ZIBELINE INTERNATIONAL PUBLISHING

ISSN: 2590-4043 (Online)
CODEN: AEMCDV

Acta Electronica Malaysia (AEM)

DOI: http://doi.org/10.26480/aem.01.2022.04.06

RESEARCH ARTICLE

AN INTEGRATED CAMPUS RADIO FREQUENCY IDENTIFICATION SYSTEM ON CLOUDS ANALYSIS FOR IMPROVED SECURITY

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ARTICLE DETAILS

Article History:

Received 10 September 2022
Revised 13 October 2022
Accepted 19 November 2022
Available online 23 November 2022

ABSTRACT

Using the most recent technologies, several steps had been done to improve campus security systems. Campuses primarily use Radio Frequency Identification (RFID) technology for attendance tracking, with additional uses for activity monitoring and personal security. This research study suggests a framework of RFID integrated solutions for improved campus IT security, including tracking student valuables, tracing campus IT assets, preventing exam paper leakage, and issuing legitimate certificates. The use of RFID technology in current campus applications must be broadened where RFID technology specific performance concerns may occur in order to fulfil the expanding requirements of campus security system. Due to managing and handling data banks generated by RFID tags, which further requires enhancing the entire IT infrastructure, it is challenging to design RFID enabled scalable and reliable applications. This is problematic for Small and Medium Enterprises (SME), such as academic institutions, who have limited budgets. Therefore, campuses must embrace the idea of adopting cutting-edge cloud computing due to its both technological and financial benefits for supporting RFID technology in order to advance RFID campus implementation and develop internet of things-based applications.

KEYWORDS

Internet of Things, Cloud Computing, RFID

1. INTRODUCTION

Security is the state of offering protection against, or resistance to, any threat or danger that can be applied to any valuable or vulnerable asset. Because it has an impact on both society and students, academic institution security is crucial. The system should offer high security to firmly prevent disciplinary actions and decrease criminal activity.

This study suggests a system that makes use of RFID and aids in providing security at various levels for students and visitors, for which use of RFID technology needs to be increased. Due to the flexibility of e-data, low efficiency, and large amounts of data created, (Chetna and Gupta, 2010) concluded that the proliferation of RFID technology may cause issues. More infrastructure (hardware and software), costs, and services come with expanded deployments. as well as storage spaces. Second, professional services that comprise consulting, architecture design, platform selection, integration, installation, and management make up the majority of the cost of using RFID technology.

In this study paper, we suggest an architecture framework to integrate cloud computing, which will increase scalability and improve RFID system performance, rather than raising funds for expanding IT infrastructure and adopting professional services to meet changing system needs. Security measures will be put in place for campus IT assets, students' valuables, exam paper leakage, and the issuance of genuine certificates with the goal of enhancing and adapting current campus RFID systems and designing contemporary reliable, accurate, fast, and scalable systems based on cloud computing.

2. TECHNOLOGY OF RFID

Each tag used in RFID is affixed to an object and has a memory location where a special identification code is stored. An RFID reader can read many tags at once without physical touch or an optical link, and it can write data to multiple tags in a matter of milliseconds without the need for human involvement. According to (Yangi and Zhangi, 2010), RFID tags have a lifespan of more than ten years and can be reattached to different objects. Wireless RFID readers are necessary for mobility reading or identification since RFID fixed readers cannot read things that move into or out of a defined area.

RFID has the ability to become ingrained in our environment, resulting in a setting that is aware of our presence and attentive to our needs. As an enabling technology, RFID enables the development of robust applications when paired with other technologies. Through a sophisticated technique of transmitting and acquiring data from RFID tags, embellishing data through a computerised programme running over a potent background system capable of handling overflow of data, RFID technology can manage huge items data. According to previous study, RFID technology is still in its early stages of development and is used in a variety of applications, including asset tracking, manufacturing, supply chain management, retailing, transportation, health care, entertainment, and academia (Chetna and Gupta, 2010). However, due to performance issues like limited computational capacity, inadequate resources, and other factors, it is not widely accepted. inadequate management of the data.

