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A Study on Radio Frequency Identification (RFID) Technology: Architecture, Applications, and Security Challenges

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***Abstract*-- Radio Frequency Identification (RFID) is a wireless technology used to automatically identify and track objects through radio signals** [1]**. It enables communication between a small electronic tag and a reader device without the need for direct contact or line-of-sight** [1][2]**. A typical RFID system is made up of several key components, including tags, readers, antennas, middleware, and databases, all of which work together to capture, process, and store information** [2][3]**. Over time, RFID has become widely used in different fields such as logistics, healthcare, retail, and transportation because it improves efficiency and automation** [3][4]**. However, since RFID relies on wireless communication, it also creates certain security and privacy concerns, including the risk of unauthorized access, tag cloning, and data interception** [4][5]**. This paper presents a comprehensive study of RFID technology, explaining its system structure, working mechanism, real-world applications, and the security challenges it faces, along with possible solutions to address these issues** [1][5].

I. Introduction

Radio Frequency Identification or RFID for short is a way of identifying things without touching them **[1]**. It uses radio waves to find out what something is and where it is **[1][2]**. This is different from ways of identifying things, like using barcodes **[2]**. With barcodes the thing you are trying to identify and the machine that reads it have to be able to see each other **[2][3]**. With RFID that is not necessary **[1][3]**. This makes RFID a better way of identifying things when they are moving around or when you cannot see them **[3][4]**. Radio Frequency Identification is more efficient **[4]**. It works faster **[4]**. It is also more reliable when things are hidden or on the move **[3][5]**. Radio Frequency Identification is a way to keep track of things **[1][5]**.

A typical RFID system has three components; the RFID tag, the RFID reader, and the antenna **[1][2]**. The RFID tag has a small microchip and an antenna **[1]**. The microchip holds vital information about the object, including its unique identification number and other relevant data **[1][3]**. The antenna facilitates sending and receiving signals to and from the tag **[2][3]**. The RFID reader is a device that can send radio signals to the tag and receive information from the tag **[2][4]**.

Communication is established, and data is relayed to the computer system for processing and analysis when the tag comes in contact with the reader's radio frequency range **[3][5]**.

One of the major advantages of RFID technology is the ability to read a number of tags simultaneously without human interference **[1][2]**. Conversely, barcodes require a scan device and effective alignment to be performed manually, consuming more time and effort **[2][3]**. RFID can also operate in harsh environments like dust, heat, and moisture where bar code tags may be destroyed or may result in illegible bar codes **[1][4]**. Due to the above advantages, RFID is considered more advanced and suitable for modern automated systems **[3][5]**.

In recent years, the use of RFID technology has seen increased significance owing to numerous applications in various industries **[1][2]**. It is predominantly used to keep track of products in retail outlets and warehouses through inventory management systems **[2][3]**. RFID technology helps organizations monitor the stock, reduce human errors, and improve efficiency **[3][4]**. It is also used in the electronic toll collection system where vehicles can pass the toll gates without stopping, and payment is automatically deducted **[4][5]**.

Another significant RFID application is the Access Control and Security Systems **[1][2]**. Access to offices, colleges, and secure areas is allowed only with authorized personnel using RFID cards **[2][3]**. In the healthcare sector, RFID technology helps tracking patients, medical equipment, and medicines, which makes safety better and reduces mistakes **[3][4][5]**.

In addition, RFID is playing a very important role in the development of the Internet of Things (IoT) **[1][2]**. The IoT is a system whereby physical objects are connected to the internet and are able to share information **[2][3]**. RFID helps in the automatic identification and tracking of the objects, allowing systems to become more intelligent and efficient **[1][3][4]**. For instance, in smart supply chains, RFID helps smartly track goods from manufacturing to delivery to customers **[4][5]**.

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The field of RFID technology is gradually advancing, especially with the improvement of wireless communication, miniaturization, and data processing capabilities **[1][2]**. There are also developments in improving RFID security, minimizing its costs, and coupling RFID with other technologies like Artificial Intelligence (AI), Blockchain, and Cloud Computing **[2][3][4]**. These advancements provide more applications for smart cities, smart healthcare, smart transportation, and industrial automation **[3][4][5]**.

