to see, track and to some extent even control all items like man and material in the network as they are electronic tagged and the electronically connected physical environments.

RFID enables multiple solution/ application development in areas like asset management, visitor management, document management, file management, ePharma, warehouse management (WMS), supply chain management (SCM), etc.

RFID based applications these days are limited only by people's imagination. RFID technologies offer practical benefits to almost anyone who needs to keep track of physical assets. Retailers use RFID to increase efficiency in their supply chains, improve demand planning, EAS (electronic article surveillance), is another common use of RFID, typically seen in anti-theft products at the exits of retail or department store establishments.
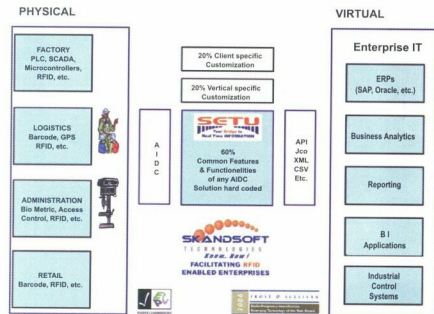
solutions allow the Information to be configured, monitored and managed in Real-time from one central location irrespective of the distribution of physical location.

RFID technology can be used for

a few inches to a few feet, they are primarily used for Access Control and Security applications, Library books tracking, etc.

Ultra-high frequency (UHF) RFID (300 MHz to 1000 MHz) offers longer

Machine shops track their tools with RFID to avoid misplacing tools and to track which tools touched a piece of work. RFID-enabled smart cards help control perimeter access to buildings.

RFID based Access control applications are used to selectively grant access to certain areas to certain tagged individuals and other areas to all tagged individuals. Before you even think about changing an existing process, make sure you are aware of its strengths, weaknesses, and reasons for being in place. The way to go about planning for a new RFID deployment is "How can I improve the existing process with RFID?" and not "Where can I use RFID?"

Asset management overview

The world of assets can be broadly divided into:

Non Linear Assets

- Mobile assets (fleet, vehicles, IT network tool/ equipment)
- Fixed Physical assets (plant, equipment, facility)
- Component relationship based assets (aircraft, ship)

Linear or continuous Assets (roads, pipelines, rail tracks)

Typically a non-linear asset occupies a finite and bound space and can be tracked by its location or modeled as part of a parent child hierarchy. Linear Assets, on the other hand, have linear properties and often connect with each other by their relationship with the linear infrastructure itself; i.e. Networks.

An asset management system attempts "High Availability" of all assets – linear or non-linear for an organization. The time spent in searching for assets, eats into productivity, and hence profitability. Global researches have demonstrated that workers lose the equivalent of one
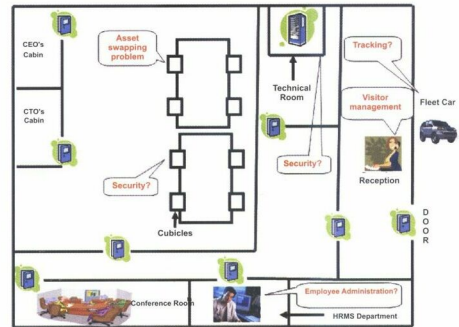
full 40-hour workweek per year if they spend only 10 minutes a day searching for and gathering needed items.

Holding too many assets ties up capital, which every business seeks to avoid. To improve competitiveness and profitability, enterprises should manage assets with the same care and innovation they have employed to drive excess inventory and costs out of their operations.

Automatic identification and data collection (AIDC) technologies are readily available to help optimize asset levels. Bar code, RFID etc. can make it simple and convenient to gather and manage asset information in a timely and efficient manner. These technologies can record asset movements automatically, and provide the data in Real-Time to asset management and other software applications.

A typical Asset management Process Schematic

The above schematic describes the problems faced due to poor or no asset management solution present in a typical

office.

Areas of Focus/ Concern

The following are the major areas of concern related to asset management:

- Security
- Tracking and monitoring of goods
- Efficient utilization of human resources
- Real-Time asset visibility across different departments.

Using RFID for an Asset Management solution

An efficient use of all the available assets – physical and human is critical for a successful Asset Management solution. This write-up helps understand how RFID impacts efficient asset management.

The first step to any asset management program is to identify and record all assets. Identifying and recording of all assets provides a snapshot that gives the organization an accurate view of its assets for a brief period of time. For asset management to be effective, organizations need to create

and use consistent processes to record changes in asset location, condition and availability.

