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# Review on Security of Radio Frequency Identification Technology

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**Abstract**

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as a battery and may operate at hundreds of meters from the RFID reader. This paper presents the introduction to the expected security mechanisms required to boost security of RFID. This study is related to key benefits of RFID. The future security mechanism for the improvement of RFID is also discussed in this paper.

**Keywords:** RFID, RF channel, AES, DES, RSA, PORT, SOCKET.

## 1. INTRODUCTION

RFID (Radio Frequency Identification) technology has been widely applied in the field of logistics and supply management, manufacturing and assembly, networking, smart anti-theft. It is a noncontact automatic identification technology that uses radio signals to automatically identify the target and access to relevant data, making the system without any physical contact can be completed automatically identifies the

specific target object. Its unique noncontact transmission make it a wide range of applications, but this feature is also brought some problems to the security of the system. [1]

The RFID system communication channel is divided into the cable channel in the back-end database and reader and the radio channel in reader. Typically researchers believe that the cable channel portion having a relatively strong security to existing communication device is able to meet the security of wired communication. Wireless RF channel is invulnerable to outside attacks, and thus pose a threat to the security of the entire RFID system. RFID technology has many advantages, such as without physical contact, quick reading, long recognition distance, obstacle-free and so on.

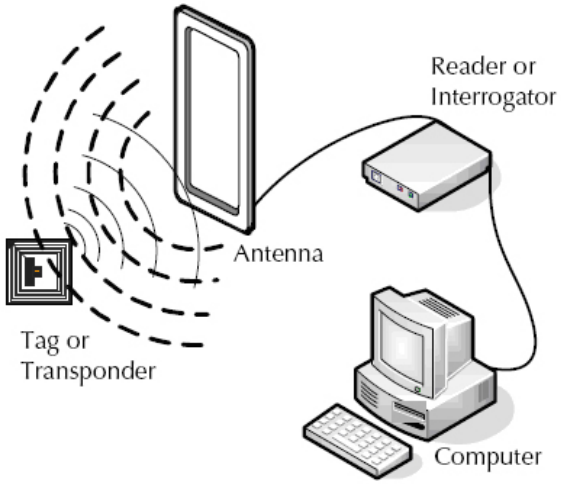


**Figure 1.1:** Working of RFID

But its application may have challenges to the security and privacy of individuals or organizations. It is very hard to apply existing and excellent security technologies that assumes very high computing power and large memory size to RFID due to RFID tag with low resources, low computing power and small memory size.

## 2. APPLICATIONS OF RFID

RFID can be used in a variety of applications such as:

1. Access management.
2. Tracking of goods.
3. Tracking of persons and animals.
4. Toll collection and contactless payment.
5. Machine readable travel documents.

6. Smart dust (for massively distributed sensor networks).
7. Tracking sports memorabilia to verify authenticity.
8. Airport baggage tracking logistics
9. Timing sporting events.[1]

## 3. RFID DESIGN

A radio-frequency identification system uses tags, or labels attached to the objects to be identified. Two-way radio transmitter-receivers called *interrogators* or *readers* send a signal to the tag and read its response.

RFID tags can be passive, active or battery-assisted passive. An active tag has an on-board battery and periodically transmits its ID signal. A battery-assisted passive (BAP) has a small battery on board and is activated when in the presence of an RFID reader. A passive tag is cheaper and smaller because it has no battery; instead, the tag uses the radio energy transmitted by the reader. That makes a difference in interference and in exposure to radiation.

Tags may either be read-only, having a factory-assigned serial number that is used as a key into a database, or may be read/write, where object-specific data can be written into the tag by the system user. Field programmable tags may be write-once, read-multiple; "blank" tags may be written with an electronic product code by the user.

RFID tags contain at least two parts: an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, collecting DC power from the incident reader signal, and other specialized functions; and an antenna for receiving and transmitting the signal. The tag information is stored in a non-volatile memory. The RFID tag includes either fixed or programmable logic for processing the transmission and sensor data, respectively.

