RFID in Airport Management

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As the global economy grows, and the pace of business transactions accelerates, the air transport industry faces greater challenges and demands. Customer expectations for shorter delivery times and better availability of in-transit service continue to grow. To meet these ever-increasing demands, the air transport industry must provide higher levels of service and guarantee higher levels of security. RFID along with other AIDC technology like Biometrics, GPS, etc. will assist in overcoming some of the barriers presented by current airport processes.

For airports and airlines, what looks like a deceptively simple task is getting ever-more complex as lengthy security procedures, worsening airport congestion, increased interlining and mounting passenger and baggage volumes introduce delays and complicate handling procedures. Routing more traffic through central hubs also means that small problems at one site can rapidly snowball out of control, affecting baggage and passenger transfers at other destinations down the line.

RFID technologies offer many benefits to the air transport industry. The use of these new technologies will allow air transport companies to better manage operating expenses and provide higher levels of service to their customers while operating more safely and securely.

Areas of Focus/Concern

- Baggage management
- Security
  - Passengers and personnel
  - Baggage
- Operations
  - Check-In
  - Boarding pass issue
  - Operating costs
  - Efficient utilization of human resources
  - Accurate billing

RFID enabled process

- The process starts when personnel enter the entrance of the airport. All the employees are given RFID enabled ID cards. SETU™ validates the staff at the entrance through the RFID readers installed there

Figure 1: RFID implemented process at the Airport entrance

- When the passenger checks-in at the airport they would be given boarding passes.
- The boarding passes would carry data like:
  - Flight details
  - Personal details
  - Passport number, etc.
  - Checked in Baggage information (Number of Bags, weight, etc.)
  - Associate passengers that are traveling as a family or in a group.

The system would also read the new RFID enabled passports, and validate the information contained in it and immediately associate the passenger's current flight details to their boarding pass.

These details are associated at the secure master database level with the serial number of the RFID tags simultaneously as the employee is generating the boarding pass. Both the passenger and the baggage are tagged and associated with each other.

Figure 2: RFID based Boarding Pass Generation

All baggage, including hand baggage and the passengers would carry RFID enabled tags with the same information as on the boarding pass with the same ID number. If a family of 4 passengers is traveling together or passengers are traveling in a group, they can be associated with each other.

- The passenger then proceeds towards the aircraft after the immigration control and security check procedure. They system will update the master database at each check point. If any passenger has not checked in at these stations at the predetermined time before departure, then the SETU™ system will SMS the passenger that they need to immediately proceed to the specific area.
- At the time of boarding the aircraft, the passenger is validated once again on entry to ensure that he/she is boarding the right flight and no unauthorized personnel or baggage is boarding the plane with the help of the RFID hand-held reader. The "passenger-on-board' message is immediately sent to the system. In case of any discrepancy or passengers not checked in alarms are generated and the SETU™ system starts sending SMS to the passengers that the boarding gate will close in x minutes. The system will also notify the airline personal, as to the last checkpoint the passenger cleared, enabling the airline employees to physically search for the passenger.

Figure 3: RFID implemented passenger-boarding process

- The baggage follows the same procedure and is passed through the conveyor belt. Each tag carries a unique identifier that is read while the bag is transported to conveyor belts to route it to screening machines and then on to the appropriate plane. Also the weight sensors check the weight of the baggage along the route, if there is any change in weight, the SETU™ system will, place the bag in a temporary holding area and immediately notify the supervisor that the particular bag has been tampered with and at what location the bags weight changed and by how much and that immediate action is necessary. This prevents things being stolen from the passenger bags as well as making sure that no foreign objects are added to the bags after they have been checked in by the passengers.

Figure 4: RFID enabled baggage loading process

- At the time of disembarking from the plane the passengers are again validated to check for the presence of any unauthorized passengers who might have traveled or passengers who would have disembarked erroneously on some other port. In case of any discrepancy, alarms are generated.

Figure 5: RFID enabled disembarking process

- A similar procedure is followed for the baggage again. All baggage is scanned and any unauthorized baggage if found is immediately reported.

Figure 6: RFID enabled baggage-unloading process

- At the baggage collection area passengers locate their baggage faster and more accurately. RFID readers installed at appropriate locations over the baggage conveyor read the

tags on them and this information is displayed on an overhead monitor. The monitor can displays the name of the baggage owner through the association created earlier.