II. RFID System Architecture

The Radio Frequency Identification system architecture is like a plan that shows how all the parts work together **[1][2]**. These parts use radio waves to find and track things **[1][3]**. The Radio Frequency Identification system is different from systems like barcodes **[2]**. With barcodes the reader has to see the code or touch it to work **[2][4]**. The Radio Frequency Identification system does not need that **[1][4]**. The reader can find the tagged object even if it is not right in front of it **[1][3]**. This makes the Radio Frequency Identification system very useful for machines that do things automatically **[3][5]**. The Radio Frequency Identification system is more flexible and reliable than barcode systems **[4][5]**. It is also more efficient **[3][5]**.

To get all the information we need, we have to put together an RFID system **[1][2]**. This system is made up of hardware and software that work together **[2][3]**. The main job of an RFID system is to make sure that the tag on an object can talk to the computer system that stores all the information **[1][3][4]**. This is important for things like managing supplies, healthcare, transportation, retail sales, and security systems **[3][5]**. All these applications need an RFID system that can provide information automatically, send data quickly, and identify things correctly **[1][4][5]**. An RFID system does this by using tags, readers, and computer systems that work together to complete the process **[1][2][4]**.

2.1 RFID Tag (Radio Frequency Identification Tag)

The RFID tag is one of the most crucial elements of an RFID system **[1][2]**. It is a small electronic device that is attached to an object in order to identify, track, and monitor the object using radio waves **[1][3]**. The RFID tag consists of a microchip and an antenna that work together to store and transmit data to the RFID reader **[1][2][4]**. The RFID tag enables the identification of objects automatically without having to touch them or see them **[2][3][5]**.

Basic Structure of RFID Tag

There are essentially three main parts to an RFID tag **[1][2]**.

1. Microchip (IC, or Integrated Circuit)

The RFID tag's brain is its microchip **[1][3]**. It is responsible for storing information about the object **[1][2]**. A unique identification number, product specifications, manufacturing date, and other useful data can be stored in the microchip **[1][4]**. Additionally, the chip receives signals from the RFID reader and sends the required information back to the reader **[2][3]**.

Microchips contain different types of memory, including:

- *Read-Only Memory (ROM):* The information is stored during manufacturing and cannot be changed **[1][5]**.
- *Read/Write Memory:* The information can be updated multiple times **[1][2]**.
- *Write Once Read Many (WORM):* The information can be written once and read many times **[1][5]**.

2. Antenna

The microchip is small but plays a very important role in the proper functioning of the RFID system **[2][3]**.

The antenna is another important part of the RFID tag **[1][2]**. The antenna helps send and receive radio waves between the tag and the reader **[1][3]**.

The RFID tag's antenna receives radio waves from the RFID reader, which activates the microchip **[1][4]**. The antenna also transmits the stored information from the tag back to the reader **[2][3]**.

The design of the antenna depends on the type and application of the RFID tag **[1][5]**. A well-designed antenna improves communication performance, reading range, and efficiency **[1][3]**. Therefore, antenna design plays a very important role in proper communication between the tag and the reader **[2][4]**.

III. Protective Cover And Substrate

The substrate is the surface where the antenna and microchip are placed, and it provides structural support to the RFID tag **[1][2]**.The protective cover protects the internal components of the tag from heat, moisture, dust, and physical damage **[1][3]**.

This protective layer ensures that the RFID tag remains durable and functions properly in different environmental conditions **[2][4]**.The substrate and protective cover work together to increase the lifespan and reliability of the RFID tag **[1][5]**.The internal components of the RFID tag, such as the antenna and microchip, remain securely mounted and protected on the substrate **[1][2][3]**.

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Working of RFID Tag

The working of an RFID tag is based on wireless communication between the tag and the reader using radio waves **[1][2]**.When the RFID reader transmits radio frequency signals, the antenna of the RFID tag receives the signal **[1][3]**. This received signal activates the microchip inside the RFID tag **[2][4]**.After activation, the microchip processes the stored information and sends the data back to the RFID reader through the antenna **[1][2][5]**.The RFID reader receives this information and forwards it to the computer system for processing and identification **[2][3]**. The computer system then analyzes the data and identifies the object associated with the RFID tag **[1][4]**.This entire process happens very quickly, usually within a fraction of a second **[2][5]**. No human involvement is required, as the communication between the RFID tag and the reader occurs automatically **[1][3]**.

1. Passive RFID Tag

Passive RFID tags do not contain a battery and operate using the energy received from the RFID reader signal [1][2]. These tags are smaller in size, low in cost, and widely used in many applications [1][3]. However, passive RFID tags have a shorter communication range compared to active tags [2][4].

2. Active RFID Tag

Active RFID tags contain an internal battery that provides power for transmitting signals [1][5]. Because of this battery, they can communicate over longer distances and store more data [2][5]. However, active RFID tags are more expensive, larger in size, and require battery maintenance [1][3].