3. TECHNOLOGY USING CLOUD COMPUTING

Cloud computing is a type of computing that shares computer resources and services over the internet rather than relying on local servers or

Quick Response Code	Access this article online	
	Website: www.actaelectronicamalaysia.com	DOI: 10.26480/aem.01.2022.04.06

Cite the Article: Ipseeta Nanda, Rajesh De (2022). An Integrated Campus Radio Frequency Identification System on Clouds Analysis for Improved Security. *Acta Electronica Malaysia, 6(1): 04-06.*

individual devices to handle applications. Computing (computational resources) are available, dependable, and scalable over a cloud (the Internet). Grid computing follows Because cloud computing is a new computer architecture based on the internet, stored data and applications are safely available everywhere. Applications that need more processing horsepower and storage space can be handled by cloud computing to retrieve data more quickly and securely while staying within budgetary limitations. Cloud computing is broadly categorised as Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS), and Infrastructure-as-a-Service by (Chetna and Gupta, 2010). (IaaS).

SaaS refers to the method of delivering any software programme over a web platform, often using a browser.

PaaS stands for platform as a service, and it refers to a platform that allows users to construct applications, interfaces, databases, storage, and testing. With a membership fee or for free, it enables the creation of enterprise-class applications for local or on-demand use.

Basic computing resources like disc space, storage, and servers are made available as on- demand services thanks to IaaS. It enables remote access, the deployment of personalised applications, and virtual server access. Because data generated by RFID tags applied to every piece of IT equipment, student valuables, and exam papers can now be processed and stored more effectively thanks to cloud computing, the campus RFID application that is already in place can be expanded in order to implement a campus security system. Combining RFID technology with cloud computing enables the creation of contemporary systems that are scalable, dependable, and effective. System development is reduced by cloud computing, operating and management expenses.

4. PROPOSED ARCADICULAR

This study suggests an architecture for fusing cloud computing with the already-existing RFID technology in Fig. 1 in order to create an application that is both efficient and scalable enough to meet our needs, such as supplying security in diverse contexts. RFID and cloud computing enable the development of the internet of things. The reading of RFID tags will produce a large amount of data, for which cloud computing will be more useful. The campus RFID system's current architecture has been updated and coupled with cloud computing so that the new architecture is scalable, effective, and dependable. The sole piece of client-side software needed to access various apps and ease or lower the implementation costs that are a major barrier to the widespread use of RFID systems is the browser.

Front end and back end are the two primary elements of the proposed architecture, which also includes the following components.

4.1 RFID Subsystems

RFID readers and RFID tags are the two primary elements of RFID technology. Coiled antennae on the reader are used to transmit and receive radio frequency data to and from the tags. A microchip that holds data, an antenna, and a carrier—to which the chip and coil antenna are attached—make up the tag mounted. According to recent study, the magnetic field created by the reader and tag's coiled antenna is utilised to power the tag's microchip, which reflects back its own signals to transmit data (Daniel and Rajni, 2010).

4.2 Middleware for RFID

A software layer called RFID middleware sits between reader devices and cloud-based commercial applications. For accessing cloud- based apps, RFID middleware is typically installed in computers that are linked to the internet. These apps can coordinate on a higher layer by sending and receiving RFID events produced by RFID middleware through a communication channel. Three primary parts make up RFID middleware, which also makes the process of developing apps easier.

4.3 Interface for Applications

Applications can request data and carry out actions in one or more reader devices with the help of the application interface, which offers the necessary tools.

4.4 Activity Layer

The reader-generated event cycles are managed and written by the event layer. When sending reports, event layers must permit data dissemination that may be synchronous or asynchronous with varying delay. Data is transmitted to the higher layer of the architecture, where it is consumed, after the massive amount of tags have been filtered and aggregated.

4.5 Device Administration

Device management is in charge of organising and configuring reader device activities, as well as checking reader status and reporting any issues. It can also create a logical framework in accordance with the requirements of business applications through device management.

4.6 Utilizing the Cloud

RFID data is filtered, processed, and stored in accordance with the needs of the commercial programme created. Cloud computing services will be employed as shown below in the suggested architecture.

4.7 Software-as-a-Service (SaaS)

Online business software that may be accessed through a web browser. The application specifies its rules for processing, storing, and filtering RFID data. This business application is extremely dependable, easily scalable, and accessible from anywhere in the world. Then, this data is handled on a platform appropriate to the application and saved on a particular server in the cloud.