Figure 7: RFID enabled baggage collection process

- Finally as the passenger is exiting the airport he/ she is again validated to check if the passenger is carrying the correct luggage thus ensuring security of the luggage

Figure 8: RFID enabled exit system at the Airport

- Once the passenger exits the airport, the passenger and the baggage RFID Tags are deactivated (killed)
- SETU™ based systems provides monitoring and control facilities to ensure that no unauthorized access is possible in high security areas and personnel have to pass through multiple Biometric access points to gain access to those areas.
- SETU™ based systems can provide the real-time location of individual passengers, analyze traffic and the behavior of individuals, and observe and record unusual behavior and notify the concerned personnel to take appropriate action.

Impact of SETU™ on Areas of Focus/ Concern

Asset Management

- Passenger and Baggage tracking
- Seamless Information exchange between the various departments at the airport.
- Baggage management
- Security

SETU™ accommodates data right from manual data feeds, to bar codes, to RFID, GPS, Biometric, ICS like SCADA, PLCs, etc. SETU™ tracks both the passengers and the baggage in real-time and ensures that they are boarding the correct plane by means of generation of alarms in case of any discrepancy. With the help of a central database and web-enabled access to the data, SETU™ facilitates seamless information exchange between various departments at the airport. Having a transparent system helps collaboration between various departments, enabling better decision making.

Operations

- Check-In
- Boarding pass issue
- Operating costs
- Efficient utilization of human resources
- Accurate billing

SETU™ facilitates Real-Time data inputs to the financial packages enabling improved TCO, lean operations and reduced errors in billing. SETU™ allows specific processes to be embedded on the network across functional areas (inventory tracking, WMS, asset tracking, etc.,) and allows the user to define multiple event rules including custom rules. The operating costs are reduced because of the process automation and reduced labor. SETU™ facilitates seamless integration with external applications, analysis tools to help arrive at business decisions when they need to be taken.

Security

- Theft
- Tracking of individual items
- Tracking of individuals
- Passengers
- Employees
- Visitors
- Access control

SETU™ facilitates Real-Time tracking of all passengers, employees, assets and ensures that there are no unauthorized movements. Communicating with various accesses control systems directly to allow preventive actions to be taken. SETU™ facilitates customized report generation leading to better asset management, and thefts.

Features

- A central monitoring facility to know of all valid and invalid movements
- Real-Time information on all relevant data of people and baggage
- Appropriate alarm and check systems to enforce process-based and legal movements of people and baggage within the airport
- Facilitates a fault-free movement of all baggage to their respective flights across the conveyor belt systems using intelligent data based conveyor

belt routing engines
- External information plug-ins to various government departments like the Home Ministry and Ministry of Finance etc. to access movement of doubtful people

Benefits
- Tracking baggage in real time
- Preventing the improper loading of baggage
- Preventing baggage loss
- Preventing baggage cross-pickup
- Minimizing sorting errors by the baggage handling system
- Minimizing the time needed to match passengers and baggage
- Improving maintenance and tracking of unclaimed baggage
- Checking passenger information regarding dangerous baggage in real time
- Checking passenger information to help identify suspicious people in real time
- Displaying information about arrived baggage to baggage handlers and passengers
- Hassle free and error-free movement of all passenger baggage
- Monitoring movement of all internal employees
- Monitoring the movement of all tagged assets
- Monitoring the movement of all vehicles belonging to or working for the Airport authority, Airlines, etc.

SETU™ based integrated Messaging System (SMS):
- Passenger can be sent email reminding them of their upcoming flight at predefined intervals
- Generate and send SMS and emails to the flight crew of their schedule
- Custom messages can be generated by the system, informing the passengers via SMS of Boarding time, Boarding gate number, flight delays if any, etc.
- Generate of a list of passengers that have not checked in and automatically generate an SMS informing the passenger that he needs to board immediately at gate number X within the next X number of minutes – which, in turn, could help the airlines avoid hefty fees for missing take-off slots.

SETU™ based integrated Global Positioning System (GPS):
- Keeps track on the movement of all vehicles that enter the Airport perimeter
- Keeps track of all high value equipment
- Prevent the vehicles from runway intrusion
- Generate multiple alarms when the vehicle or asset enter or leave specified areas
- Help the airlines track their fleet of vehicles
- These systems are so sophisticated that they can notify the airlines when their employees like Pilots, Airhostess, etc. are picked up from their residence.