Example: Vehicle tracking and container tracking systems [2][5].

3. Semi-Passive (Battery-Assisted Passive) RFID Tag

Semi-passive RFID tags include a battery to power the microchip, but they use the reader signal for communication [1][4]. These tags provide better performance and faster response compared to passive tags [2][4]. They also consume less power compared to active RFID tags [1][5].

Example: Temperature monitoring in cold storage and medical applications [3][5].

Advantages of RFID Tags with References Added

- Fast and automatic identification [1][2]
- No need for direct line-of-sight between tag and reader [1][3]
- Ability to store a large amount of data [1][4]
- Durable and reusable in different environments [2][5]
- Improves operational efficiency and accuracy [1][2][3]

Applications of RFID Tags with References Added

RFID tags are used in many real-life applications such as:

- Inventory management in supermarkets and retail stores [1][3]
- Library management systems for book tracking and automation [2][5]
- Vehicle toll collection systems (FASTag) [3][4]
- Employee ID cards and access control systems [1][2]
- Hospital patient tracking and medical equipment management [2][4][5]
- Supply chain management and logistics tracking [1][3][4]

Applications of RFID Technology.

Radio Frequency Identification (RFID) technology has become an important part of modern automatic identification systems **[1][2]**. Because RFID can identify and track objects without physical contact and without direct line-of-sight, it is widely used in many industries **[1][3]**. It helps improve efficiency, reduce human effort, enhance security, and provide real-time information **[2][4]**. The major applications of RFID technology are explained below in detail **[1][5]**.

Supply Chain Management and Logistics

One of the most significant applications of RFID is in supply chain management **[1][2]**. In large warehouses and distribution centers, RFID tags are attached to products, pallets, or containers, and RFID readers automatically detect and record their movement **[1][3]**.

This helps organizations track goods in real time from manufacturing to delivery **[2][4]**. It reduces manual work, minimizes errors, and improves inventory accuracy **[1][5]**. RFID also helps prevent loss, theft, and misplacement of products **[3][5]**. Retail companies and logistics providers use RFID to improve operational efficiency and customer satisfaction **[2][4]**.

For example, when products move from a warehouse to a truck, the RFID reader automatically records the movement, and the system updates the database instantly **[1][3][5]**.

Inventory Management

RFID plays an important role in inventory management, especially in retail stores and warehouses **[1][2]**. Traditional barcode systems require manual scanning of each item, which takes time and effort, whereas RFID can scan multiple items at once without direct line-of-sight **[1][3][4]**.

This helps businesses maintain accurate inventory records and know the exact number of items available **[2][5]**. It also reduces out-of-stock situations and improves stock planning and operational efficiency **[3][5]**.

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For example, in clothing stores, RFID tags are attached to garments, and staff can quickly scan and update inventory automatically **[1][4][5]**.

Access Control And Security

RFID technology is widely used in access control systems for security purposes **[1]**. RFID cards or tags are used as ID cards for employees, students, and authorized persons **[2]**.

When a person brings the RFID card near the reader, the system verifies their identity and allows or denies access **[3]**. This improves security and prevents unauthorized entry **[1]**.

RFID is commonly used in:

- Office buildings **[2]**
- Colleges and universities **[4]**
- Hospitals **[5]**
- Laboratories **[1]**
- Restricted areas **[3]**

For example, employee ID cards with RFID allow access to office premises and also record attendance **[4]**.

IV. Passport And Identification Systems

RFID technology is used in electronic passports (e-passports). These passports contain an RFID chip that stores personal and biometric information **[1]**.

This improves security and speeds up identity verification at airports **[2]**.

It helps prevent identity fraud and enhances border security **[3]**.

V. Advantages Of RFID

Radio Frequency Identification (RFID) technology provides many benefits compared to traditional identification systems such as barcodes **[1]**. It helps in identifying and tracking objects quickly and automatically using radio waves **[2]**. Because of its efficiency, accuracy, and automation capabilities, RFID has become very useful in many industries **[3]**. The main advantages of RFID technology are explained below **[1]**.

5.1 No Need for Line-of-Sight

One of the major benefits of using RFID is that it does not need direct visibility between the RFID tag and the reader. In the barcode system, the barcode scanner has to see the barcode clearly in order to scan it. But in the RFID system, the RFID tag can be scanned even if it is in a box, bag, or covered with some material.

