

# Database Administration in Raspberry using A Server Machine

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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 device does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage. This paper deals with Raspberry machine, acting as a client machine which stores the details of users in database reading input from RFID. The server machine(Windows OS) is maintained to administrate the databases in client machine(Raspbian OS).Hence SSH connection is established between client and server to provide secure connection .The databases from client machine is transferred to server machine through SSH tunnel and stored in server machine for backup of database.**

**Keywords: ARM11 Processor, RaspbianOS, SSH, WinSCP, MySQL WorkBench.**

## 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]



Figure1.Raspberry Computer

*A Components To Set Up Raspberry Pi*

- SD Card
- HDMI to HDMI / DVI lead
- RCA video lead
- Keyboard and mouse
- Ethernet (network) cable [optional]
- Power adapter
- Audio lead [optional]

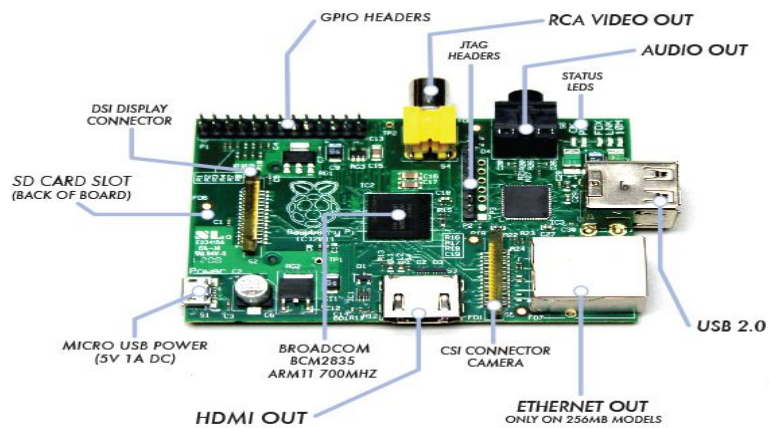


Figure2.Raspberry board with its components

*B ARM Architecture*

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

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

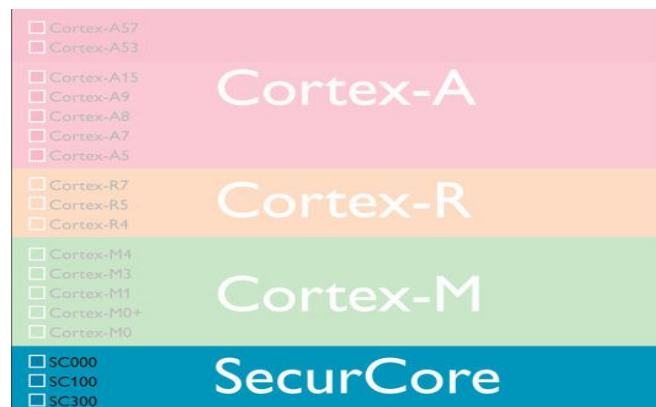


Figure.3. ARM11 Architecture

## 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 free software and maintained independently of the Raspberry Pi Foundation. It is based on ARM hard-float (armhf)-Debian 7 'Wheezy' architecture port with the LXDE desktop environment, but optimized for the ARMv6 instruction set of the Raspberry Pi. A minimum size of 2 GB SD card is required for Raspbian, but a 4 GB SD card or above is recommended. The downloaded Raspbian "wheezy" image file has to be unzipped and then written to a suitable SD card, formatting it for use. [1][2]

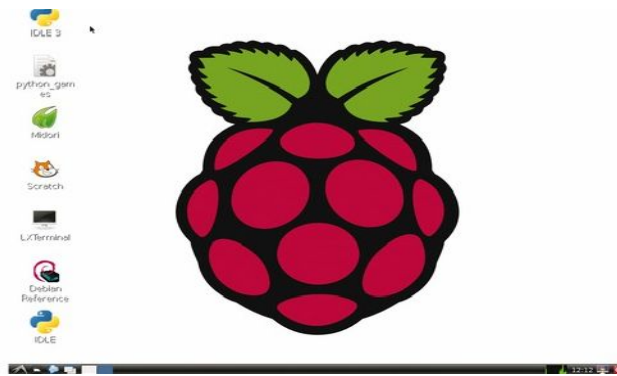


Figure.4 Raspbian Window

## III. RELATED WORK

### A. MYSQL GUI Tools

The MySQL GUI Tools package is a combination of several tools which will help to manage MySQL databases. This application pack can be installed in the local computer to remotely administer the database. [8] The MySQL GUI Tools include the following topics:

