



# LIBRATRACE: ADVANCED RFID BOOK TRACING SYSTEM

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## I. Abstract

This project describes the design and implementation of a library book tracking system that uses modern technology to automate the book tracking and management process. user data. The system combines software and hardware such as MySQL database and Flask web framework with RFID reader to provide efficient and effective solutions. The system makes it easy to add and track books and keep track of how users interact with the library. Test results show how reliable and efficient the requirements are in operating the library.

**Keywords:** Library Management System (LMS) Web Application, RFID Technology, Arduino-based Serial Communication, RFID Tag Scanning, Flask [Python]

## II. Introduction

Libraries are important to communities and schools because they give people access to rich resources and information. However, managing users' information and tracking books is still a problem arising from traditional library management. Inefficiencies in libraries can result from manual processes that are time-consuming and error-prone. New library management that uses technology is needed to speed up the solution of these problems and make them more efficient.

## III. Objective

Using a variety of technologies, including Flask (a Python web development framework), MySQL (a relational database management system), and RFID (Radio-Frequency Identification) technology for book tracking, the provided code snippets aim to create a library management system. A library's management tasks, such as adding new books, keeping track of books that users have borrowed, keeping track of user information, and producing reports, are all intended to be automated by this system.

## IV. Literature Survey

Beijing Jiaotong University, China, B. Q. Yuan, "Analysis and Design of RFID Security Protocol for Internet of Things", M.S. thesis, 2016. · Note. In order to improve the security of networks and devices equipped with RFID technology, this thesis investigates the research and development of RFID security protocols in IoT systems. Negative aspects: scalability, compatibility Existing systems and resource limitation of IoT devices are some aspects that may limit the functionality of the proposed security protocols. In addition, implementing complex security measures can lead to additional costs and potential performance issues, especially in resource-constrained IoT contexts.

Ze Z. J. Tang, "Investigation on Campus Security Internet of Things' Key Technologies," Modern Vocational Education, no. 25, pages. Sep. 140-141. 2016. This study probably focuses on investigating important technologies utilized in Internet of Things (IoT) systems for campus security, perhaps including RFID-based approaches to asset tracking and access control. · Drawbacks: Integrating comprehensive IoT security solutions on a campus-wide scale may present difficulties in terms of compatibility with a variety of devices, resolving privacy concerns, and integrating with the current infrastructure. Furthermore, the implementation of Internet of Things systems throughout a sizable campus may result in significant expenses for hardware, software, and continuous upkeep.

Ze Z. J. Guo, "Autonomous Campus Card Information Management System: Architecture and Security Evaluation," MdotS. 2017 Huaqiao University thesis, China. This thesis is probably going to be about designing and analyzing the security of an intelligent campus card system. This system might use RFID technology for access control, student identification, and other things. · Drawbacks: The suggested intelligent campus card system's viability might be hampered by elements like RFID technology's adaptability to a range of environmental circumstances, the possibility of card cloning or interception, and the requirement for ongoing updates to counter new security risks. Furthermore, a thorough assessment of the financial benefits of widely implementing and maintaining such a system is necessary.

J. Kaur, K. Kaur, "IoT-based automated employee performance appraisal: a fuzzy approach," Computers Materials and Continua, vol. 53, no. 1, pp. 24-38, the Jan. 2015. Although it may not directly relate to RFID security protocols, this paper discusses an automated employee performance appraisal method using fuzzy logic in an Internet of Things context. · Disadvantages: The fuzzy logic approach to performance evaluation may be flexible and adaptable, but it may also add complexity and potential errors to the evaluation process. Furthermore, the incorporation of IoT devices and data sources for performance evaluation may give rise to privacy issues and necessitate cautious handling of confidential employee information.

S. Anandhi, R.D. Anitha, V. An RFID Cloud Authentication Protocol for Object Tracking System in Supply Chain Management, by Sureshkumar, was published in Digital Connectivity - Social Impact by Springer Singapore in 2016. from 247 to 256. · Remarks: With an emphasis on improving efficiency and security, this paper suggests an RFID cloud authentication protocol for supply chain management object tracking. · Drawbacks: Although cloud-based RFID authentication solutions have advantages like centralized management and scalability, there may be issues with data privacy, network dependability, and reliance on outside cloud providers. It may also be necessary to make large investments in infrastructure and employee training in order to incorporate RFID technology into the current supply chain procedures.