SETU™ based integrated Electronic passenger check-in

Besides the self-service check-in kiosks, airports have enabled online check-in. The service enables passengers with electronic tickets to choose their seat and check in online at home or in their office and print out their own boarding passes online. Passengers who check in online and have only hand luggage can go directly to the passport control at the airport. If they have luggage that needs to be checked in, they drop it at a fast baggage drop.

SETU™ based integrated Airport Management System that Combines RFID with Video

Integrating systems like SETU™ with Optag, developed by a consortium of European companies and a university is developing a system to track travelers inside airports. Systems like Optag are primarily intended to increase security and safety of passengers and to speed boarding times. The Optag systems employ panoramic cameras and active RFID transponders with a 10- to 20-meter read range.

These tags would be attached to passenger tickets and read by interrogators placed throughout the airport checked-passenger waiting areas. This system could track passengers with an accuracy of 1 meter and update location data once per second, based on passenger movements.

Systems like Optag work by integrating data from the RFID system with images from the digital panoramic camera system. The camera system would overlay tag locations onto images. Systems like Optag can be combined with facial-recognition software.

SETU™ based integrated Video surveillance with Facial-recognition software

SETU™ based integrated Video surveillance with Facial-recognition software enables the Images captured from video surveillance systems to be processed by special facial recognition software and checks it against known databases of wanted persons. If there is a hit, it will immediately trigger a warning to the security personal that there is a match and that they need to take a closer

look. The security personal can then view the images and see how long it has been unattended and take the appropriate action. This has been implemented at a few airports around the world.

SETU™ based integrated Video surveillance of unattended objects like Baggage

SETU™ based integrated Video Surveillance systems at Airports take digital video of the entire airport and keeps checking against its earlier records at regular intervals, for example if there is an unattended baggage or person has not moved in a predetermined amount of time, it will trigger a warning to the security personal that the highlighted object has not moved. The security personal can then view the images and see how long it has been unattended and take the appropriate action. This has been implemented at a few select airports around the world.

SETU™ based integrated Biometric check-in for frequent flyers

SETU™, integrated with SecBoard system, jointly developed by Lufthansa Systems Group and Bundesdruckerei is a Biometric Check-in system. Passengers with an electronically readable identity card containing biometric data will also benefit from technology: they will be able to move through airport security points more quickly and easily than travelers without cards.

The registration is a one time process, where the passengers' fingerprints are recorded, digitized and stored on a smart card, this can be reused again for future flights. In addition to the fingerprint data, the card contains a photo of the passenger, personal information and a serial number. At check-in, the serial number is linked to the check-in data in the database.

At the boarding station between check-in and the aircraft, where a fingerprint check is conducted. The fingerprint data from this check is compared with the fingerprint data stored in the card. If the data matches, the passenger can board the aircraft.

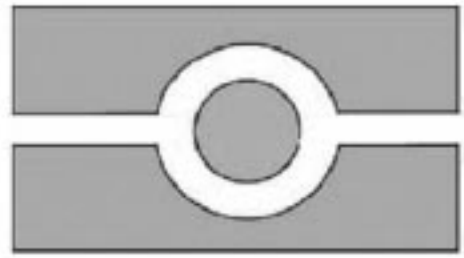
The digitally stored fingerprints are linked to a single person, counterfeit proof and protected against unauthorized access through the so-called Basic Access Control (BAC) method, which has been developed for the new German biometric passports, according to Lufthansa Systems.

RFID passports (e-passports)

An RFID passport is the same as a traditional passport with the addition of a small RFID enabled chip embedded in the back cover. The tightening of security required the border control to take steps in cracking down on counterfeit paper passports with the help of the new RFID enabled passports.

The RFID tagged passports will store the same information that is printed on the data page of the passport, including a digitized fingerprint and will also include a digital picture of the owner, which will facilitate the use of face recognition technology at ports-of-entry, the unique chip identification number and a digital signature to protect the stored data from alteration.

RFID tagged passports have been issued by US, UK and many European governments and other countries around the world. Among the very first RFID based passports were issued by the Malaysia government in 1998. The Malaysian RFID passports record the travel history (time, date, and place) of entries and exits from the country in addition to the basic information contained on the visual data page of the passport.



