**FUTURE SCOPE AND WORK**

**ADOPTION OF RFID**

Commercial applications of RFID can be found today in supply chain management, automated payment systems, airline baggage management, and so on. According to RFIDupdate.com, one of the catalysts for the RFID industry has been mandates issued by Wal-Mart and the US Department of Defense (DOD) for their suppliers to adopt RFID technology4 . Although the market has not grown quickly or as large as originally expected, these two mandates continue to be important drivers in development of the industry.

**BUSINESS TRENDS**

In June 2003, the world’s largest retailer, Wal-Mart, sent out a request to its top 100 suppliers to “*put RFID tags on all cases and pallets of consumer goods shipped to a* *limited number of Wal-Mart distribution centres and stores*” by 2005. While thedeployment of the RFID project continued, Wal-Mart indicated in 2006 that “*out-of-stock* *items carrying RFID tags could be replenished three times faster than they were before the project began*”

However, not all companies have found RFID technology that helpful. A number of smaller Wal-Mart suppliers have had trouble justifying the investment in implementing RFID in their supply chain7 in order to meet Wal-Mart’s expectations.

**GOVERNMENT USE**

Similar to Wal-Mart, the US Department of Defense (DOD) began a policy in July 2004, requesting vendors supplying goods directly or indirectly to the DOD integrate RFID into their shipping procedures. This mandate triggered a number of DOD suppliers to test RFID, or run pilot projects in order to comply with the new requirements.

Another adoption of RFID technology has been by governments, with the electronic passport project. In a number of countries, traditional paper passports are gradually being replaced with passports embedded with a small integrated circuit. Biometric information, such as face recognition, fingerprints or iris scans are stored in the electronic passport. The electronic passport project was initiated by the US, requesting all countries participating in the Visa Waiver Program issue passports with integrated circuits. The main objectives are for automated identity verification, and for greater border protection and security.

**PERSONAL PRIVACY**

As RFID is increasingly being used in the retailing and manufacturing sectors, the widespread item-level RFID tagging of products such as clothing and electronics raises public concerns regarding personal privacy. People are concerned about how their data is being used, whether they are subject to more direct marketing, or whether they can be physically tracked by RFID chips. If personal identities can be linked to a unique RFID tag, individuals could be profiled and tracked without their knowledge or consent.

**RFID SECURITY TRENDS**

Since RFID remains an emerging technology, the development of industry standards for protecting information stored on RFID chips is still being explored and strengthened. Research into the development and adaptation of efficient hardware for cryptographic functions, symmetric encryption, message authentication codes and random number generators will improve RFID security. In addition, advances in RFID circuit design and manufacturing technology can also lower development costs releasing more resources in tags that can be used for other functions, such as allocating power consumption towards security features.

Today, certain public key technologies are also being studied and, in some cases, deployed by RFID vendors. This helps improve confidentiality, user authentication and privacy of RFID tags and associated applications. RFID vendors are also conducting research into integrity and confidentiality issues around RFID reader infrastructure. Data can now be stored on a token using dynamic re-keying, where specific readers can rewrite a token’s credentials/signature, and verify the token’s identity. However, the cost and performance issues around using public key technologies in RFID applications have stalled its use for critical security applications.

**APPROACHS FOR TACKLING SECURITY AND PRIVACY ISSUES**

There are a variety of solutions for tackling the security and privacy issues surrounding RFID. They can be categorised into the following areas:

1. Tag Data Protection
2. Reader Integrity
3. Personal Privacy

**SOLUTIONS FOR TAG DATA PROTECTION**

**Password Protection on Tag Memory**

Passwords can be used to protect tag data, preventing tags from being read without the original owner’s permission. But if the passwords for all the tags are identical, then the data becomes virtually public. However, if each tag is going to have a different or unique password, there may be millions of passwords that need to be recorded, meaning the reader would have to access the database and perform a lot of comparisons for each reading attempt.

**Physical Locking of Tag Memory**

The tag manufacturer locks information such as a unique identifier into tag before the tag is released into an open environment. In other words, the chip is read-only and is embedded with information during the manufacturing process. This provides proof of origin.

The limitation of this method is that no rewriting of data can be done on the tag chip. Additional memory would be required for storing modifiable or extra information and an algorithm would be needed for finding the latest tag data. This would result in higher memory cost and a larger size memory.

**Authentication of the “Author” in Tag Memory**

The author or owner of the tag encrypts the tag data with his own private key (i.e. digitally signs the tag) and writes the encrypted data into tag memory along with the author’s name, a reference to his public key and the algorithm used in non-encrypted form. When the reader wants to verify the authenticity of information, it retrieves the author’s name and other non-encrypted information from the tag to verify that the data has been actually written by the original author as claimed. However, if the RFID reader needs to update the tag with new data, a key management system is required in order to manage the private key.

**SOLUTIONS FOR RFID READER INTEGRITY**

**Reader Protection**

Readers can reject tag replies with anomalies in response times or signal power levels which don’t match the physical properties of tags. If passive tags are used, this can be a way to prevent spoofing attempts.

Readers can also use random frequencies with tags designed to follow a frequency dictated by the reader. Readers can change frequencies randomly so that unauthorised users cannot easily detect and eavesdrop on traffic.

On top of this, data transmitted between the reader and the RFID application server could require verification of the reader’s identity. Authentication mechanisms can be implemented between the reader and the backend application to ensure that information is passed to the valid processor.

**Read Detectors**

RFID environments can be equipped with special devices to detect unauthorized read attempts or transmissions on tag frequencies. These read detectors may be used to detect unauthorized read/update attempts on tags, if they are used together with specially designed tags that can transmit signals over a reserved frequency, indicating any attempts to kill or modify tags.