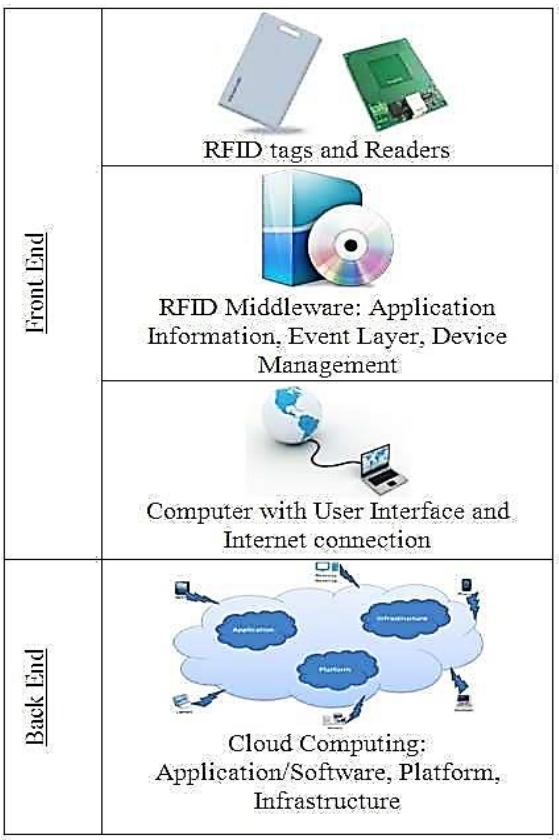

Figure 1: Proposed architecture for RFID and cloud computing

4.8 Platform-as-a-Service (PaaS)

The creation and deployment of commercial applications on the cloud are made possible by the availability of all the necessary tools, libraries, underlying software, and hardware over the internet. It offers all the advantages, including facilitating developer community interaction, team collaboration, web service connection, database integration, security, scalability, storage, and state management.

4.9 Infrastructure-as-a-Service (IaaS)

The server manages the network and traffic. The networked resources are able to communicate with one another thanks to middleware and protocols. To store all the RFID tag data generated from users, assets, test papers, and certificates in this situation, a large amount of storage space is needed. As a backup, cloud infrastructure creates copies of all the data so that the central server can access it as needed. Low priority RFID tag data that was previously lost due to storage issues will be saved up and kept, then used with data mining tools in the future to reach more conclusive findings.

The adoption of RFID systems will be aided by cloud computing, particularly by small and mid- size businesses who have grown weary of the advantages and applications of the technology due to the demanding

requirements of adopting new infrastructure and services. The proposed design currently offers a method to expand the campus RFID system's computational capabilities by adding other technologies in the future in accordance with demands and requirements.

5. Planted Security Modules

In the campus, everyone is using an RFID card. Currently, RFID readers may be found at all campus entrances, exits, and within buildings like classrooms, cafeterias, playgrounds, and libraries.

5.1 Security of Assets

Property Security For accurate asset location tracking to be integrated with other business management tasks, RFID is successfully employed in asset management systems. According to a study, RFID location traceability system provides managers with real-time information on the whereabouts of assets and their security status in the event that predetermined security requirements are broken (Yang and Liu, 2010).

Each item on campus will have an RFID tag, which RFID scanners will read when it moves from one location to another. The person moving the asset must obtain the asset issued to his or her ID card first. For instance, a student wants to take out an OCR equipment from the IT lab and a book from the library. The librarian will issue the book to the student's ID card so they can take it home, and the lab assistant will issue the student's RFID card an OCR device so they may use it on campus. The student may then bring both items to any campus location, where the student RFID card and object RFID chip will be read each time they enter or exit. If a student tries to leave the school, the security system will sound an alarm, keeping the OCR device inside the campus building while allowing the student to bring a book with them. Administrators are always able to follow the whereabouts of a college asset inside a campus building.

5.2 Student Security is Important

The possibility of theft has increased along with the value of students, which has a negative impact on society and pupils. RFID technology can be particularly beneficial for reducing frequent campus thefts, (Chen et al., 2011).

The proposed architecture allays the worry that each student's valuable will be equipped with an RFID tag either inside the body or in a concealed location. Each valued item's RFID tag will be matched with the student's RFID card. If a student is carrying assets around campus, an RFID reader will detect the RFID tags on their belongings and the equipment they are carrying. If these tags are matched, the system will allow for easy mobility; otherwise, an alarm system will be set off. Any device that a student forgets at any location can be tracked online by locating it on the campus map.