RFID technologies can be used to identify all types of assets in many environments including human resources, expensive test equipment and tools, computers, peripherals etc. The following sections describe how to take advantage of the RFID technologies to meet different asset management needs:

Fixed Assets

Asset management programs vary by the frequency in which materials are identified and the amount of information that is recorded. Regardless of the audit frequency or data content, automated data entry is beneficial because it collects information much more rapidly and accurately than manual methods. Monitoring assets regularly, can improve asset utilization by providing the information needed to optimize capacity planning and preventive maintenance.

RFID can play an important role in these applications. For example, consider a cutting machine that requires oiling and other periodic maintenance based on hours of use or the nature of the jobs processed. Traditional asset management would probably require the machine's location and condition to be verified once a year, a requirement that could be met with a simple bar code scan. By creating procedures to require workers and maintenance personnel to record the amount of time they used the machine and any maintenance performed, the company could build a service record to support its asset record. Collecting the additional data could be accomplished by scanning the asset label and scanning or key entering a job code.

Authentication

■ RFID Reader   ■ RFID Tag
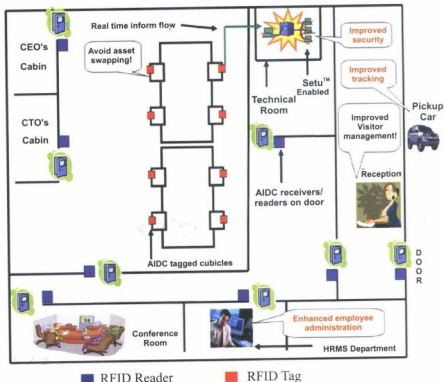
Materials authentication is another complementary asset management application. It provides a way to detect counterfeit products and can ensure that only authorized parts and supplies are used with equipment. RFID smart labels, which embed a chip and antenna for wireless data communication within an adhesive label, can provide authentication and protection.

Moveable Assets

Asset movements can be automatically recorded with RFID technologies. Employees present their ID cards (bar code or RFID tag) to the machine, which reads the tag automatically to identify employees and verify their authorization to receive the requested equipment. When the equipment is released, the machine records the item serial number and stores it in the form of a time-stamped record. Every item disbursement is tracked objectively with no human data entry required. Materials can be logged

back into the system with a scan that automatically applies a time and date stamp to the transaction to document and record their return.

The asset database and other desired data or usage rules are loaded into a system. An RFID reader can be added as a peripheral device or integrated to the system to automatically identify items in the field. For example, many casinos use handheld computers with bar code readers to automatically identify collection boxes as they are removed from slot machines.

RFID based Asset Management Schematic

The above schematic shows the general capabilities of a RFID based Asset Management Solution and its effect on the various scenarios.

Description of a RFID based Asset Management Process
Asset Movement Environment

- All RFID prompting sequences and

user grids are fully configurable.

- Security and permissions are user and process defined, allowing users to perform only tasks they are authorized to perform.

- Support for multiple physical sites/ locations on a LAN, WAN, WWAN, WLAN, or Internet, including support for multiple databases.

- User defined reason codes for all movement types (issues, receive, move, allocate, de-allocate, count etc.).

- Robust cycle counting and inventory capabilities, support for all asset transaction move types, component/ sub-componenttracking, Serialization and lot tracking.

Receiving Assets

- The user logs into the system and creates a current location ID, asset ID and the user defines a predefined reason code or ad-hoc description indicating condition and/ or status.

- Prompts can be configured to suit customer's nomenclature. Other prompts can be made available including cost centers, departments, serial number, lot number, additional reason codes, etc. where needed.

Issuing Assets

- The user logs into the system and creates a current location ID (if needed), creates the asset ID.

- The user defines a predefined reason code or ad-hoc description indicating condition and/ or status.

- The user defines a destination location ID and defines the person receiving the asset.

Asset Movement

- The user logs into the system, creates the asset ID as per the current location

that has been previously defined.

- The system displays the current location of the asset and its movement status

- The user defines a predefined reason code or ad-hoc description indicating condition and/ or status (optional).

Workflow of the RFID based Asset Management Solution

- Administrator, a personnel trained on the solution, creates, modifies, deletes employees/ assets tags through the admin GUI. The data entered thus is written to the tag, which is affixed on respective ID cards.

- Admin also creates relationships for the asset to various employees (Rule Creation). Rule creation also includes definition of an event for the given asset and relevant action.

- Every time a user accesses the business process area, tags are read from the employee and the asset and matched with the rule base. If any of the rules are violated, pre-defined action is initiated.