Y. B. Wu, Nin. Li, "Impressive Campus Security System Architecture and Execution," Internet of Things Technology, vol. 3, No. 8. pp. 79-81, August 10. (2013). Although it might not directly address RFID security protocols, this article probably covers the planning and execution of an intelligent campus security system utilizing IoT technologies. · Drawbacks: Putting in place an intelligent campus security system presents difficulties with integrating various security devices and sensors, guaranteeing real-time monitoring, and protecting the confidentiality and integrity of data. Additionally, the implementation of this kind of system throughout a campus setting might necessitate large expenditures for software development, infrastructure, and continuing support.

Y. Ha. A. Cao. Li, Lan. Research and design of a smart crosslayer security solution for campus cards: Tang, Journal of Beijing Institute of Petro-Chemical Technology, vol. 20, n. 2, pages. 29-31, June. 2012. The goal of this research is probably to improve system reliability and address security flaws by developing a cross-layer security solution for campus card systems. · Drawbacks: Cross-layer security solutions may make campus card systems more resilient to different types of attacks, but they may also make things more complicated and cause incompatibilities between various network tiers. Furthermore, there is a chance that other variables like financial limitations, organizational preparedness, and the availability of qualified staff will affect how feasible it is to apply these solutions in actual campus settings.

D. C. Ranasinghe, D. W. Engels, P. H. Cole, "Security and privacy solutions for low-cost RFID systems," in Intelligent Sensors, Sensor Networks and Information Processing Conference, Melbourne, Vic., Australia, 2004, pp. 337-342. The purpose of this conference paper is to address the vulnerabilities and privacy issues related to low-cost RFID systems by discussing security and privacy solutions. The drawbacks of low-cost RFID systems include potential gaps in security and privacy protections, even though they are scalable and affordable. Further, there might be compromises made in terms of usability, performance, and compatibility with current infrastructure when implementing security and privacy solutions for low-cost RFID systems.

Ten. Z. Cao, "Information security study on RFID Internet of things technology," MdotS. dissertation, Chinese University of Xidian, 2013. The purpose of this thesis is to identify vulnerabilities and suggest mitigation strategies by examining security issues pertaining to RFID technology in the context of the Internet of Things. · Disadvantages: Although knowing RFID security in the context of the Internet of Things is essential for spotting and fixing possible flaws, the viability of putting suggested security measures into practice may differ based on elements like system complexity, resource limitations, and the dynamic nature of security threats. Furthermore, variables including user behavior, organizational policies, and regulatory compliance requirements may have an impact on how effective security solutions are.

I. J. In W. Shen, Jonathan. An enhanced ultra-lightweight RFID authentication protocol, by Ling, Computer Applications and Software, vol. 32, none. 2, pages. 304-306, February. Year: 2015. This paper aims to improve the security and efficiency of RFID authentication processes by presenting an ultra-lightweight RFID authentication protocol that has been improved. Disadvantages: Although enhanced scalability and decreased computational overhead are two advantages of lightweight RFID authentication protocols, they may also result in security vulnerabilities and a decreased ability to withstand sophisticated attacks. Furthermore, rigorous assessment of potential trade-offs in security, usability, and compatibility with current systems may be necessary before adopting ultra-lightweight protocols.

S. Anandhi, R.D. Anitha, V. Sureshkumar, "Automated RFID reader-to-reader delegation technology for supply chain management within cloud computing settings," Journal of Supercomputing, vol. No. 74. 7, p. April, 3148–3167. 2018. The purpose of this journal article is to simplify and strengthen supply chain management through the automatic RFID reader-to-reader delegation protocol. Cons: Automatic RFID delegation protocols can simplify system configuration, access control policies, and network security while also reducing administrative overhead and improving efficiency. Moreover, implementing such protocols in cloud computing environments might cause people to worry about their dependence on outside service providers, data privacy, and regulatory compliance.

## V. Methodologies

### 5.1 Existing Systems

Most library management systems currently rely on information storage technology and manual data entry. These systems can be ineffective at tracking and managing user data and are often out of sync with today's technology. Libraries will have difficulty maintaining accurate information and users will experience delays in accessing resources. Such systems are not suitable for processing more operational data.

### 5.2 Proposed System

Library management has provided a solution to overcome the shortcomings of the traditional system. The solution combines web development, data management and RFID technology to automate various processes including user registration, tracking and storing information. Thanks to the RFID tags placed inside the book, easy tracking is possible and users can easily interact with the system by understanding the web. Using tools provided by the system, administrators can monitor library operations and generate reports to inform decisions.

