IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 3, March 2020

Digital e-Learning Library System using loT Networking

Mr.D.Vinod M.E[1], Mr U.Boopathi M.E[2]

Assistant Professor, Dept of Computer Science and Engineering, S.M.K Fomra Institute of Technology, Chennai[1]

Assistant Professor, Dept of Computer Science and Engineering, S.M.K Fomra Institute of Technology, Chennai[2]

Abstract: Library staff handle a tedious task involve sorting, lending, returning, tagging, eyeing of books. In addition, library users encounter problems for finding, borrowing, localising, renewing the borrowing, queuing, and so forth. To overcome these obstacles, this paper proposes a smart library management system based on an loT networking. Using low-cost passive tags in libraries reduces the cost of modernisation significantly. As such, integrating loT architecture into library management system makes both the library users and staff's task easy, smart, convenient, and practical.

Keywords: loT Networking; loT networking; information engineering; software engineering; UML; database management; library system; automation; distributed system; tracing; tracking.

• Reference to this paper should be made as follows: Younis, M.I. (2012) 'SLMS: a smart library management system based on anlot Networking technology', Int. J. Reasoning-based Intelligent Systems, Vol. 4, No. 4, pp.186–191.

I. INTRODUCTION

Radio Frequency Identification (lot Networking) technology is in use since the 1970s. lot Networking is a form of automatic contact-less data capturing technique using radio frequency electromagnetic waves. AnloT Networking system is comprised of a transponder, reader and host computer (software application) which is usually connected to a distributed database. Readers are units that usually placed in certain places to recognize the transponders (Alani et al., 2009). loT Networking tags can be active, semi-passive and passive. A tag is a small device that can store information. Active tags contain batteries which power their internal circuits and transmit signals using battery power to anloT Networking reader within a range of 100 feet. With additional batteries, this range can be increased to 300 feet. Semi-passive tags have internal batteries which are used only to power its internal circuit. Passive tags don't have internal batteries. Semi-passive and passive tags draw their power to broadcast a signal from the reader. loT Networking reader is a device that can receive and transmit a radio signal.

It is built to encode data stored in the tag's microprocessor. Because of the higher cost, active and semi-passive loT Networking tags are used for valuable long-range asset tracking. In contrast, passive tags are cheaper and provide short ranges. When a passive reader tries to readdata from a tag, its antenna emits electromagnetic energy which is received by passive tag's antenna. The tag's microchip uses this energy to emit a radio signal using the tag's antenna. The passive reader receives and interprets this signal and passes interpreted information to a computer network. This computer network can provide information about the items carrying the passive tag and their present status to a computer user (Robles and Kim, 2010). Wide scales of plications are well studied in the literatures (Zhou et al., 2008; Ali and Hassanein, 2009; Behera and Kushwaha, 2009; Idris et al., 2009; Nambiar, 2009; Zhou, 2009; Ali et al., 2010).

These applications involve: supply chain, production and manufacturing, healthcare and medical, construction, hospitality, parking management, transportation, attendance, tracing and tracking, etc. As so, loT Networking becomes cost effective as the price of individual tags reduces with volumes manufactured, other opportunities will be enabled as the technology develops (Zhou et al., 2008). Building from earlier work, this paper proposes the use of the loT Networking in developing a smart library management system. Taking care of books from theft, making them available to the book readers and checking their availability remotely, tracing and tracking the persons who borrowed the books are important tasks. Most of the library staff's time is spent in recording information of incoming and outgoing books. Using loT Networking in libraries saves library staff's time by making their tasks with high degree of automation.

An establishment that uses loT Networking library management saves a book reader, precious time that he would have been spent, waiting for his turn in a queue for borrowing, returning, or renewing the borrowing of a book, and even searching the availability of the books in the library. loT Networking tags manufacturers are trying to bring tag prices below 10 cents per tag (Harrop, 2010). Hence, integrating loT Networking into library management system makes both the library users and staff's task easy, smart, convenient and practical. Motivated by such a goal, this paper proposes the use of the loT Networking in developing a smart library management system (SLMS). The rest of this paper is organized as follows. Section 2 gives the loT Networking library system specification. Section 3 gives the architectural design. Finally, Section 5 states our conclusion.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 3, March 2020

