

PI-RFID: INTEGRATED VEHICLE ACCESS ENTRY SYSTEM



UNIVERSITI TEKNIKAL MALAYSIA MELAKA



PI-RFID: INTEGRATED VEHICLE ACCESS ENTRY SYSTEM

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اونيورسيتي تیکنیکل ملیسيا ملاک  
This report is submitted in partial fulfillment of the requirement for the  
UNIVERSITY Bachelor of Computer Science (Computer Networking)

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2016

## DECLARATION

I hereby declare that this project report entitled

### **PI-RFID: INTEGRATED VEHICLE ACCESS ENTRY SYSTEM**

is written by me and is my own effort and that no part has been plagiarized  
without citations.


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(SITI NURAI SHAH BINTI KAMARUDDIN)



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I hereby declare that I have read this project report and found

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Bachelor of Computer Science (Computer Networking) With Honours.

SUPERVISOR :  DATE: 24/8/2016  
(DR.NURUL AZMA BINTI ZAKARIA)

## DEDICATION

To my beloved parent thank you for their endless support and always stay behind me all the time.

To my supervisor for encouraging, motivating and believing in me.



## ACKNOWLEDGEMENTS

Assalamualaikum Warahmatullahi Wabarakatuh and Greetings

Thanks God for the consent, Pi-RFID: integrated vehicle access entry system has proceeded smoothly and successfully.

I would like to express my sincere gratitude to the following person, my PSM supervisor, Dr. Nurul Azma Binti Zakaria for accepting me under her supervision for the Project Sarjana Muda. She helps to guide me and give support throughout the entire project. Without her help, I would be clueless on how to do this project.

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## ABSTRACT

This project about to develop of Pi-RFID: Integrated Vehicle Access Entry System use Raspberry Pi. Now days, the vehicles access entry is now carried out manually in many of institutions. In which, a security guard need to checking each incoming and outgoing vehicles. For this project, implement security the detection of RFID reader using Matric card to handle vehicle access entry that control by Raspberry PI. In this project, EXPLORE-NFC board is used as the RFID reader to handle vehicle access entry that control by Raspberry PI. This technology is based on radio waves that transfer data from the tag to a reader. With this project, the institutions must be a protected spot for all students and staff. What's more, this project made to keep any danger from outsiders who might bring problem for the institutions. Today, with the technological advance, the new steps should be taken to ensure effectiveness access entry vehicle at institutions.

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## ABSTRAK

Projek ini membangunkan Pi-RFID: Sistem Kemasukan Integrated Access kenderaan menggunakan Raspberry Pi. Pada masa kini, kemasukan kenderaan akses dijalankan secara manual dalam banyak institusi. Di mana, pengawal keselamatan perlu memeriksa setiap kenderaan masuk dan keluar. Untuk projek ini, pelaksanaan keselamatan pengesanan RFID reader menggunakan kad Matrik untuk mengendalikan kemasukan akses kenderaan yang dikawal oleh Raspberry PI. Dalam projek ini, EXPLORE-NFC papan digunakan sebagai pembaca RFID untuk mengendalikan kemasukan akses kenderaan yang dikawal oleh Raspberry PI. Teknologi ini adalah berdasarkan kepada gelombang radio yang memindahkan data dari tag untuk pembaca. Dengan projek ini, institusi perlu menjadi tempat perlindungan untuk semua pelajar dan kakitangan. Selain itu, projek ini dibuat untuk mengawal bahaya dari luar yang mungkin membawa masalah kepada institusi. Hari ini, dengan kemajuan teknologi, langkah-langkah baru perlu diambil bagi memastikan kenderaan kemasukan akses keberkesanan di institusi.