5.3 Security of Exam Paper

Since there have been tests, there has always been exam cheating. Exam board Edexcel, based in the UK, started using an electronic tagging system in 2007 to stop exam papers from being stolen and catch fraud. Out of 620000 exam papers sent to various institutions and universities, there were 70 security breaches. Prior to the joint test board policing the system to adhere to tight protocols to ensure security, papers were still missing, stolen, sold, or distributed online. "Incidents involving stolen papers are exceedingly unusual, but the potential impact is huge," said Edexcel's managing director Jerry Jarvis in a BBC news interview. Each bundle of exam papers will have a radio frequency tag attached to it that will save information on the number of papers, their origin, and their destination. This will enable quick checks and make it simpler to identify tampered packages. Exam question papers that are wrapped, tagged, and double-checked in the exam room before opening the package can be protected against theft using a similar RF tagging technique. The administration will be informed of any discovered manipulation.

5.4 Secured by an Authentic Certificate

In order to combat document fraud and expedite the issuance and attestation processes, 30 institutions in the United Arab Emirates and the Ministry of Higher Education and Scientific Research have implemented radio frequency tagging technology for documents supplied to students. These RF chips hold information about the document's issuance date and validity, which the attestation department can use to verify the legitimacy of the document without having to contact the university that issued it.

These chips, which have an 8kb memory size, 13.56MHz frequency, and ISO 14443A standards, are useful for saving student data. This is beneficial for the provision for revocation or the issuance of additional electronic certificates. According to a study, all pertinent information, including student photos and issuing authorities' signatures, can be recorded and maintained (Mudraganam, 2009).

6. Contrast and Upcoming Work

In contrast to (Chetna and Gupta's, 2010) proposal, this one proposes new UMS security applications based on CC, such as asset security, exam paper security, and certificate authentication security, in addition to describing the RFID and CC architecture. While combining two technologies has many advantages, it also creates a new field of study for RFID security in cloud computing. The campus RFID system can be connected to the local police station via cloud computing for instant reporting or to call the police, fire department, or ambulance in the event of an emergency. It is possible to design an electronic exam box that will only open when two RFID cards are found together.

7. Conclusion

Only if its drawbacks do not prevent its acceptance will RFID technology streamline operational processes and make daily tasks easier. More processing power and storage are required by security modules, which can be affordably given via cloud computing. Midsize campuses can easily combine their current RFID systems with cloud computing services to improve system scalability and reliability.

Assuming there are no communication issues, cloud computing services will handle the majority of the system processing for finding valuables or RFID tags on campus, identifying theft, and data mining of RFID tag generated data, resulting in overall RFID system functionality.

The suggested Cloud RFID architecture framework points the way to more efficient RFID systems combined with cloud computing that enable ubiquitous computing.

References

Chen, Y., Y. Wang, X. Li and G. Li, 2011. The design and implementation of intelligent campus security tracking system based on RFID and ZigBee. Proceedings of the Second International Conference on Mechanic Automation and Control Engineering, Jul. 15-17, IEEE Xplore Press, Hohhot, pp: 1749- 1752. DOI: 10.1109/MACE.2011.5987296

Chetna D. and J.P. Gupta, 2010. A cloud computing architecture framework for scalable RFID. Proceedings of the International Multi Conference of Engineers and Computer Scientists, Mar. 17-19, Hong Kong, pp: 1-4.

Daniel, O. and G. Rajni, 2010. Radio Frequency Identification (RFID) Technology: Gaining a competitive value through cloud computing. Int. J. Manage. Inform. Syst., 14: 5-5.

Mudraganam, C.S., 2009. Smart DEGREE from TCS to combat certificate malpractices. RFID J.

Yang, B. and P. Liu, 2010. Value added on integrated solution of RFID enhanced asset traceability system. Proceedings of the IEEE International Conference on Service Operations and Logistics and Informatics, Jul. 15-17, IEEE Xplore Press, Qingdao, Shandong, pp: 330-335. DOI: 10.1109/SOLI.2010.5551558

Yangi, F. and F. Zhangi, 2010. Research for applications of RFID in Chengdu and innovation designing based on TRIZ. Proceedings of the International Conference on Apperceiving Computing and Intelligence Analysis, Dec.17-19, IEEE Xplore Press, Chengdu, pp: 452-456. DOI: 10.1109/ICACIA.2010.5709939