**SOLUTIONS FOR PERSONAL PRIVACY**

**Kill Tag**

By executing a special “kill” command on a tagged product, the RFID tag will be “killed”and can never be re-activated. This “kill” command may disconnect the antenna or short-circuit a fuse. This ensures that the tag cannot be detected any further, and thus protects the privacy of the individual who possesses the product.

However, there may be instances where tags should not be “killed”. A store may wish for example to re-detect the tags on defective products returned by customers. Also, smart-cards embedded with RFID chips for access control will need to be activated continuously.

**Faraday Cage**

An RFID tag can be shielded with a container made of metal mesh or foil, known as a “Faraday Cage”. This foil-lined container can block radio signals of certain frequencies and thus protect tagged products from being detected. However, this approach might not work in some situations. For example, it is difficult to wrap foil-lined containers around tags used in clothing for pets and people.

**Active Jamming**

Active jamming of RF signals refers to the use of a device that actively broadcasts radio signals in order to disrupt the operation of any nearby RFID readers. This physical means of shielding may disrupt nearby RFID systems.

However, the use of such a device may be illegal, depending on the broadcasting power of the device and government regulations in force. There is a risk of severe disruption to all nearby RFID systems if the jamming power is too strong.

**RSA” Selective Blocker Tag**

A blocker tag is a passive RFID device that uses a sophisticated algorithm to simulate many ordinary RFID tags simultaneously. It provides an endless series of responses to RFID readers through the use of two antennas to reflect back two bits simultaneously, thereby preventing other tags from being read, performing a kind of passive jamming.

However, this approach gives individuals a lot of control. In addition, a blocker tag may be used maliciously to circumvent RFID reader protocols by simulating multiple tag identifiers.

**Logical “Hash-lock”**

When a tag is locked, it is given a value (or meta-ID) that is a hash value of the corresponding key or PIN. The tag will refuse to reveal its ID until it can be unlocked by presenting the value of the key or PIN value. For example, tags may be locked at check out time in a supermarket and then unlocked by the individual using a given meta-ID and PIN after returning home. These meta-ID and PINs may be read optically by individuals, and be printed on the interior of the package or on the payment bill after purchasing, rather than transmitted by radio.

The limitation of this approach is that individuals need to manage the lock/unlock features and the associated PINs for a whole collection of tags and purchases, and need to keep track of which objects carrying which RFID tags. This approach also incurs additional cost as it involves a cryptographic operation on tags.

**APPLICATION**

In addition to the above discussed project, here we are giving some more applications of RFID system for the reader for understanding purpose.

**RFID Technology for Device Control and Authentication in Industries**

The system is designed to provide security in an organization by allowing only the authorized persons to access the secure area. The main priority is the security in any organization. The authorized persons are assigned with  RFID tags that allow them into the secured premises.

[](https://www.elprocus.com/wp-content/uploads/2014/08/8-22-2014-7-32-54-PM.jpg)

**Fig No. 10 RFID Technology Based Device Control and Authentication**

The RFID tag consists of an integrated circuit,  which is used for storing and processing the data, demodulating the radio frequency signal that is to be transmitted. When a person shows the RFID tag in front of the RFID reader and the reader reads the data and compares the data stored in the system. If the data matches with the stored data, the system authorizes the person and allows to enter into the secured area so that the person can take control of various devices. The system also displays the result on the LCD. If it finds the provided information mismatched then, it alerts an unauthorized entry with a [buzzer sounds as an indication](https://www.elprocus.com/8-candidate-quiz-buzzer-circuit-using-8051-microcontroller/) of entering or providing wrong information.

**RFID Technology For Books Tracking in Libraries**

[](https://www.elprocus.com/wp-content/uploads/2014/08/15.jpg)

**Fig No. 11-RFID Technology For Books Tracking in Libraries**

Searching and arrangement of misplaced books is a difficult task often carried out by the library personnel. Many a times Librarians busily search the improperly placed books or books wrongly placed by the library users and students in the library of a school, office or college. And often find this task very difficult. To overcome this problem, an RFID based intelligent book tracking system has been developed for monitoring the books in the library through wireless communication between the RFID reader and the books. This system consists of RFID tag and RFID reader to detect the information about the books placed in the library.

**RFID Technology for Intelligent Tollgate System**

The proposed system performs the following actions such as detecting, billing and accounting for vehicles as they pass through a toll gate within the frequency range between 30 kHz and 2.5GHz. In this system, an RFID tag is programmed with the vehicle owner’s information in the form with an EPC (electronic product code) that can ensures to read the data at certain distances and detects the vehicle in order to enhances a transaction.

**RFID Technology for Authentication of Passport Details**

[](https://www.elprocus.com/wp-content/uploads/2014/08/25.jpg)

**Fig No. 12-RFID Technology for Authenication of Passport Details**

A Passport system can become intelligent enough by the [implementation of RFID technology](https://www.elprocus.com/rf-based-project-ideas/) to it. In this system, passport service issues RFID tag to eligible citizen, which contains passport details like name, address, nationality, passport number, and other relevant data. During the time of authentication, the RFID card reader reads that information and compares it with the data stored in the passport database. If it finds to be matched, then it will allow for further precedence, otherwise it alerts the authorities as fake details.

This is all about the RFID based attendance system project and RFID based applications. Any further help regarding this sort of projects or any other [latest electronic or electrical projects](https://www.elprocus.com/ece-and-eee-mini-projects-for-engineering-students/), please contact us by commenting in the comment section given below.