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## LIST OF ABBREVIATIONS

RFID	- Radio-frequency identification
GPIO	- General-purpose input/output
NFC	- Near Field Communication
P2P	- Peer-to-peer
LED	- light-emitting diode
OS	- Operating system
USB	- Universal serial bus
RAM	- Random access memory
LAN	- Local area network
UHF	- Ultra high frequency
USM	- Universiti Sains Malaysia
ILS	- Integrated library system
HDMI	- High-Definition Multimedia Interface
VGA	- Video Graphics Array
VNC	- Virtual Network Computing
ERD	- Entity relationship diagram
SPI	- Serial peripheral Interface
PC	- Personal computer
IT	- Information Technology
SSH	- Secure Shell
PHP	- Personal Home Page
SD Card	- Secure Digital Card
WPA	- Wireless Protected Access
WiFi	- Wireless Fidelity

## CHAPTER I

### INTRODUCTION

#### 1.1 Project Background

There are big numbers of students who are currently continuing their study in Malaysian institutions. The great security should be implementing in order to make sure institutions are the safe place for all students and to prevent any harm from outsider that can cause danger or problem to the institution. The most importance security measure that should be handled well is at the entrance. The entrance is the main medium to ensure the security of the institution is under control. There are many ways that can be implemented for this purpose. For example, administrative safeguard, physical safeguards, technical safeguards and etc.

Computing technology becomes more robust by combining with a variety of other technologies such as the use of Raspberry PI and Radio Frequency Identification (RFID). Nowadays, the use of Raspberry PI and RFID are increasing popular because there are many systems that can be developed with these technologies to facilitate daily activities. The Raspberry Pi acts as a small computer and RFID uses wave technology which stores identity in the scanner.

In this project, EXPLORE-NFC board is used as the RFID reader to handle vehicle access entry that control by Raspberry PI. This technology is based on radio wave that transfers data from the tag to a reader. EXPLORE-NFC is a high performance fully Near Field Communication (NFC) compliant expansion board for

the Raspberry Pi. Besides that, EXPLORE-NFC meets compliance with Reader mode, Peer-to-peer (P2P) mode and Card emulation standards. On the other hand, Raspberry PI is effectively used to store information about vehicles' owner that enters the institution. The small size makes for an easy-to-hide computer that sips power and can be mounted behind the display with an appropriate case. To implement security the detection of RFID reader using Matric card or Staff card to handle vehicle access entry that control by Raspberry PI.

## 1.2 Problem Statement (PS)

The vehicles access entry is now carried out manually in many of institutions. In which, a security guard need to check each incoming and outgoing vehicles. Vehicle sticker has become the medium to facilitate the work of security done. Therefore, inspection on each vehicle needs to be done to ensure that the vehicle is allowed to enter into institution or not. This system complicates the safety work at the entrance.

**Table 1.1: Problem Statement**

PS	Problem Statement
PS <sub>1</sub>	The vehicles access entry is now carried out manually in many of institutions. In which, a security guard need to check each incoming and outgoing vehicles

## 1.3 Project Question (PQ)

**Table 1.2: Project Question**

PS	PQ	Project Question
PS <sub>1</sub>	PQ <sub>1</sub>	How to study about Raspberry Pi, RFID reader and RFID Card Tag?
	PQ <sub>2</sub>	How to develop the system?
	PQ <sub>3</sub>	How to test the prototype in order to ensure the system functions properly?

#### 1.4 Project Objective (PO)

The objectives are the suggestion and solution for the problem faced. This project is built to enhance security control of vehicles access entry at the entrance institution academic. This project objectives (PO) are developed based on the previous section which is the project question (PQ) The Project Objective (PO) is shown below.

**Table 1.3: Project Objective**

PS	PO	Project Objective
PS <sub>1</sub>	PO <sub>1</sub>	To perform background study on Raspberry Pi, RFID reader and RFID Card Tag.
	PO <sub>2</sub>	To develop the system “Pi-RFID: Integrated Vehicle Access Entry System”
	PO <sub>3</sub>	To test the prototype in order to ensure the system functions properly.