An RFID reader transmits an encoded radio signal to interrogate the tag. The RFID tag receives the message and then responds with its identification and other information. This may be only a unique tag serial number, or may be product-related information such as a stock number, lot or batch number, production date, or other specific information.

RFID systems can be classified by the type of tag and reader. A Passive Reader Active Tag (PRAT) system has a passive reader which only receives radio signals from active tags (battery operated, transmit only). The reception range of a PRAT system reader can be adjusted from 1–2,000 feet (0–600 m), allowing flexibility in applications such as asset protection and supervision.An Active Reader Passive Tag (ARPT) system has an active reader, which transmits interrogator signals and also receives authentication replies from passive tags.An Active Reader Active

Tag (ARAT) system uses active tags awoken with an interrogator signal from the active reader. A variation of this system could also use a Battery-Assisted Passive (BAP) tag which acts like a passive tag but has a small battery to power the tag's return reporting signal.

## 4. LITERATURE REVIEW

RFID means Radio frequency Identification describes a system of Identification. It is generally based on storing and remotely retrieving information. RFID technology has been used in several commercial applications. There is no doubt that in the future, RFID is beneficial for several companies. A lot of work have been done in the field of RFID that is discussed as follows:

Mandeep Kaur et al represented an overview of the current state of radio frequency identification (RFID) technology. RFID continues to make Inroads into inventory control systems and it's only a matter of time before the component costs fall low enough to make RFID an attractive economic proposition. RFID is integrated effectively to modify product packaging and its associated materials. Finally, at this delicate stage, while major corporations are trialing the technology, media reaction and outspoken privacy groups can influence the rules by which we use the technology. RFID's potential benefits are large.[2]

Ononiwu G. et al represented radio frequency identification (RFID) based attendance system with automatic door unit. Radio-frequency identification (RFID) is a technology that uses radio waves to transfer data from an electronic tag, called RFID tag or label, attached to an object, through a reader for the purpose of identifying and tracking the object. The objective to build an RFID based attendance system with a door unit was successfully achieved. In terms of performance and efficiency, this project has provided a convenient method of attendance marking compared to the traditional method of attendance system. By using databases, the data is more organized. This system is also a user friendly system as data manipulation and retrieval can be done via the interface, making it a universal attendance system.[3]

Sumita Nainan et al described that RFID is a nascent technology, deeply rooted by its early developments in using radar 1 as a harbinger of adversary planes during World War II. The study has identified and explained the key benefits of RFID technology. RFID will open doors to a pool of applications from a plethora of industries. Although the focal challenge to thwart the adoption is its investment cost, RFID technology provides an ocean of lucrative business opportunities that could convince several firms adopt it. The first part of the paper explains the evolution of RFID technology and the role of its individual components within the system. The second part of the paper discusses the feasibility of employing RFID technology and how it is benefactor

of improved efficiency at lowered costs. The last part of the paper highlights one of the numerous practical implementations of RFID technology.[4]

Jianqiang Wang et al presented a paper on "RFID-Based Vehicle Positioning and Its Applications in Connected Vehicles". This paper proposed an RFID-based vehicle positioning approach to facilitate connected vehicles applications. This paper proposes an RFID approach as a helpful alternative to positioning in connected vehicle applications where GPS is not available or of poor quality. To fill gaps between tags, estimation has to be made based on the latest position update from tags. Road experiments are carried out to validate the RFID-based positioning approach. One type of experiments involves both radar and RFID reader on board. The radar is used to provide ―true‖ positions of the test vehicle, against which estimates from RFID-based positioning are compared. The result shows good match between the two sources of vehicle positions. The other type of experiments focuses on verifying whether the position estimated from the kinematics integration matches the position obtained from the tags. A photoelectric switch is used to trigger the estimation of vehicle position based on the latest tag update. The results indicate that the error of position is about 5.4% during acceleration or deceleration process and around 2.5% when speed is relative stable. With the help of calibration.[5]

Enrique Valero et al represented evolution of RFID Applications in Construction a Literature Review. They proposed the RFID approach as a helpful alternative to positioning in connected vehicle applications where GPS is not available or of poor quality. This approach installs RFID tags on the road surface and on-board tag readers in vehicles. When a reader passes over a tag, the reader can receive the position information stored in the tag. RFID facilitates the control on a wide variety of processes in different stages of the lifecycle of a building, from its conception to its inhabitance.[6]

