Common UNIX Printing System on Low Power Embedded Device with User Access Management

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Abstract— Raspberry Pi is small size processor used in many applications due to its small size, processing power, simplicity. Raspberry Pi has overtaken the computer on the factor of less power consumption and form factor dimensions. Most of the Linux operating system based softwares run on Raspberry Pi since it supports running Linux operating system on it. The specialized OS used for Raspberry Pi is Raspbian OS. In traditional LAN based printer sharing topologies usually organizations employ a network printer, connected to a machine which is continuously running and exclusively used for printing needs. Such environments waste lot of compute cycles and power consumption sitting idle when printers are not actively used. We propose a method to share printer in LAN using Raspberry Pi and CUPS. CUPS is a Common UNIX Printing System used to print documents in Linux. Our efforts are more focused on creating a system which would act like low cost, low power consuming network printing server. The web based user management features like user authentication, keeping track of number of pages printed, add to set of additional functionality of the system developed.

Key words: CUPS, Raspberry Pi, SQLite3

I. INTRODUCTION

Generally a network printer is connected to a system which has configuration of hundreds of GB hard disk storage, high speed processor, RAM, motherboard and other hardware peripherals. To attach a printer in a network the machine configuration discussed is nothing but wastage of space, electricity & cost. Even there is no limit for any user in taking printouts from printer and there is no any authentication process to authenticate user for accessing printer unless some expensive proprietary printing management systems are used.

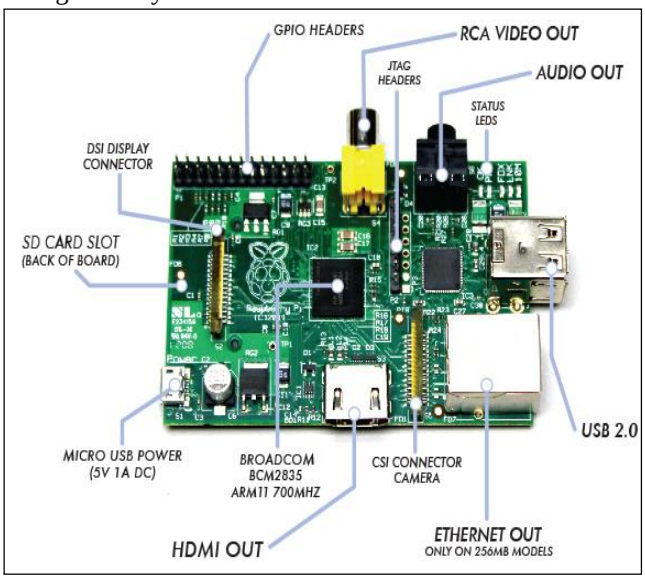

Fig. 1: Raspberry PI

The Raspberry Pi is a credit-card sized processor and capable of what little computer can do. It has a 32-bit ARM processor and uses a Debian distribution of Linux for its default operating system (OS). It can be programmed with Python or any other language that will compile on ARM v6.

The Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, VideoCore IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. The system has Secure Digital (SD) or MicroSD (Model B+) sockets for boot media and persistent storage[9].

A. CUPS

CUPS is an acronym for Common UNIX Printing System, a modular printing system for Unix-like computer operating systems which allows a computer to act as a print server.

The primary mechanism for many debian printing and print services is the Common UNIX Printing System (CUPS). This printing system is a open source and now became the new standard for printing in most Linux distributions.

CUPS manages printing jobs and provides network printing using the standard Internet Printing Protocol (IPP). CUPS also supports PostScript Printer Description (PPD) and auto-detection of network printers, and features a simple web-based configuration and administration tool.

A typical architectural overview of CUPS is shown in figure4

B. SQLite3

SQLite is an embedded SQL database engine. SQLite does not have a separate server process. SQLite3 is a popular choice as embedded database software for local/client storage in application software such as web browsers [10]. It is arguably the most widely deployed database engine, as it is used today by several widespread browsers, operating systems, and embedded systems, among others. SQLite3 has bindings to many programming languages.