### 5.3 Architecture diagram

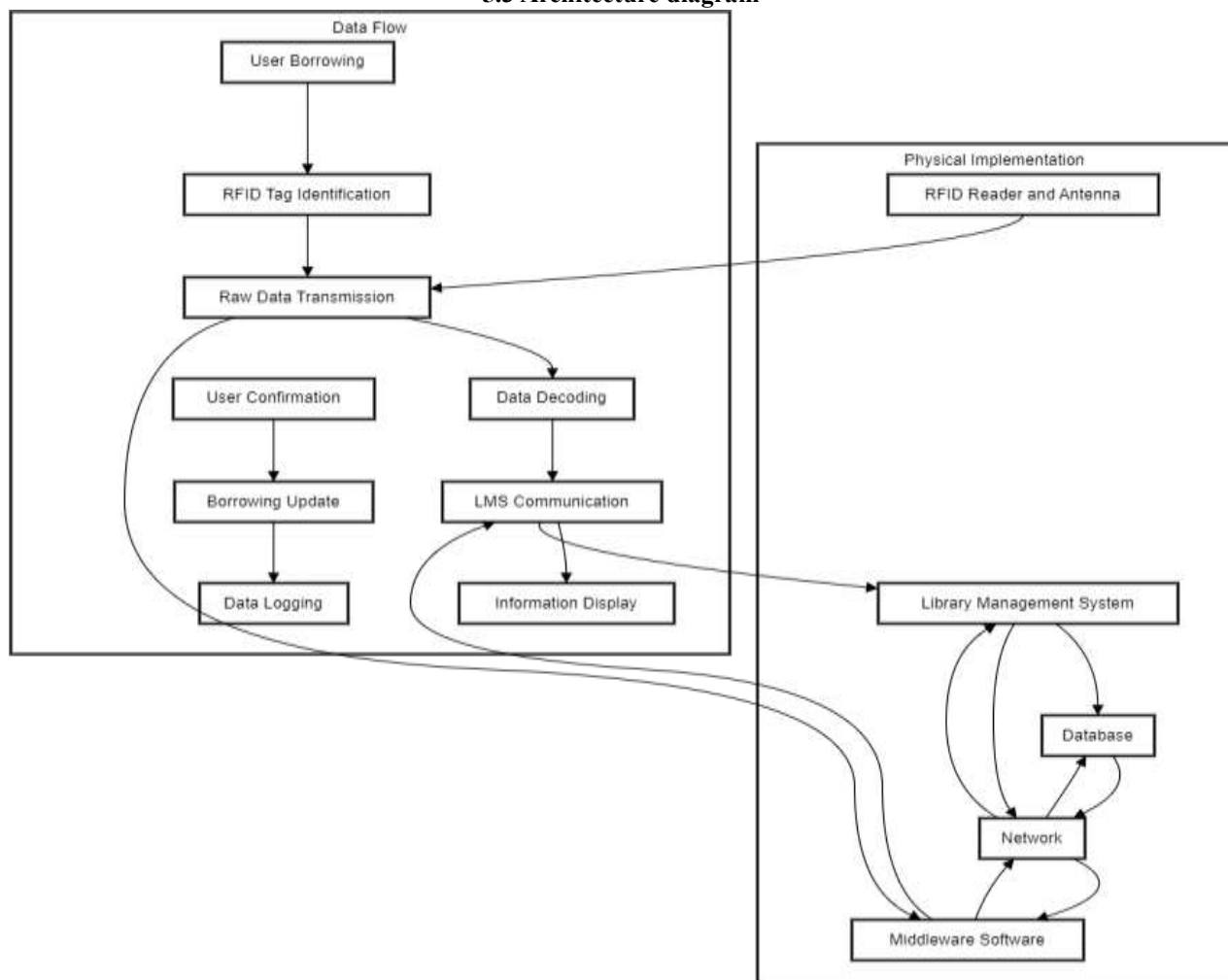


Figure 5.1

The Figure 4.1 explains the project is comprised of multiple HTML pages that illustrate distinct library management system functionalities. These include adding a book (AddBook.html), tracking books (TrackBook.html), displaying user records (UserRecords.html), and displaying tracked records (TrackRecords.html). JavaScript Scripts: Scripts written in JavaScript. script1 and js. js) are incorporated into the HTML pages in order to communicate with the backend server and dynamically retrieve data. In order to obtain user and book data and update the corresponding HTML tables, these scripts send asynchronous requests to the Flask server. Python Scripts: To implement the Flask backend functionality, multiple Python scripts (app.py, db.py, and mypy.py) are provided. The aforementioned scripts establish pathways to manage diverse HTTP queries and communicate with the MySQL database to execute CRUD (Create, Read, Update, Delete) actions on user and book entries. Moreover, Arduino-based serial communication (mypy.py) is used in this project to read RFID tags that are affixed to books. Following a book scan, the Arduino notifies the Flask server of the information from the RFID tag, and the Flask server updates the database with the pertinent book and user details. MySQL Database: Book and user record information is stored in the MySQL database (see the totalbooks and user\_records tables). The Flask server accesses these tables and modifies them to carry out different tasks like adding new books and obtaining user records.