- MySQL Administrator to backup a database,
- MySQL Administrator to restore a database,
- MySQL Query Browser to access a database and execute queries

#### *MySQL Administrator*

- To Backup a database:

MySQL Administrator is used to backup a database using the following steps:

1. The login detail for the MySQL connection is entered. The Server Host should be the domain name and cPanel login details are used in order to access database. Alternatively, the MySQL username can be used instead of domain name to connect with MySQL server and access the database. The Port value should be the default value 3306. After entering the credentials, OK button is clicked.
2. After login, a screen with the MySQL server status will appear. With this application on a local server it is possible to execute administrative tasks like restarting the MySQL server in the remote system.
3. To create a backup of database, the "Backup" button is clicked from the left menu in the home window. Then "New Project" button is clicked, a name is set for the backup and "Save Project" button is clicked.
4. Once new project is created, the databases are selected for backup. To do this, database is marked from the left column that shows the available databases. Next, "Execute Backup Now" button is clicked to start the backup of the database.
5. A suitable location in the local computer is specified and "Save" button is clicked.

- To Restore a database:

MySQL Administrator is used to restore a database using the following steps:

1. The "Restore" Button from the left menu of the home window is clicked. Next, the "Open Backup File" button at the bottom of the screen is clicked. Then the .sql file that is previously created is located and selected using the Backup option.
2. The MySQL Administrator application will automatically detect which database should be restored. Now "Start Restore" button is clicked to initiate the backup restore.

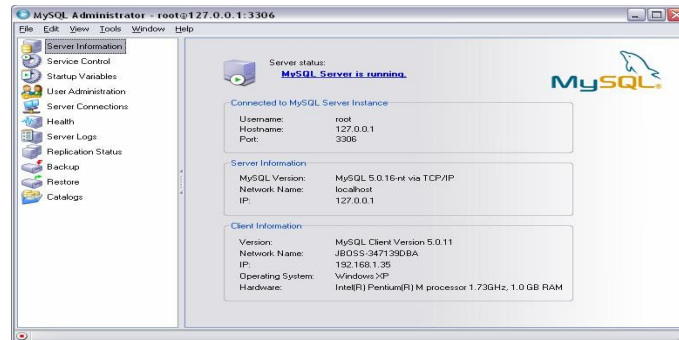



Figure.5 MySQL GUI window

#### MySQL Query Browser to access a database and execute queries

1. The MySQL Query Browser application has a similar interface to the MySQL Administrator application. The login detail for the MySQL connection is entered. The Server Host should be the domain name and cPanel login details are used in order to access database. Alternatively, the MySQL username can be used instead of domain name to connect with Mysql server and access the database. The Port value should be the default value 3306. After entering the credentials, OK button is clicked.

2. On the right part of the home screen the databases in the account is listed. Double-clicking on the database allows working with the database. Then just the queries are typed and the "Execute Query" button displayed with a little  icon is pressed to execute the query.

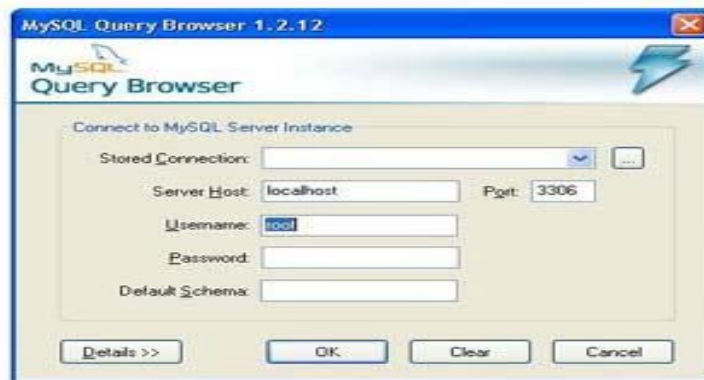


Figure.6 Query Browser window

#### B. Limitations

MySQL GUI tools provide the above options to backup and restore a database. But, it has certain drawback with respect to SSH connection. MySQL GUI tools do not provide options for establishing SSH connection, which is essential for a secure connection between client and server machine. Hence, Mysql WorkBench is chosen.