II.SLMS SPECIFICATION

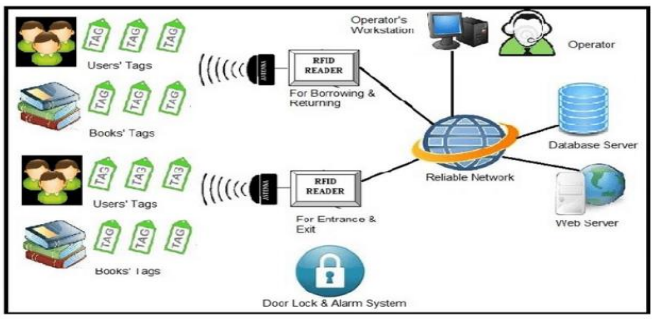
The SLMS features are stated as follows:

- Only authorized persons can enter the library.
- If an un-borrowed book outgoes from the library, an alarm system will start immediately. Next, the person in charge will take an appropriate action.
- The user should go to the borrowing counter, identify himself to the operator. The operator enters the books to be borrowed to the system that is, making the status of these books as borrowed. As such, when the user goes outside the library no alarm will be issued.
- Similarly, when the user wish to return the books that he has already borrowed, no alarm will be issued in the entrance door since these books are registered as borrowed. The user should go to the borrowing counter, identify himself to the operator.The operator enters the books to be returned to the system that is, making the status of these books asreturned(i.e.unborrowed). As such, when anyone goes outside the library carrying these books, the alarm will be issued.
- The users can track the availability of the books remotely.

III.SLMS DESIGN

The SLMS consists of: users, operators, books, identification cards (tags), identification devices (readers, each reader attached to an antenna), door lock with alarm, and an operator(s) workstation(s) (PC) contains the system's modules and connected to a database server that can be accessed through a web server, and a reliable network that is shared by all system's parts, as depicted in Figure 1. Here, each user has unique identification (user_id). This user_id is written on a passive tag (user_tag). Similarly, for books, each book is attached with a passive tag (book_tag). The PC is connected to the readers and door lock through a reliable network. Two sets of readers (each set can be one or more) are used. One is attached to the main entrance of the library. The other is used for borrowing/returning purposes.

Figure 1:The smart library management system (see online version for colours RDIF/loT.



A.USER ENTRY MODULE:

The user entry module is used for entering the name of the user, identity, affiliation, the maximum period of borrowing, the maximum number of books allowed to be borrowed, the username and password to access the web site, etc. The construction of the user entry table in the database is shown in Table 1.

A. Table 1

Construction of the 'User Entry' table

- Name
- Identity
- Affiliation
- Max period of borrowing
- Max no. of books
- Username
- Password

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319-5940
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 9, Issue 3, March 2020

B.BOOKS ENTRY MODULE:

The books entry module is used for entering the title of the book, a masking bit, and other information (author(s), publisher, identity, year, request for borrowing by users, the location of the book, etc). The purpose of the masking bit is to monitor whether the book inside the library and does not borrowed (true) or outside the library (false, that is, the book is borrowed). Initially, the masking bit is activated (set to true). The construction of books entry table is shown in Table 2.

Table 2

Construction of the 'Books Entry' table

- Title
- Masking bit (true/false)
- Authors
- Publisher
- Identity
- Year
- Request for borrowing

C.BOOKS BORROWING MODULE:

The books borrowing module is used by the library operator for borrowing books operation. This module works as follows. When a user presents his/her tag, the module identifies the user and ask him to present the books. Next, the module receives the detected book_tags from the reader. After that, the module issues a query to the database to determine the legibility (whether or not there is a request for borrowing the book from other users). If the borrowing operation is allowed, the module displays the name of each book and its legitimacy for borrowing to the operator through graphical user interface (GUI). The operator selects the allowed books and changes their status to be borrowed (by updating the masking bit for each book to be borrowed in the database to false). The use case of the book borrowing module is shown in Figure 2

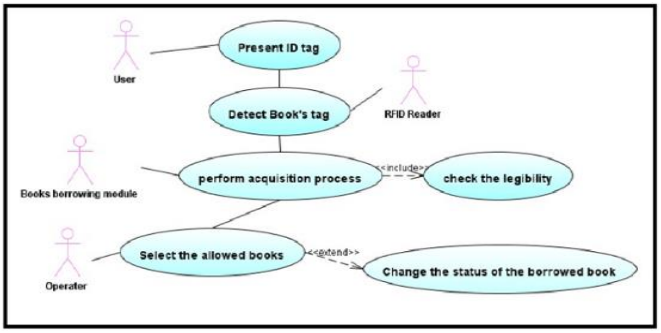
D.BOOK RETURNING MODULE:

The books returning module is used by the library operator for returning books operation. This module works as follows. When a user presents his/her tag, the module identifies the user and ask him to present the books. Next, the module receives the book_tags from the reader. After that, the module issues a query to the database to determine the borrowing period (whether or not the returning books within the allowed period). The module displays a GUI that issuing a penalty in case that the maximum period of the allowed borrowing is exceeded. Finally, the operator activates the masking bits (by updating the masking bit for each book to be returned in the database as true). The use case diagram of this module is depicted in Figure 3.

E.BOOKS LOCALISATION MODULE:

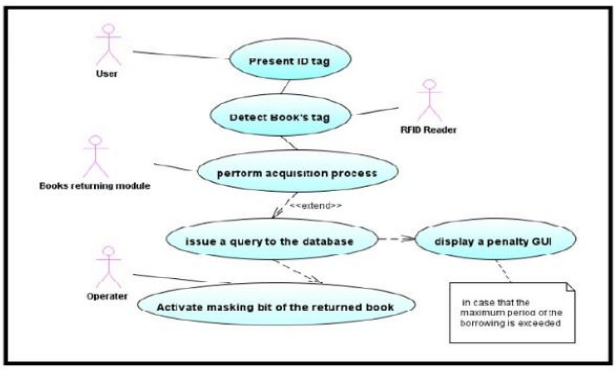
The books localisation module enables the library staff to handle sorting of the returned books. The operator presents the book (book_tag) to the reader, and then the module receives the book identity, queries the database, retrieves the location (floor, shelf) from the database. Finally, displays the location of the book to the operator. The use case diagram of this module is shown in Figure 4.

• **Figure 2:** The use case diagram for the books borrowing module (see online version for colours RDIF/loT)



IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319-5940
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 9, Issue 3, March 2020

Figure 3: The use case diagram for the books returning module (see online version for colours RDIF/loT)



*F.*DOOR LOCK MODULE:

The door lock module controls the person entrance to the library. When an authorised person (user, operator) presents his/her tag, the loT Netorking reader detects the presented tag and sends the identity to the main server through the network. After receiving the detected identity, the door lock module queries the database and retrieves information regarding the authorisation of the person during this time. If the person is authorised, the module issues a command to open the door, otherwise; the door is locked. The use case diagram for this module is shown in Figure 5.

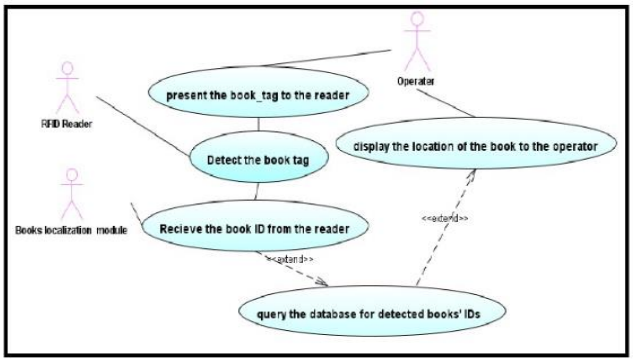
G.BOOKS MONITORING MODULE:

The books monitoring module is used to track the books at the EXIT door of the library (can be the same as the entrance door). Here, the module continuously reads the book-tags, queries the database, checks the masking bits of the books. If any masking bit is active (true), then the module starts the alarming system, and closes the exit door. The alarming is continuing until the operator removes the alarming state by issuing ignore command to the book monitoring module. The use case of this module is shown in Figure 6.