## 5.4 Advantages

### 5.4.1 Outside Frameworks:

To empower simple get to to assets and administrations, see into conceivable outcomes for joining the Library Administration Framework with outside frameworks like online databases, computerized storehouses, and learning administration frameworks.

### 5.4.2 Portable Application Advancement:

To extend the Library Administration System's reach and grant clients helpful get to library assets and administrations whereas they're on the go, make a versatile application that works with both iOS and Android stages. Personalized proposals and upgraded asset revelation can be accomplished by executing progressed look calculations and recommendation engines that take under consideration client inclinations, perusing history, and collaborative sifting.

### 5.4.3 Progressed Announcing and Analytics:

Increment the system's capacity for detailing and analytics to deliver chairmen valuable data around asset ubiquity, utilization patterns, and client behavior. This will permit chairmen to apportion assets and make data-driven choices.

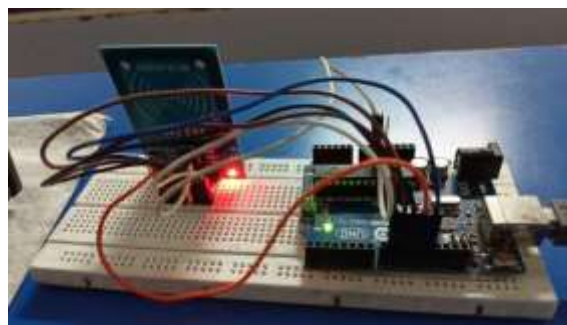
### 5.4.4 Interlibrary Credit Administration:

Set up interlibrary credit administration highlights to advance participation and asset sharing between libraries, empowering clients to effortlessly get to assets from partnered foundations.

### 5.4.5 Openness Highlights:

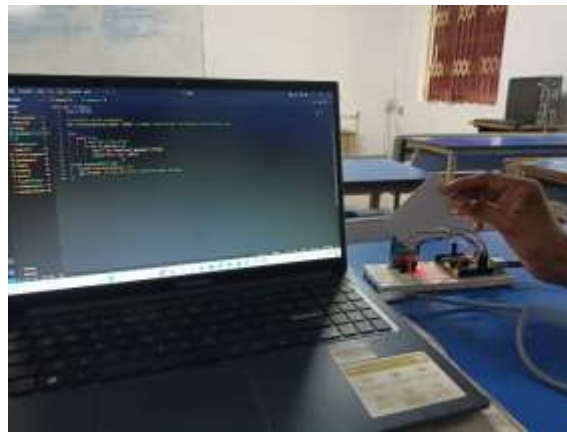
Include this to form the framework more open.

## VI. Experimental Results



**Figure 6.1**

The above image contains the total structure of the project.(RFID module with Arduino). In this system the RFID module is directly connected to the Arduino. The Arduino gives the 5V power supply to the module. Then the other pins of the RFID module should be connected respectively.