#### IV. PROPOSED SYSTEM

##### A. Secure Shell (SSH) Connection

Secure Shell (SSH) is a cryptographic network protocol for secure data communication, remote command-line login, remote command execution, and other secure network services between two networked computers that connects, via a secure channel over an insecure network, a server and a client.

The following are the essential steps to initiate SSH connection between a client (Raspberry Pi) and server (Windows) machine.

###### ➤ *OpenSSH For Raspberry*

OpenBSD developers forked Gronville's code and did extensive work on it, creating OpenSSH, which shipped with the 2.6 release of OpenBSD. From this version, a "portability" branch was formed to port OpenSSH to other operating systems. As of 2005, OpenSSH was the single most popular SSH implementation, coming by default in a large number of operating systems. OpenSSH continues to be maintained and now supports both 1.x and 2.0 versions. OpenSSH is installed in the Raspberry. [3]- [5]

###### ➤ *FreeSSH For Windows*

FreeSSH is a tool similar to OpenSSH, it is an open source and can be downloaded easily. The FreeSSH .exe file is run as usual to install the tool. The icon will be available in the start menu. While installation the installation window prompts for selecting two different options. The SSH server must be running. Various options are available where changes have to be made with Users and SSH option. The host address is entered and saved for later use. The SSH option store the keys generated while installation. [6]

##### B. Generating SSH Keys In Client Machine

In case of client machine (Raspberry system) the commands to generate the SSH keys are:

```
ssh-keygen -t dsa
```

This command generates both private and public key which is copied to the server machine through WinSCP[7]. These keys are used in Workbench to connect with client machine through SSH.

##### C. Database Administration With The Help Of Server Database

The server machine collects database from client machine, and stores the database for backup. The databases can be retrieved from server machine in case if the client machine suffers data loss due to corruption. The database connectivity through SSH connection is provided. In order to maintain server database Mysql Workbench is used. It provides both the data export and import functionality to transfer the database to and from client and server machine.

###### ➤ *Mysql WorkBench*

MySQL Workbench is a visual database design tool that integrates SQL development, administration, database design, creation and maintenance into a single Integrated Development Environment for the Mysql database system. [9][10]

Steps to work with Mysql WorkBench:

- Launch MySQL Workbench. It is presented with the Home window.
- To administer MySQL Server in client machine, first a Server Instance is created. The instance contains information about the target server, including how to connect to it. From the MySQL Workbench Home window, New Server Instance option is clicked. The Create New Server Instance Profile wizard is displayed.
- Next a connection is set, or an existing connection is selected to connect to the server. Assuming that a connection is not already created, with the default values that is already existing, credentials like MySQL user name, password (should be stored in the vault) are entered. This enables to connect to the server without needing to enter a password each time. It is also possible to use a different account to connect to the server by setting the user name and password, if required.
- The connection is tested using the Test Connection option. If it is not successful again the credentials that are entered is checked with the Back option available to move to the previous pages.
- SSH login based management and Native Windows remote management types are available. The Operating System and MySQL Installation Type are configured for the SSH login variant.
- The SSH login based management is chosen, since it provides secure transfer of databases. The parameters which includes the User Name, Host Name, and the SSH key for authentication is entered.

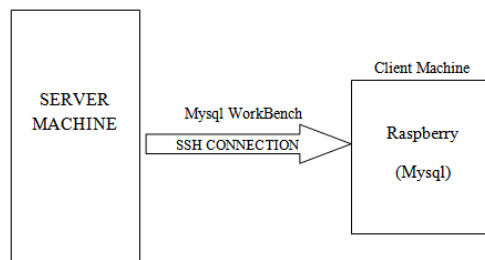


Figure.7 Connection with Mysql in client machine through SSH

- The WorkBench wizard in server machine will check if it is able to access the MySQL Server configuration file, and access the start and stop commands in the client machine.
- From the Home window, double-clicking on the Server Instance created will open the Startupconfiguration page.
- Here, the start and server button is available to start and stop the Mysql server in the client machine.

#### D Advantages

The export and import option in MySQL WorkBench provides necessary facility to store backup of database in server machine to restore it during any data loss in client machine. The backup of database in server machine is stored in form of .sql file. While restoring the database in client machine PHP script is used to extract database from .sql file. [11][12]

### V.CONCLUSION

Raspberry pi is invented with the intention to promote computers at lower cost, provided with all essential features of a computer. 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 compared with MySQL GUI tools for its efficient performance to import and export the databases from client machine using SSH credentials. Server maintains backup of the database and can be used in case of any data loss in client machine.

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