H.REMOTELY ACCESS MODULE:

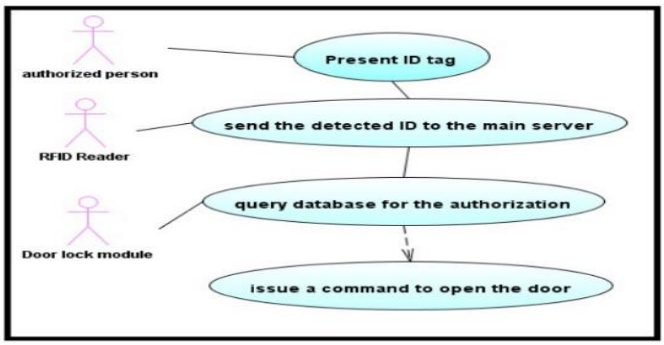
The remotely access module is used by the user to access thelibrary system remotely through WWW. Here, the user requires to login through his/her user name and password. After login to the system, the user can search for a certain book, check its availability, renewing the borrowing period (in the case that there is no request to borrow this book), and so forth. The use case diagram of this module is shown in Figure 7.

Figure 4 The use case diagram for the books localization module (see online version for colours RDIF/loT)

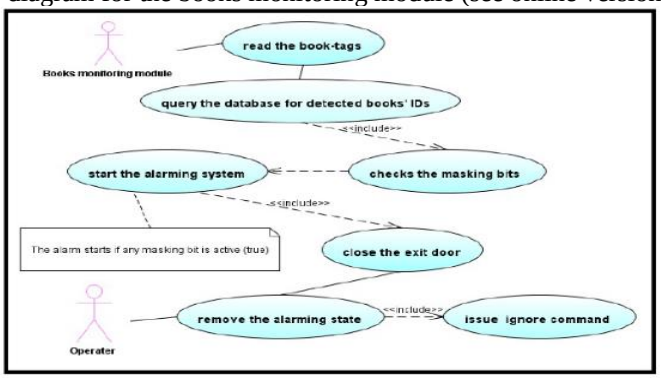


IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319-5940
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 9, Issue 3, March 2020

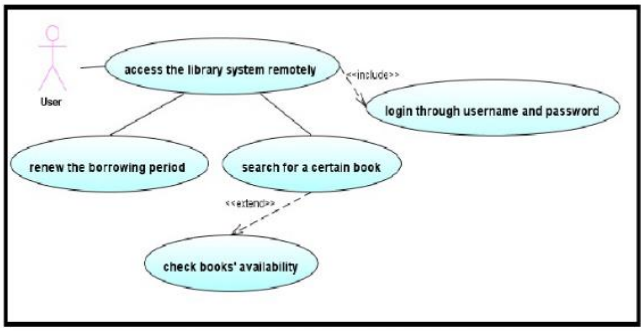
Figure 5 The use case diagram for the door lock module (see online version for colours RDIF/loT)



• Figure 6 The use case diagram for the books monitoring module (see online version for colours RDIF/loT)



• Figure 7 The use case diagram for the remotely access module (see online version for colours RDIF/loT)



PROBLEMS AT NETWORK LAYER

•IP, especially IPv6, is engineered for today's Interneten-vironment with desktops and laptops as end devices communicating with wire-connected servers. In this section wediscuss which properties of the hosts and the networks currently assumed by IP no longer exist in the IoT world, andwhat have been done to tailor IP and its companion protocols to fit them into the IoT environment.

• **Mesh network routing:**
The topologies of typical IoT networks fall into two categories, as is explained in star topology and peer-to-peer (a.k.a., mesh) topology. The routing configuration is straightforward on a star network where the hub node (e.g.,a Bluetooth master node) can act as the default gateway for the peripheral nodes. However, the deployment scale of the start topology is limited by the signal coverage of a single hub node, making it unsuitable for application scenarios that cover a wide area. The mesh topology enables larger coverages by having the nodes relay the packets for each other. Since coding the whole network is too expensive,a routing mechanism is necessary for implementing ecient packet forwarding inside the mesh.

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 3, March 2020

•Security:
Security is critical to IoT applications due to their close interaction with the physical world. The mainstream security model of IP-based applications is channel-based security (e.g., TLS and its datagram variant DTLS, which provides a secure communication channel between the resource server and the client.