- The system administrator can give access to a few individuals who may need to re-assign assets to various people, frequently. From the GUI perspective most of these activities will be done by the Administrator – the user (employee or receptionist or security) have nothing to do with the GUI, though there are some minor activities like receiving a pop-up. For any other user activities, admin gives access to a few users as defined in the workflow.

Impact of RFID on Areas of Focus/ Concern for an Asset Management solution

1. Real-time Information

Technologically advanced RFID Middleware's like SETU(TM) enables single point data access, enhanced visibility, monitoring of perishable goods, real-time reporting mechanisms.

These platforms are designed and engineered to handle mega volumes of data transactions and hence provides a single or multiple point collection and access to the real-time data collected. Increases web based collaboration leads to real-time information access across the enterprise. Even real-time collection of data like humidity, temperature, chemical, etc. to help monitoring of perishables and other specialty goods due to its ability to collect data from various technological devices.

The platforms enables multiple integration methodologies like API's (via - XML, API, JCO) – for integration with existing applications like ERP's (SAP, Oracle, etc.), HRMS, workflow engines, reporting modules, etc.

2. Inventory & Replenishment

Automatic Inventory Counts – E.g. when the stocks of a particular item fall below a predetermined threshold, the software can be customized (custom-rule) to trigger alarms (sound/ pop-ups), send SMS/ emails to the appropriate personnel, enabling Real-time corrective action to be taken making the business process intelligent.

3. Efficiency & Security

Efficient utilization of human resources, enhanced security – theft, tracking of individual items, access control

Allows business processes to be embedded on the network across functional areas (inventory tracking, WMS, asset tracking, etc,) and allow the user to define multiple event rules

including custom rules.

The ability to communicate with various access control systems directly to allow preventive actions to be taken in case of any un-authorized movement of goods and people.

Benefits of an RFID based Asset Management solution
Accuracy
- An RFID enabled system can manage and track every aspect of each asset including number, description, size, weight, and control considerations.
- Barcode scanning and RFID eliminate the errors associated with manual processes.
- Vehicle-mounted and hand-held RF terminals establish a Real-Time, paperless environment where material handlers are directed by on-screen prompts.
- Electronic messaging capability is standard for communicating directly with material handlers. On hand asset accuracy up to near 100%, receiving and shipping accuracy improved.

Real-time, on-line communications
- RFID enabled systems are arranged around the basic functions that all asset operations perform: Receive, Issue, Move, Put to use, Return from use, and Count assets.
- Full-stream asset visibility from receiving through issuing. The system maintains a central database for all assets worldwide and can interface directly with other systems.

Performance and productivity
- Reduction in time required for maintaining asset inventory, reduced travel time while handling assets.
- Employee productivity reporting tools, all movement activities are time stamped, enabling faster asset searches

Conclusion
- Effective asset management requires timely, accurate information.
- Gathering the information must be convenient, otherwise operators will tend to skip the step and hence data integrity will be compromised.
- Even temporary unavailability of low-value items can have a surprising impact on a company's productivity and profitability.
- Therefore once an asset management program is established, organizations should seek to include as many assets as possible in the program to maximize their return on investment.
- RFID represents a truly transformational technology and provides the ability to revolutionize the aspect of security and Real-Time tracking.
- It has the potential to drive enormous shareholder return benefits across a breadth of key metrics including revenue growth, operating margin, working capital and capital expenditures.

Just imagine the possibilities …

About SkandSoft Technologies:

Skandsoft is a software development company with a dedicated focus on RFID & follows its Partner Engagement Model of working exclusively through its System Integrators globally.

SETU(TM) (US & Global patent applied & pending) is a one-stop RFID real-time information management platform that allows any solution to be developed (CLP, Asset Management, Visitor Management, ePharma, etc.) for any vertical (Retail, Pharma, Manufacturing, Logistics, etc.) SETU(TM) helps comply with multiple RFID mandates on a single platform. SETU(TM) talks agnostically to any AIDC/ RFID hardware and any backend enterprise software like ERP's (SAP, Oracle, etc), BI, CRM, etc.

SkandSoft Technologies SETU(TM) is the recipient of the prestigious Frost & Sullivan 2006 RFID Emerging Technology of the Year Award & is an EPCglobal certified RFID Middleware. www.skandsoft.com

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Homi Limbuwala is the VP of Business Development (International) at SkandSoft Technologies, leading the strategic initiative for RFID solutions & product marketing for Europe & the Americas.

Homi has a over 17 years work experience, starting his career in engineering, retail & moving to IT with CIS & then as Director at Radix Software, with a brief stint at Solectron Global Services eventually joining SkandSoft Technologies.

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