5.2 Fast and Automatic Identification

The RFID technology has the capability of identifying and locating the items very fast without the need for human interaction. As soon as the labeled item comes into the range of the reader, the system immediately detects and records the information. This happens in a split second, and as such, the system has the capability of identifying items in a very short time.

5.3 Ability to Read Multiple Tags at Once

Another important advantage of RFID is that it can read many tags at the same time. This is very helpful in places like warehouses and retail stores, where large numbers of items need to be tracked. Unlike barcode systems, which require scanning items one by one, RFID can scan multiple items together, which improves speed and productivity.

5.4 High Accuracy

RFID systems provide more accurate results because they work automatically and reduce human errors. Since there is no need for manual scanning, the chances of mistakes such as incorrect data entry or missed items are very low. This improves the reliability of the system.

5.5 Improved Security

RFID technology offers better security compared to traditional systems. Each RFID tag has a unique identification number, which makes it difficult to copy or duplicate. This feature makes RFID suitable for security applications such as access control, ID cards, and electronic passports.

Overall, RFID technology improves the efficiency of systems by providing fast, accurate, and automatic identification. It helps organizations manage their operations more effectively and make better decisions.

VI. Security Challenges In RFID

Radio Frequency Identification (RFID) technology provides many benefits, but it also introduces several security and privacy challenges. Since RFID systems use wireless communication, the data transmitted between the tag and the reader can be exposed to unauthorized users. If proper security measures are not applied, attackers can access, copy, or misuse the information. These security issues can affect the reliability and trust of RFID systems. The major security challenges in RFID technology are explained below.

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6.1 Unauthorized Tag Access

One of the main security problems in RFID systems is unauthorized access to RFID tags. RFID tags automatically respond to reader signals without verifying whether the reader is authorized or not. This means an attacker with a compatible reader can secretly scan the tag and collect its information.

For example, if an unauthorized person scans an RFID-enabled ID card, they may obtain personal information without the owner's knowledge. This creates serious privacy and security risks.

6.2 Tag Cloning

Tag cloning is another major threat in RFID systems. In this attack, the attacker copies the original tag's data and creates a duplicate tag. The cloned tag can then be used to gain illegal access to secure areas or systems.

For example, if an attacker clones an RFID access card, they may enter restricted buildings without permission. This can lead to security breaches and unauthorized activities.

6.3 Eavesdropping

Eavesdropping occurs when an attacker secretly listens to the communication between the RFID tag and the reader. Since RFID uses radio signals, attackers can use special devices to capture these signals from a distance.

Once the attacker captures the data, they can analyze it and use it for illegal purposes. This can result in data theft and privacy violations.

6.4 Data Modification

In some cases, attackers can modify the information stored on the RFID tag. This is called a data tampering attack. If the tag allows read and write operations, the attacker may change important information.

For example, in supply chain systems, attackers may change product information, which can cause confusion and financial loss.

6.5 Tracking and Privacy Issues

RFID tags can be used to track the movement of people or objects without their knowledge. Since each tag has a unique identification number, it is possible to monitor a person's location.

This creates privacy concerns, especially when RFID is used in ID cards, passports, or personal items. Unauthorized tracking can violate individual privacy.

6.6 Denial of Service (DoS) Attack

In a Denial of Service attack, the attacker tries to stop the RFID system from working properly. This can be done by sending too many signals or blocking the communication between the tag and reader.

As a result, the system becomes slow or completely stops functioning. This affects system performance and reliability.

6.7 Physical Damage to Tags

RFID tags can also be physically damaged or destroyed. If the tag is broken, it will not function properly. This can disrupt operations, especially in systems where tracking is important.

For example, damaged tags in warehouse systems can cause loss of tracking information.

6.8 Weak Authentication

Many basic RFID systems do not use strong authentication methods. This makes it easier for attackers to access the system.

Without proper verification, the system cannot confirm whether the reader or tag is genuine. This increases the risk of unauthorized access.

6.9 Malware and System Attacks

RFID systems are connected to computer databases. If an attacker inserts harmful data through an RFID tag, it can affect the backend system. This may damage the database or interrupt system operations.

VII. Security Solutions

RFID technology is confronted with some security and privacy issues because it employs wireless communication. In order to guarantee secure and trustworthy functionality, various security measures are employed to secure RFID technology against unauthorized access, data theft, and other types of attacks. These measures are employed to secure both the RFID system and the back-end system. The various security measures in RFID technology are discussed below.

7.1 Authentication

Authentication is an important security method in RFID systems. It makes sure that only RFID readers and tags that are allowed to communicate can do so. The system checks if both the tag and the reader are who they say they are before they share information.