IV.COMPARISON

NFC vs loT Networking vs bluetooth vs wifi-difference between NFC,loTNetworking,bluetooth and wifi
Table 3:

Specifications	NFC	RFID	Bluetooth	wifi
Maximum Coverage Range	10cm	3meter	100meter	100meter
Frequency of operation	13.56MHz	varies	2.4GHz	2.4GHz,5GHz
Communication	2-way	1-way	2-way	2-way
Data rate	106,212,424Kbps	varies	22Mbps	144Mbps
Applications	credit card related payments, e-ticket booking	EZ-Pass, tracking items	communication between phone and peripherals	wireless internet

V.CONCLUSION

IoT networks represent a new type of applications where the IP architecture cannot easily fit in without signicantmodication to the protocol stack it is an important part of the smart library management system. This paper proposed the integration of the passive loT Networking technology into a library management system. This integration makes both the library users and staff's task easy, smart, convenient, automated and practical. The proposed system enables the library staff to handle sorting, lending, returning, tagging, eyeing of books in such an easy and convenient manner. In addition, library users can find, borrow, localise, renew the borrowing period of books easily and remotely using the proposed system, Furthermore, the suggested door lock module ensures the security of the library and prevents books' thefts effectively. The design of SLMS is open and modular that can be extended for additional functionalities and upgrading purposes.

VI.SCOPES

- Connectivity and Communication
- Data Sharing
- Hardware Sharing
- Internet Access
- Internet Access Sharing
- Data Security and Management
- Performance Enhancement and Balancing
- Entertainment

REFERENCES

[1]. Alani, M., Ismail, W. and Mandeep, J. (2009) 'Active loT Networking system and applications', Electronics World, Vol. 115, No. 1877, pp.22–24.
[2]. Ali, K. and Hassanein, H. (2009) 'Passive loT Networking for intelligent transportation systems', Proceedings of the 6th IEEE Consumer Communications and Networking Conference (CCNC 2009), Las Vegas, NV, USA, pp.536–537.
[3]. Ali, M.F.M., Younis, M.I., Zamli, K.Z. and Ismail, W. (2010) 'Development of Java based loT Networking application programmable interface for heterogeneous loT Networking system', The Journal of Systems and Software, Vol. 83, No. 11, pp.2322–2331.
[4]. Behera, S. and Kushwaha, R.K. (2009) 'loT Networking based people management system using UHF tags', Proceedings of the 2nd Annual Seminar of CDAC Noida Technologies (ASCNT 2009), Noida, India, pp.231–238.
[5]. Harrop, P. (2010) 'Printed loT Networking in 2010', Printed Electronic World, January. Available online at:http://www.printedelectronicsworld.com/articles/printed-loTNetworking-in-20100001961.asp?sessionid=1
[6]. Idris, M.Y.I., Tamil, E.M., Razak, Z., Noor, N.M. and Km, L.W. (2009) 'Smart parking system using image processing techniques in wireless sensor network environment', Information Technology Journal, Vol. 8, No. 2, pp.114–127.
[7]. Nambiar, A.N. (2009) 'loT Networking technology: a review of its applications', Proceedings of the World Congress on Engineering and Computer Science 2009 (WCECS 2009), San Francisco, USA, pp.1253–1259.
[8]. Robles, R.J. and Kim, T. (2010) 'Review: context aware tools for smart home development', International Journal of Smart Home, Vol. 4, No. 1, pp.1–12.
[9]. Zhou, W. (2009) 'loT Networking and item-level information visibility', European Journal of Operational Research, Vol. 198, No. 1, pp.252–258.
[10]. Zhou, G., Jiang, P. and Zheng, M. (2008) 'Design ofanloT Networking-based manufacturing data tracking system inplant production', Proceedings of the 1st International Conferenceon Intelligent Robotics and Applications (ICIRA 2008), Wuhan, China, pp.688–696

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Vol. 9, Issue 3, March 2020

BIOGRAPHIES

D.Vinod received the bachelor's degree in 2010 in computer science from Anna University in Asan Memorial College of Engineering and Technology. He finished his master's degree in 2012 in computer science from Anna University in S.A. Engineering College. His research interests include design and analysis of algorithms concerning wireless networks, network security, Internet of things, etc. Topics include coverage problems in sensor network, routing, top-k query, capacity (throughput) study, diagnosis of WSN, and so on. He is a member of the IEEE.

U.Boopathi received the bachelor of engineering degree in 2004 in computer science from Bharathidasan university in erode sengunthar engineering college. He finished his master's degree in 2016 in computer science from Anna University in Sriram Engineering College. His research interest topics include cyber security, artificial intelligence, data analytics etc. Topics include security analysis in Cloud computing, block chain and keyword algorithm etc.