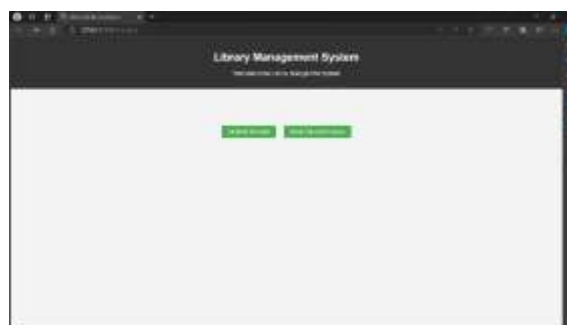
**Figure 6.2**

This image contains the information of the code structure of the project. This system is fully based on the python flask framework. particularly the above image represents the pyserial module program. The pyserial module is used to get the output of the rfid id reader through the port of the system



**Figure 6.3**

The above image represents the tracked records of the user. We maintain separate database for the user. Whenever the user logs into the reader the information are directly put into the database. And the values updated at the real time accordingly



**Figure 6.4**



**Figure 6.5**

This image represents the total records in the webpage. It will contain the totalbook information in that webpage. The totalbooks page also have the separate database for storing the information.





**Figure 6.6**

## VII. Conclusion

The displayed venture constitutes a strong and user-friendly library administration framework, joining frontend, backend, and database components successfully. Utilizing HTML, CSS, and JavaScript, the frontend offers a outwardly engaging and natural interface for clients to perform different assignments such as including books, following records, and seeing client intelligent. In the mean time, Python with the Carafe system serves as the backend, encouraging consistent communication with the MySQL database for putting away and recovering book data and client records. Through energetic substance era, the framework guarantees real-time information overhauls and upgrades client involvement. With its versatile design and comprehensive usefulness, the extend illustrates a effective usage of a present day library administration framework custom fitted to meet desires of directors and clients alike.

## VIII. References

- [1] B. Q. Yuan, "Analysis and Design of RFID Security Protocol in Internet of Things," M.S. thesis, Beijing Jiaotong University, China, 2016.
- [2] Z. J. Tang, "Research on Key Technologies of Campus Security Internet of Things," Modern Vocational Education, no. 25, pp. 140-141, Sep. 2016.
- [3] Z. J. Guo, "Design and Security Analysis of Intelligent Campus Card Information Management System," M.S. thesis, Huaqiao University, China, 2017.
- [4] Z. J. Guo, "Design and Security Analysis of Intelligent Campus Card Information Management System," M.S. thesis, Huaqiao University, China, 2017.
- [5] J. Kaur, K. Kaur, "A fuzzy approach for an IoT-based automated employee performance appraisal," Computers Materials & Continua, vol. 53, no. 1, pp. 24-38, Jan. 2015.
- [6] S. L. Ma, Z. D. Liu, "Application of Internet of Things Technology in Intelligent Campus," XInternet of Things Technology, vol. 2, no. 6, pp. 68-69, Jun. 2012.
- [7] S. Anandhi, R. Anitha, V. Sureshkumar, "An RFID Cloud Authentication Protocol for Object Tracking System in Supply Chain Management," in Digital Connectivity – Social Impact, Springer Singapore, 2016, pp. 247-256.
- [8] Y. C. Wu, N. Li, "Design and Implementation of Intelligent Campus Security System," Internet of Things Technology, vol. 3, no. 8, pp. 79-81, Aug. 2013.
- [9] Y. H. Cao, A. Li, L. Tang, "Research and design of a smart crosslayer security solution for campus card," Journal of Beijing Institute of Petro-Chemical Technology, vol. 20, no. 2, pp. 29-31, Jun. 2012.
- [10] Z. H. Zhou, "Intelligent Campus Network Based on RFID and Campus Card," Electronic world, no. 15, pp. 163, Aug. 2014.
- [11] D. C. Ranasinghe, D. W. Engels, P. H. Cole, "Security and privacy solutions for low-cost RFID systems," in Intelligent Sensors, Sensor Networks and Information Processing Conference, Melbourne, Vic., Australia, 2004, pp. 337-342.
- [12] Z. Cao, "Study on security related to RFID technology in Internet of things," M.S. thesis, Xidian University, China, 2013.
- [13] B. Zhang, "RFID system security architecture and key technology research," M.S. thesis, University of Electronic Science and Technology of China, China, 2014.
- [14] J. W. Shen, J. Ling, "An improved ultra-lightweight RFID authentication Protocol," Computer Applications and Software, vol. 32, no. 2, pp.304-306, Feb.2015.
- [15] S. Anandhi, R. Anitha, V. Sureshkumar, "An automatic RFID reader-to-reader delegation protocol for SCM in cloud computing environment," Journal of Supercomputing, vol. 74, no. 7, pp.3148- 3167, Apr. 2018.
- [16] Y. Zheng, "Application of wireless connection based on hash function of RFID security authentication protocol," M.S. thesis, Jilin University, China, 2015.