II. METHODOLOGY AND SYSTEM ARCHITECTURE

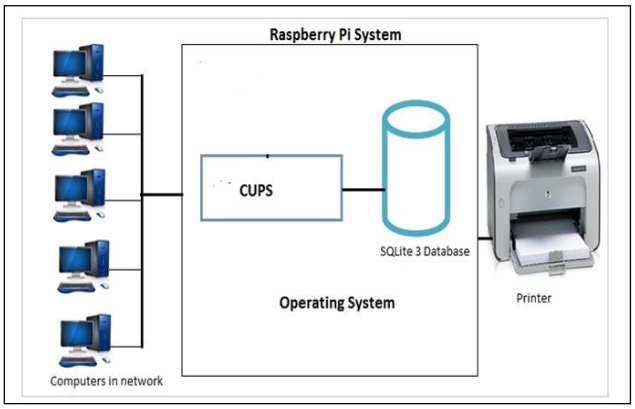

Fig. 2: System Architecture

The system has been developed as a web application running on Apache web server. The web application has

been specially developed using python keeping into mind the compatibility of python on Raspberry Pi. Python backend is integrated with Apache using CGI technology. At the same time considering the low memory footprint of Raspberry Pi SQLite was chosen to be a database storing user information namely username, password, number of pages printed, max number of pages allowed for printing. HTML along with CSS and JavaScript was used to improve user interface end. The overall high level architecture has been depicted in figure 2.

Following two tables are created to store the user and admin information.

A. User Data:

userdata(uname varchar2(10), pass varchar2(10), alloc_copies int,remain_copies int, status varchar2(10), id int);

B. Admin Data:

admindata(adminname varchar2(10), pass varchar2(10));

1) The user who wants to access printer should log in first from any node in a network with his username and password.
2) If user doesn't have username and password, then he request administrator to create his user account.
3) After requesting, administrator checks the username, password and status of the user in a database.
4) If user is valid then new window appears in which user allow browse the file which he want to print and take the print out.
5) If user is not authorized then error message is displayed to user.
6) In another case if user is authorized but his status is off then is not allowed to take print. For that user send request to enable his access to printer.
7) Then administrator enable user to access the printer. After that user can take print out.
8) In this system, add new user, change the password, enable or disable the status, change the number of print copies, view report are the facilities provided by administrator.

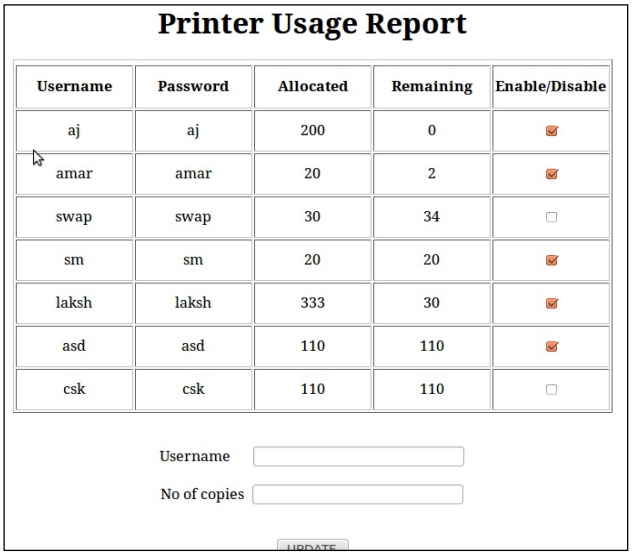

Fig. 3: Admin printer usage report

admin can see whole printer usage report username, password, Allocated copies, remaining copies, Enable/Disable (change status of user)

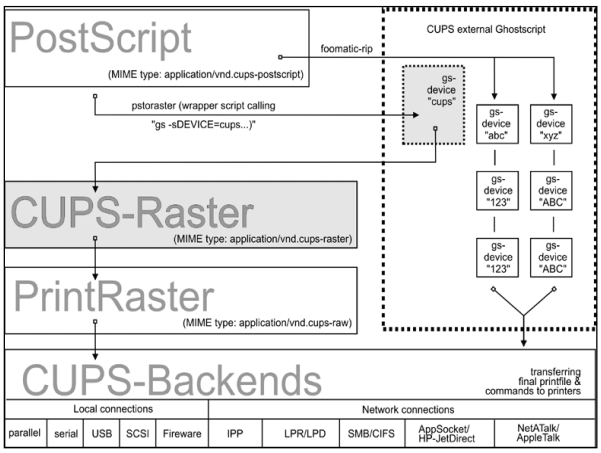

Fig. 4: CUPS architecture

C. Advantages

- The system is cost efficient as heavy configuration and resource demanding system is replaced by Raspberry Pi system.
- Power efficient as Raspberry Pi requires the less power.
- Provides the user authentication so that unauthorized user never accesses the network printer.
- Provides useful functionality to administrator to handle the network printer users and their quota.

III. Conclusion and Future Scope

Creating print server using Raspberry Pi circuit with the help of CUPS saves the disk space, power and cost.This print server provides user management which can control the access to printer by providing authentication using username, password and limitations on number of prints. Only authorized users are able to access the printer with some limited number of quantity.

The system can be further extended with functionality to remote authorized user to login remotely and access the printer.

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