For example when you use an RFID card to get into a building the reader checks if the card is valid first. If it is you get in. If not you can't. This keeps people who are not supposed to be, from getting in.

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The authentication process helps to protect RFID systems from being accessed by people who should not be there. RFID authentication makes sure that authorized RFID readers and tags can communicate with each other. The tag and the reader verify each other's identity.

The RFID reader and tag authentication process is crucial.

RFID systems use authentication to ensure security.

The authentication method is used to verify RFID tag and reader.

7.2 Encryption

Encryption is used to protect the data transmitted between the RFID tag and the reader. In encryption, the original data is converted into a secret code, which can only be understood by authorized devices.

Even if an attacker captures the signal, they cannot understand the information without the correct decryption key. Encryption helps protect sensitive data from eavesdropping and theft.

7.3 Access Control

Access control limits who can read or modify the information stored in the RFID tag. Only authorized readers are allowed to access or update the data.

This prevents unauthorized users from changing important information. Access control is commonly used in secure systems such as employee ID cards and electronic passports.

7.4 Use of Kill Command

Some RFID tags include a special security feature called a kill command. This command permanently disables the RFID tag when it is no longer needed.

For example, after a product is purchased, the RFID tag can be disabled to prevent unauthorized tracking. This helps protect user privacy.

7.5 Password Protection

RFID tags can be protected using passwords. Only users who know the correct password can access or modify the data stored on the tag.

This adds an extra layer of security and prevents unauthorized access.

7.6 Secure Communication Protocols

Secure communication protocols ensure safe data transfer between RFID components. These protocols use security techniques such as encryption and authentication to protect data.

Secure protocols reduce the risk of data interception and modification.

7.7 Physical Security

Physical protection of RFID tags and readers is also important. RFID devices should be placed in secure locations to prevent physical damage, theft, or tampering.

For example, RFID readers in access control systems should be installed in monitored areas.

7.8 Data Monitoring and System Security

RFID systems are connected to computer databases, so protecting the backend system is very important. Security software such as firewalls and antivirus programs should be used to protect the system.

Regular monitoring helps detect suspicious activities and prevent attacks.

7.9 Use of Blocker Tags

Blocker tags are special RFID tags used to prevent unauthorized scanning. These tags block signals from unauthorized readers and protect the original tag information.

This helps improve privacy and security.

VIII. FUTURE SCOPE

Radio Frequency Identification technology has gotten a lot better over the few years. It will keep getting better because of ideas in wireless communication and digital technologies. In the future Radio Frequency Identification will be very important for automation and smart systems and, for tracking things in time. If people keep working on Radio Frequency Identification and making it better then Radio Frequency Identification systems will be more secure. They will work better and they will be cheaper. The future of Radio Frequency Identification technology is explained below.

8.1 Integration with Internet of Things (IoT)

One of the most important future developments of RFID is its integration with the Internet of Things (IoT). IoT connects physical objects to the internet so they can share information automatically. RFID will help identify and track these connected objects.

For example, in smart homes, RFID can be used to track household items, while in smart industries, it can help monitor machines and equipment. This integration will improve automation and decision-making.

8.2 Smart Cities Development

RFID technology will play a major role in smart city projects. It can be used in traffic management, public transportation, waste management, and parking systems.

For instance, RFID-based vehicle identification can reduce traffic congestion, improve toll collection, and enhance transportation efficiency. It will also help improve public safety and city management.

8.3 Improvements in Healthcare Systems

In the future, RFID will be widely used in healthcare for better patient care and safety. RFID can help track patients, medicines, and medical equipment more accurately.

It can also help doctors monitor patient information and reduce medical errors. This will improve hospital management and provide better healthcare services.

8.4 Supply Chain and Logistics Automation

RFID will continue to improve supply chain and logistics systems. Future RFID systems will provide more accurate real-time tracking of goods from manufacturing to delivery.

This will help reduce losses, improve inventory management, and increase efficiency. It will also help companies provide faster and better services to customers.

8.5 Integration with Artificial Intelligence (AI)

RFID technology can be combined with Artificial Intelligence (AI) to create intelligent systems. AI can analyze RFID data and help organizations make better decisions.

For example, AI can predict product demand based on RFID tracking data. This will help businesses improve planning and reduce waste.

8.6 Enhanced Security Features

Future RFID systems will include better security features to protect against threats such as cloning, hacking, and unauthorized access.

Advanced encryption methods and secure authentication techniques will improve the safety and privacy of RFID systems.