#### 1.5 Project Scope

Now days, the vehicles access entry is now carried out manually in many of institutions. In which, a security guard need to checking each incoming and outgoing vehicles. For this project, implement security the detection of RFID reader using Matric card to handle vehicle access entry that control by Raspberry PI. The scopes of this project will cover items below:

a) Raspberry PI

The Raspberry Pi is an ease, card measured PC that fittings into a PC screen or TV, and usage a standard comfort and mouse. It is an able little device that enables people of all ages to explore figuring, and to make sense of how to program in dialects, for example, Scratch and Python. The Model B+ is the redesign of the principal Raspberry Pi. The Model B+ is perfectly suitable for use in schools it offers more flexibility for learners than the leaner Model A

or A+, which are more useful for embedded undertakings and endeavours which require low power, and has more USB ports than the Model B.

b) EXPLORE-NFC

EXPLORE-NFC is use as RFID reader. EXPLORE-NFC is a high performance full NFC consistent extension board that is perfect for use with the Raspberry Pi. EXPLORE-NFC meets consistence with Reader mode, P2P mode and Card emulation guidelines. The board includes a coordinated high performance radio wire and offers an adaptable SPI interface. It is completely supported by the NXP NFC Reader Library.

c) The platform of OS

Raspbian is a free operating system taking into account Debian streamlined for the Raspberry Pi equipment. An operating system is the arrangement of essential projects and utilities that make the Raspberry Pi run. Although of the fact that Raspbian is principally the endeavours of Mike Thompson and Peter Green, it has additionally profited extraordinarily from the eager backing of Raspberry Pi group individuals who wish to get the most extreme execution from their gadget.

## 1.6 Project Contribution (PC)

This project was developed to enhance the current security system with advances in technology, new measures should to be taken to guarantee that just vehicles with section permitted access at educational institutions. The after effects of the studies and perceptions might serious harm the security of educational institutions.

With this project, the institutions must be a protected spot for all students and staff. What is more, this project made to keep any danger from outsiders who might bring problem for the institutions.

The use of RFID technology is the best way to launch vehicles access entry at institutions. The use of this technology can resolve the entire problem faced. This is because by detecting the Matric or Staff card using RFID reader, all information about that vehicle and owner can be detected with quick and easy.

**Table 1.4: Project Contributions**

PS	PQ	PO	PC	Project Contributions
PS <sub>1</sub>	PQ <sub>1</sub>	PO <sub>1</sub>	PC <sub>1</sub>	Improve the study of Raspberry Pi, RFID reader and RFID Card Tag.
	PQ <sub>2</sub>	PO <sub>2</sub>	PC <sub>2</sub>	Build a new system with database.
	PQ <sub>3</sub>	PO <sub>3</sub>	PC <sub>3</sub>	New method and technologies in the access main entrance process able to work appropriately

### 1.7 Expected Output

Every problem has a method to solve. With this project, the problem for security guard to monitor the vehicle entry can be solved. The expected result from this project consists of a to perform background study on Raspberry Pi, RFID reader and RFID Card Tag. Besides that, the expected output for this project is to achieve the objective of the project which is to develop the system of "Pi-RFID: Integrated Vehicle Access Entry System". This system can detect the Matric card or Staff card using RFID reader followed by LED light will appear. Another expected output from this project is to test the prototype in order to ensure the system functions properly.

## 1.8 Thesis organization

This report will consist of seven chapters which is Chapter I: Introduction, Chapter II: Literature review, Chapter III: Methodology, Chapter IV: Design, Chapter V: Implementation, Chapter VI: Testing and lastly Chapter VII: Conclusion

### Chapter I: Introduction

This chapter will be discussing about introduction, project background, research problems, research objectives, project scopes, project significant, report organization and expected output.

### Chapter II: Literature Review

In this chapter, a related work or previous work of this project, analysis of the current problems or justification and proposed solution for further project. After that, all the sub-topics will be analyzed to make understanding of this project.

### Chapter III: Methodology

This chapter will be focusing on the methodology part where activities, steps and stages in completing this project are been exposed according to it sequence phase by phase for the category of analysis. This chapter also includes the milestone and Gantt chart.

### Chapter IV: Design

In this chapter, hardware and software requirements will be introduced together with the environment setup, architecture network design, experimental design and simulation design.