

Establishing SSH Connection and Interfacing GSM/GPRS Functionality with Raspberry Pi

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ABSTRACT: Raspberry Pi is a credit-card-sized single-board computer which is invented to provide the basic features of a computer. It is built using ARM11 processor. This project deals with Raspberry machine, acting as a client machine which stores the details of users in database reading input from RFID. The server machine is maintained to administrate the databases in client machine (Raspberry). The databases from client machine is transferred to server machine through SSH tunnel and stored in server machine for backup of database. Further, SIM GSM/GPRS 900 module is used to interface GSM/GPRS functionality with Raspberry Pi. The alert message is sent to user when client machine fails due to system crash or power failure using GSM. The SSH connection established between client and server is checked periodically and if in case the connection fails, the GPRS is used to restore connection between client and server machine.

KEYWORDS: ARM11 Processor, RFID, SSH, GSM/GPRS SIM Module.

I.INTRODUCTION

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. On 19February2012, the Raspberry Pi Foundation released its first proof of concept SD card image that could be loaded onto an SD card to produce a preliminary operating system. The image was based upon Debian 6.0 (Squeeze), with the LXDE desktop and the Midori browser, plus various programming tools. [1]



Figure1Raspberry Computer

A. Components of Raspberry Pi

The Raspberry Pi includes following components:

1. SD Card
2. HDMI to HDMI / DVI lead
3. RCA video lead
4. Keyboard and mouse
5. Ethernet (network) cable

6. Power adapter
7. Audio lead [optional]

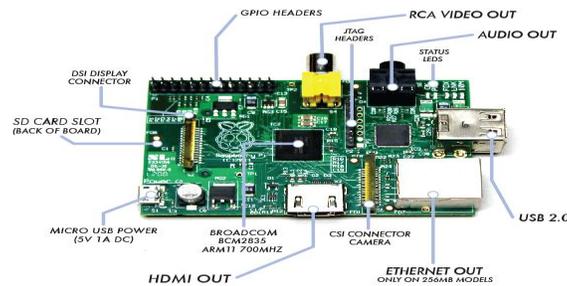


Figure2.Raspberry board with its components

B.Processor of Raspberry Pi

Raspberry device uses ARM 11 processor. ARM 11 is a 32-bit architecture.Its architecture consists of:

1. Application profile (ARMv7-A e.g. Cortex-A8)
2. Real-time profile (ARMv7-R e.g. Cortex-R4)
3. Microcontroller profile (ARMv7-M e.g. Cortex-M3)
4. SecurCore Processors



Figure3. ARM11 Architecture

II.RASPBIAN OPERATING SYSTEM

Raspbian is a Debian-based free operating system optimized for the Raspberry Pi hardware. It is the current recommended system, and was officially released in July 2012, although it is still in development. It is based on ARM hard-float (armhf)-Debian7 'Wheezy' architecture port with the LXDE desktop environment, but optimized for the ARMv6 instruction set of the Raspberry Pi. The downloaded Raspbian "wheezy" image file has to be unzipped and then written to a suitable SD card, formatting it for use.[2]

III. SYSTEM DESIGN

This project includes two different systems client machine and server machine, GSM/GPRS SIM module, and a mobile. The functional description is as follows:

1. Initially the Raspberry Pi machine acts as a client machine which stores the details of the users in the database with the inputs from RFID.
2. A server machine is used to administrate the database in the client machine, to verify periodically if the users are regularly updating their details in the databases. This is done by establishing SSH connection between the client and server machine.
3. The MySQL WorkBench provides the SSH tunnel between client and server machine. It facilitates the server with database import and export option to take backup of database and restore it in client machine if any data loss occurs in client machine.
4. The GSM/GPRS SIM module is used to send alert message to the mobile if the client machine fails. The GPRS is used to restore the connection between client and server machine if the existing connection fails, to enable uninterrupted connection between server and client.