Dr. Vinit Kotak et al presented a paper on "RFID-based Bus Ticketing System". In the daily operation of the public transport system, the movement of buses isun certain because of conditions such as traffic congestion, unexpected delays, irregular vehicle dispatching times, and other incidents. Such uncertainty results in passengers having to wait for their bus to arrive at the bus stop. This paper proposes a new system based on RFID, in which each commuter owns a smartcard fitted with an RFID tag having a unique ID. It also modernizes the public transport infrastructure.[7]

## 5. PROBLEM FORMULATION

The problem is the security threats to existing RFID Technology. There is lot of threats of data loss and data theft from hacker. There is risk from cryptanalyst also in case of secure system. Here, we have to reduce the threats to RFID Security using customized security algorithms. More complicated cryptographic tools are then built

from these basic primitives. These primitives provide fundamental properties, that are used to develop more complex tools called cryptosystems or cryptographic protocols, that guarantee one or more high-level security properties.

## 6. PROPOSED WORK

Various research papers have been discussed to define the functionality of RFID. Theoretical description as well as diagrammatical description of proposed work is discussed here which is as follows:

Introduction of the new security layer in our security system has improved the system greatly.

1. IP filters are used to reject unauthenticated transmission of packets from server to client.
2. Next step is to enhance network security by customizing existing encryption techniques.
3. Loopholes of existing security mechanisms & enhance security of network has been eliminated here.
4. Socket server & corresponding client to prevent unauthentic access during data transmission has programmed
5. Use of more complex key during encryption & decryption is made.
6. A user interface to make client server communication is developed.

The transmission speed of fibre optic is usually higher than coaxial cable. The speed of coaxial cable is higher than the twisted cable. If we attach security level then the speed of data transmission decreases.

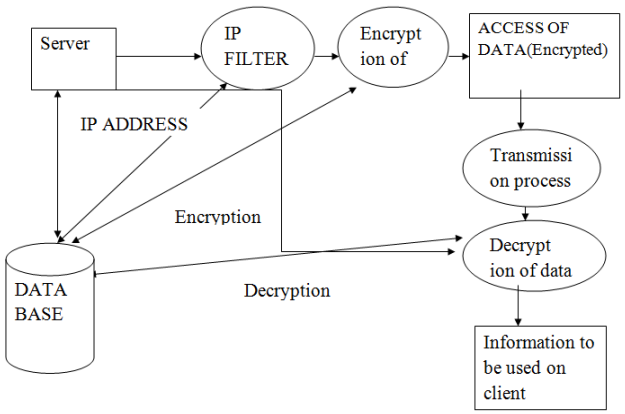


**Figure 1.2:** Proposed Work

## 7. FUTURE SCOPE AND CONCLUSION

In existing research work, there had been a lot of challenges regarding security of RFID. New challenges set new demands on RFID. With the increasing interest in RFID, there has been a greater focus on the subject of securing such networks. In our research we have secured RFID. However there is some work related to RFID too. But there are lots of limitations of such researches as there was security loop holes in case of encryption based data. Data was made non understandable but this system could not stop the destruction of data by intruders. In our research we have provide security to data as well as we have saved data from being destroyed by attacker. In some research the security key to encrypt data was not much strong and delay was increased in data transmission due to security reasons. Here we have reduce the transmission delay by reducing size of packet and made the security key more strong.

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[5] Jianqiang Wang, Daiheng Ni, and Keqiang Li presented a paper on "RFID-Based Vehicle Positioning and Its Applications in Connected Vehicles" in 2014.

[6] Enrique Valero, Antonio Adan and Carlos Cerrada presented a paper "Evolution of RFID Applications in Construction a Literature Review" in 2015.

[7] Dr. Vinit Kotak, Ms. Archana Chaugule, Aakanksha Utkhede, Tushar Chemburkar, Saurabh Tendulkar in 2016 presented a paper on "RFID-based Bus Ticketing System".