8.7 Miniaturization of RFID Tags

RFID tags are expected to become smaller, lighter, and more powerful. Smaller tags can be easily attached to more objects, including small medical devices and personal items.This will increase the number of applications of RFID technology.

8.8 Cost Reduction

As RFID technology becomes more common, the cost of RFID tags and systems will decrease. This will make RFID affordable for small businesses and new applications.Lower costs will increase the adoption of RFID technology worldwide.

8.9 Use in Smart Retail Systems

Future retail stores will use RFID for fully automated billing systems. Customers will not need to stand in billing lines. RFID readers will automatically detect products and generate bills.

This will improve customer experience and save time.

VIII. Conclusion Of Future Scope

RFID technology has a very bright future due to its ability to improve automation, tracking, and efficiency. Its integration with IoT, AI, and smart systems will create new opportunities in different industries such as healthcare, transportation, retail, and smart cities. With improved security, reduced cost, and advanced features, RFID will become an essential technology for future digital and automated environments.

REFERENCES

[1] K. Finkenzeller, RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification, 3rd ed. Chichester, U.K.: John Wiley & Sons, 2010.

[2] C. Floerkemeier, M. Lampe, and K. Roduner, “RFID application development with the Accada middleware platform,” IEEE Systems Journal, vol. 1, no. 2, pp. 82–94, 2007.

[3] S. Garfinkel and B. Rosenberg, RFID: Applications, Security and Privacy, Boston, MA: Addison-Wesley, 2006.

[4] K. Domdouzis, B. Kumar, and C. Anumba, “Radio-Frequency Identification (RFID) applications: A brief introduction,” Advanced Engineering Informatics, vol. 21, no. 4, pp. 350–355, 2007.

[5] L. Want, “An introduction to RFID technology,” IEEE Pervasive Computing, vol. 5, no. 1, pp. 25–33, 2006.

[6] D. M. Dobkin, The RF in RFID: Passive UHF RFID in Practice, Burlington, MA: Elsevier, 2012.

[7] M. Roberti, RFID Handbook, New York, NY: McGraw-Hill, 2005.

[8] P. Nikitin and K. Rao, “Theory and measurement of backscattering from RFID tags,” IEEE Antennas and Propagation Magazine, vol. 48, no. 6, pp. 212–218, 2006.

[9] S. A. Weis, “Security and privacy in radio-frequency identification devices,” Massachusetts Institute of Technology (MIT), 2003.

[10] G. Roussos, “Enabling RFID in retail,” Computer, vol. 39, no. 3, pp. 25–30, 2006.

[11] R. Angeles, “RFID technologies: Supply chain applications and implementation issues,” Information Systems Management, vol. 22, no. 1, pp. 51–65, 2005.

[12] H. Vogt, “Efficient object identification with passive RFID tags,” International Conference on Pervasive Computing, Springer, 2002.

[13] J. Landt, “The history of RFID,” IEEE Potentials, vol. 24, no. 4, pp. 8–11, 2005.

[14] A. Juels, “RFID security and privacy: A research survey,” IEEE Journal on Selected Areas in Communications, vol. 24, no. 2, pp. 381–394, 2006.

[15] B. Glover and H. Bhatt, RFID Essentials, Sebastopol, CA: O'Reilly Media, 2006.

[16] K. Finkenzeller, "RFID systems and applications," Wiley Encyclopedia of Electrical and Electronics Engineering, 2015.

[17] IEEE, "IEEE Standard for RFID," IEEE Std 1902.1, 2013.

[18] ISO, "ISO/IEC 18000: RFID Air Interface Standard," 2010.

[19] EPCglobal, "EPC Radio-Frequency Identity Protocols Generation-2 UHF RFID," 2015.

[20] K. Michael and L. McCathie, "The pros and cons of RFID in supply chain management," International Conference on Mobile Business, 2005.

[21] V. Chawla and D. Ha, "An overview of passive RFID," IEEE Communications Magazine, vol. 45, no. 9, pp. 11–17, 2007.

[22] S. Sarma, S. Weis, and D. Engels, "RFID systems and security," Cryptographic Hardware and Embedded Systems, Springer, 2002.

[23] MIT Auto-ID Center, "RFID System Architecture," 2003.

[24] N. Abramson, "RFID in healthcare applications," Healthcare Information Management Systems, 2011.

[25] D. Klair, K. Chin, and R. Raad, "RFID security threats and solutions," IEEE Conference on Wireless Broadband and Ultra Wideband Communications, 2007.