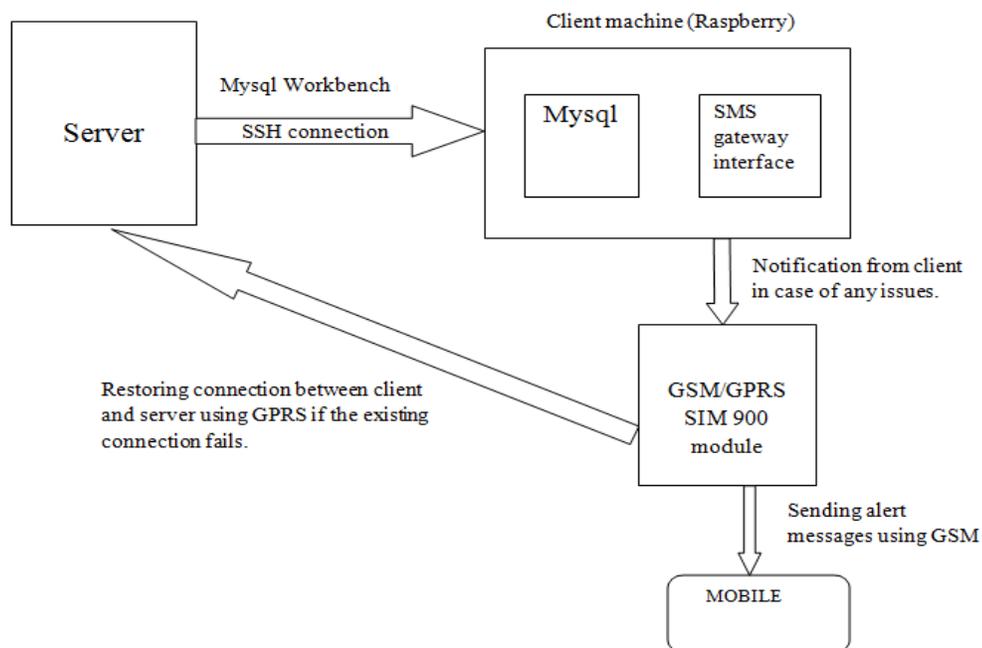


Figure.4System Design

A. Establishing SSH connection with Client Machine

The Raspberry acts as client machine. In order to establish SSH connection with client machine initially SSH keys are generated in the client machine. These keys are used in server machine to connect with client machine. Periodically, the server machine is checked for the established SSH connection with client machine.[3][4]

B. Database Administration in Server machine

The remote database connectivity is established with the client machine from server machine. Due to which the databases in client machine can be viewed from server machine. The backup of database is maintained in the server machine. This can be used to restore the database in client machine when client machine suffers data loss using PHP code. Mysql WorkBench is used, since it provides options for SSH connection, import and export functionality which is not provided with other tools such as WORD PRESS server, FreeTDS Driver, MySQL GUI tools.[5]

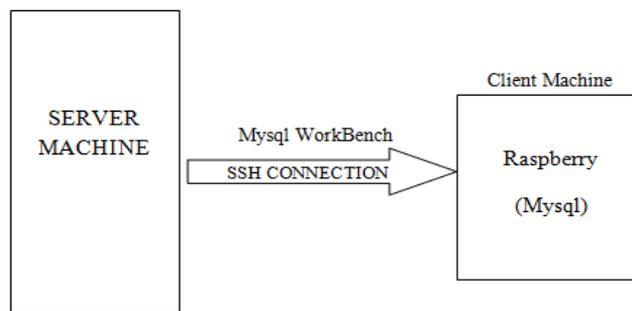


Figure5. Connection with MySQL in client machine through SSH

C .Interfacing GSM/GPRS Functionality with Raspberry Pi

GSM/GPRS SIM Module 900 is used to interface GSM/GPRS functionality with Raspberry Pi. SIM 900 GSM / GPRS module is directly connected to the Raspberry PI .It uses only TX and RX pins on Raspberry PI. First is about hardware connection, link one end of cable directly to pin of Raspberry PI according to the following figure and another end to the adapter board, insert the adapter board directly into the pins of SIM900 GSM / GPRS module, thus connection is done. Next, some modifications are made with the system configuration.

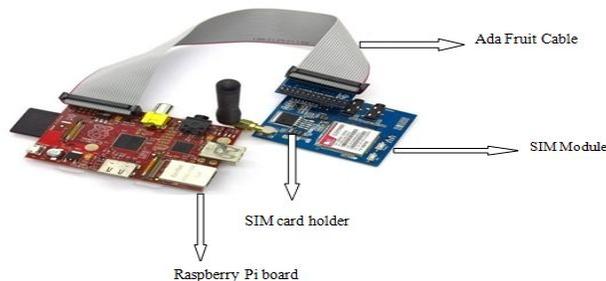


Figure6.SIM 900 GSM/GPRS module connected with Raspberry Pi

GSM is used to send alert message to the user mobile if the client machine (Raspberry Pi) fails due to any power failure, machine crash, etc. Automated message is sent using PHP code. GPRS is used to restore the connection between client and server if the existing connection fails. Since, the periodic updation of the database in client machine is maintained in server machine.[6][7]

IV.CONCLUSION

In this project Raspberry pi acting as a client machine stores the details of users in database, with inputs from RFID. A server machine is maintained to administrate the databases in client machine. Microsoft WorkBench is chosen for its efficient performance to import and export the databases using SSH credentials, from client machine. GSM/GPRS SIM module is used to interface GSM/GPRS functionality with Raspberry Pi. For further enhancement,



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the alert messaging functionality can be further extended such that it is built in various electric appliances, where the alert message is sent from Raspberry system attached with the device to the user if particular device fails.

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