DESIGN AND IMPLEMENTATION OF SMART CARD-BASED PHYSICAL ACCESS ON RS-485 SERIAL MULTIPOINT NETWORK

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Abstrak

Kata Kunci :

Abstract

Keywords :

CHAPTER 1
OVERVIEW

1.1 Background

Providing simplicity and high level of security, smart card is now widely deployed for many applications such as identity card, loyalty card, parking card, medical healthcare card, wireless telecommunication SIM card, banking service card, and so on.

Smart card is nowadays also trusted to replace many traditional physical accesses such key, barcode card and magnetic card.

Somehow, there are still challenges on applying the smart card system in particular environments e.g. buildings. Using PC based smart card reader; it will spend a lot of effort and finance to handle many physical access points. Each point needs one network PC, one PC based smart card reader and the whole system requires an affordable network system that can communicate for about thousands meter long.

Using RS-485 serial multipoint network, I try to minimize and simplify the system. Many SC-WRUs are connected serially through RS-485 network while a single PC can handle hundreds of SC-WRUs. With its ability to deliver high-speed data for about 4000 feet without repeater, RS-485 network will be economic solution for the above problems.

Built on a single microcontroller, SC-WRU itself should have ability to read from many kinds of smart card type and to communicate over RS-485 communication protocol.

1.2 Objectives and Benefits

1.2.1 Objectives

- ✓ To build microcontroller based Smart Card Writer and Reader Unit (SC-WRU), which enables us to write into and read from many kinds of smart card type, memory and microprocessor cards with

synchronous or asynchronous transmission technique according to ISO 7816-1, 2, 3 and 4.

- ✓ To build a RS-485 serial multipoint network which enables us to attach some SC-WRUs.
- ✓ To determine the most suitable communication protocol applied to the network regarding constraints on microcontroller.

1.2.2 Benefits

Several applications are offered by the system. Three applications and their benefits are described below.

a. Door Lock
   - ✓ Eliminate traditional mechanic door lock

b. Security System
   - ✓ Allows higher security thanks to sophisticated database query and smart card system
   - ✓ The administrator can easily remove or add persons allowed to enter particular room

c. Presence Machine
   - ✓ Reduced administrative workload
   - ✓ Eliminate work on monthly changing printer ribbon and presence paper on traditional presence machine
   - ✓ Store up to thousands employee or student presence data
   - ✓ Easy to load and manage the data

1.3 Scope

This final project will cover the design and implementation of hardware and software that build the system. In the hardware section, we will discuss how to configure microcontroller as smart card writer and reader unit and RS-485 transceiver. As smart card writer and reader unit the microcontroller is obligated to have communication capability over ISO 7816 standard series protocol, while a

proposed protocol is going to be used to handle RS-485 serial communication between microcontrollers and server.

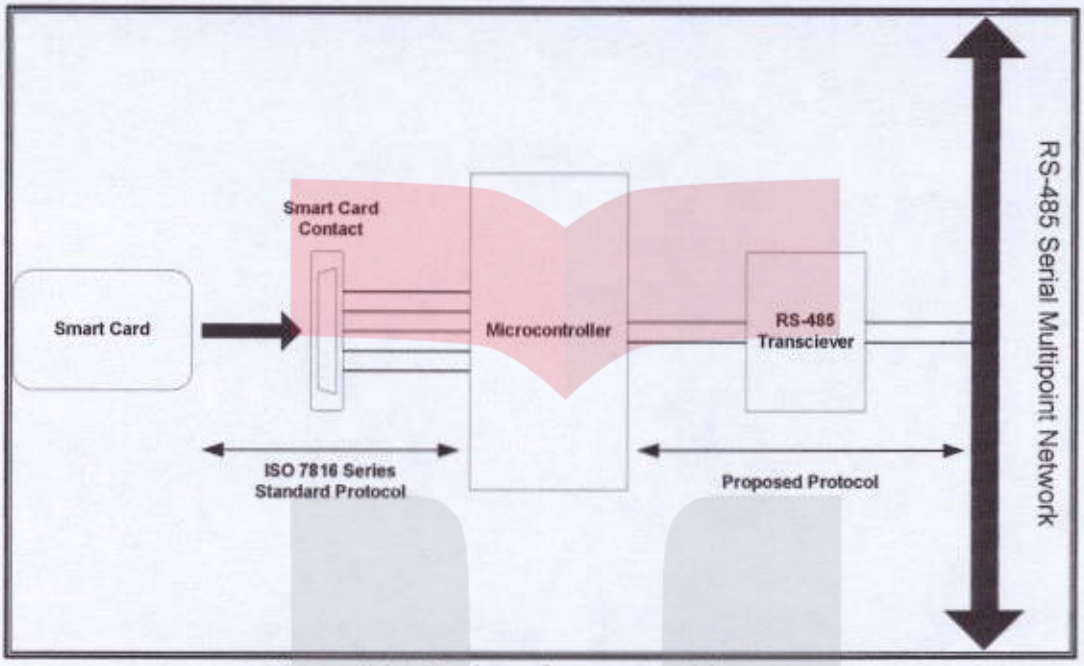

Figure 1.1 - Design of system architecture

The software section will cover relational database, executor program, assembly routine, and memory map of the smart card. Relational database and executor program are placed on server. The executor program will poll SC-WRUs, get data from them, compare the derived data and data in the database, make a decision, give SC-WRUs some assignments and store new data to the database if necessary. Here is the general diagram of the whole system:

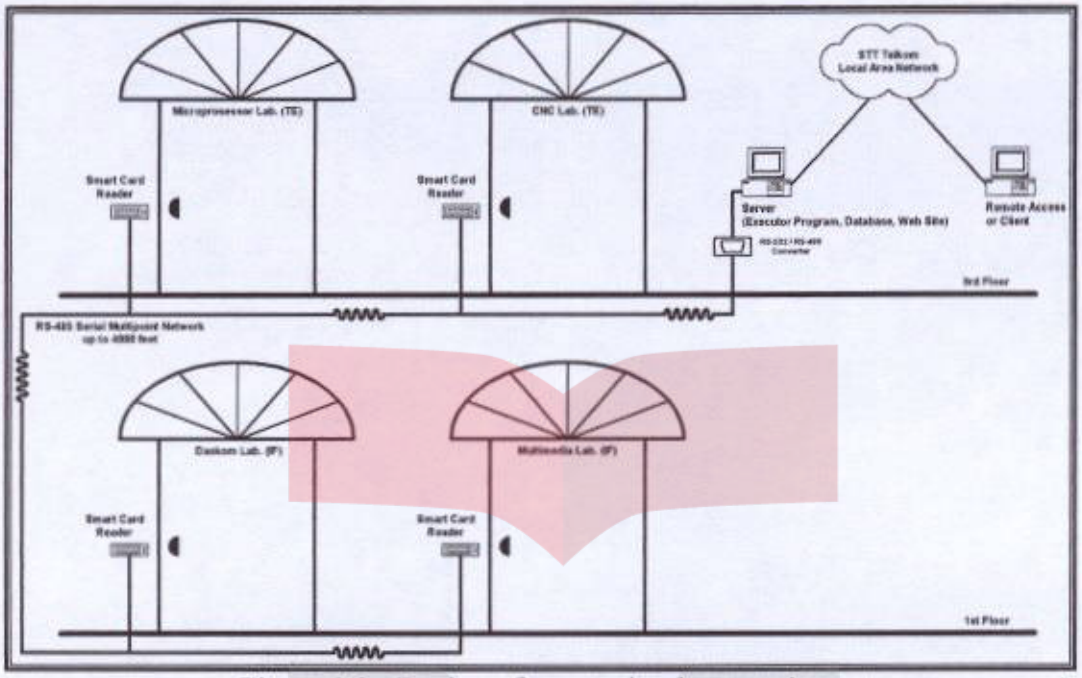

Figure 1.2 - Design of system implementation

1.4 Research Methodology

The development if this final project will consist of several main stages. Initially, a review study of the theoretical foundations will be carried out. At the same time, counseling and discussion with advisors and experts are made to get references of previous related experiments. The final stage will be done by experimental study in solving the problems faced.

1.5 Outline of Final Project

The final project will be documented as follows:

Chapter 1: Overview

Background, objectives and benefits, scope, research methodology and outline of the final project are given in this chapter.

Chapter 2: Theoretical Aspects

This chapter provides related standards and concepts of smart card, microcontroller, and serial communication will be used in the final project.

Chapter 3: System Design and Implementation

This chapter discusses details of the whole system, its configuration, and implementation techniques.

Chapter 4: System Testing and Analysis

This chapter will show the performance and result of implementation of the system. Signal measurements and comparison with the standards and technical documents are included.

Chapter 5: Conclusions and Future Work

This last chapter presents conclusions of the final project and suggestion for future work in this topic.

CHAPTER 5
CONCLUSIONS AND FUTURE WORK

5.1 Conclusions

The SC-WRU designed works as expected. Hardware and software was evaluated for future works and some limitations were found.

5.1.1 RAM capacity

With limitation on its RAM capacity which is only 256 bytes overall, the microcontroller has to service both TPDU and RS-485 protocol. As result, SC-WRU can only services asynchronous transmission with data length of maximum of about 128 bytes. It is suggested to use microcontroller with higher capacity of RAM.

5.1.2 Crystal

The crystal used to operate microcontroller was 11.0592 MHz. Employ this crystal could only service TPDU at 9600 bps. Since nowadays smart card features high-speed communication up to 115200 bps, applying higher speed crystal or microcontroller is required.

5.2 Future Work

Although the transmission line has ability to transfer full duplex communication, it is still not fully used in the proposed protocol. It is still employ half duplex data transfer. For future works, please refer to TCP/IP networking or Controller Area Network (CAN) protocol.

There are some information that serial communication port, more familiar with COM Port, will be removed from personal computer manufacturing about 3 or 4 years to go. It will be replaced with USB port. I recommend using USB port in accordance to the technology development.

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