To prevent unauthorized skimming (reading) of the information contained in the RFID chip by the readers when the passport is closed, the passports will incorporate a thin metal lining. Skimming is the act of obtaining data from an unknowing end user who is not willingly submitting the sample at that time. Eavesdropping is the interception of information as it moves electronically between the chip and the chip reader.

The International Civil Aviation Organization (ICAO) that has set Standards for RFID passports are contained in ICAO Document 9303, Part 1, Volumes 1 and 2 (6th edition, 2006). ICAO refers to the ISO 14443 RFID chips in e-passports as "contactless integrated circuits". ICAO standards provide for e-passports to be identifiable by a standard e-passport logo on the front cover.

The Electronic Passport logo is the international symbol for an electronic passport. It signifies that the passport contains an integrated circuit or chip on which data about the passport and passport bearer is stored. The logo will be displayed at border inspection lanes at all airports and transit ports equipped with special data readers for Electronic Passports.

The special features of an Electronic Passport are:

- Securely stored biographical information and digital image that are identical to the information that is visually displayed in the passport;
- Contactless chip technology that allows the information stored in an Electronic Passport to be read by special chip readers at a close distance
- Uses digital signature technology to verify the authenticity of the data stored on the chip. This technology is commonly used in credit cards and other secure documents using integrated circuits or chips.

The Electronic Passport facilitates travel by allowing:

- Automated identity verification;
- Faster immigration inspections; and
- Greater border protection and security

RFID tagged US Passports

The U.S. version of the biometric passport (e-Passport) will only have digital imaging placed onto the contactless chip, as opposed to the European version. The U.S. Electronic Passport will use the digital image of the passport photograph as the biometric identifier that will be used with face recognition technology to verify the identity of the passport bearer. However, the chip used in the U.S. passport will be large enough (64 kilobytes) to allow it to contain additional biometric identifiers should the need arise in the future.

The U.S. Department of State began issuing biometric passports to government officials and diplomats in early 2006. It began issuing regular biometric passports at its Colorado Passport Agency on August 14, 2006; though they still expect that nearly all new or renewed passports issued by the department to American citizens will be biometric by the end of 2006.

As for foreigners traveling to the U.S., if they wish to enter U.S. visa-free under the Visa Waiver Program (VWP), they are now are required to possess machine-readable passports that comply with international standards. Additionally, for travelers holding a valid passport issued on or after October 26, 2006, such a passport must be a biometric passport to permit storage of at least a digital image of the passport photograph for use with face recognition technology if used to enter the U.S. visa-free under the VWP.

A biometric or biometric identifier is a measurable physical or behavioral characteristic of an individual, which can be used to verify the identity of that individual or to compare against other entries when stored in a database.

The Department of State has incorporated a reliable anti-skimming feature and Basic Access Control (BAC) to mitigate the threat of skimming in all electronic passports. BAC is similar to a PIN used in ATM or credit card transactions. In the case of the electronic passport, characters from the printed machine-readable zone of the passport must be read first in order to unlock the chip for reading. Eavesdropping can only occur while a reader using the proper public key is reading the chip.

The new passports also use Public Key Infrastructure (PKI) technology that prevents the chip from being altered; thereby, providing a higher level of security for the passport. Access to the data on the chip requires the use of an official public key to ensure that the data has not been altered and that it was written to the chip by the Department of State.

Conclusion

Effective air transport 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. Our past can open doors to our future. Whether we realize it or not, RFID (automatic identification and data capture) technology will be an integral part of our life.

RFID increases productivity and convenience. RFID is used for hundreds, if not thousands, of applications such as preventing theft of automobiles, collecting tolls without stopping, managing traffic, gaining entrance to buildings, automating parking, controlling access of vehicles to gated communities, corporate campuses and airports, dispensing goods, providing ski lift access, managing luggage in airports, buying hamburgers, and the growing opportunity to track a wealth of assets in supply chain management. Exciting times await those of us committed to the pursuit of advancements in RFID.

RFID represents a truly transformational technology and the SETU™ platform with RFID 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.

SkandSoft Technologies along with its partners provides everything you require, from evaluation to implementation to maintenance and support in an RFID solution. We are currently addressing business process analysis, benchmarking, pilot implementations, and Enterprise integration for various global organizations in asset management, supply chain etc.

Just imagine the possibilities… ■