Outpass Generation with Raspberry Pi Using Arbian Operating System

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ABSTRACT

A kiosk is usually designed to perform any specific operations like money withdrawal, ticket booking. Kiosks are mostly designed using closed source hardwares [5] and thus they are very costly. Using open source platforms like Arduino and Raspberry pi, the manufacturing cost of kiosks can be comparatively reduced. Thus this Outpass system generates outpass with the help of the web kiosk [14] that run an embedded Linux operating system (Arbian) [7]. The existing systems are E-Outpass system, E-gate, E-gatepass for IT Park. These devices are used for product tracking, maintaining [15] the entry and exit of IT employees and other organizations. These systems are kiosk machines which cannot run like normal desktop machines. ARM [6] based fan less processors has revolutionized the mobile computing platform and it is fast. In the same way, this outpass system will also invokes a kiosk operating system which is created from the ARM based Linux kernel and named as Arbian Operating system [8].

Categories and Subject Descriptors

B.0 [**Hardware**], D.4.0 [**Operating Systems**]: *Operating System Architecture Design – OS tweaking, Debian based ARM ported architecture, Working Model of Outpass, Communication of hardware*

General Terms

QEMU, Tweaking, Tool chains, Linux from Scratch, Bill of materials, Terminals, Putty, Message Passing

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Keywords

Arbian, OutPass, Tool chain, Raspberry pi, Arduino.

1. INTRODUCTION

This outpass system is created with the help of open-source [6] embedded hardwares and networking as its backbone. Embedded hardwares are used to design devices to perform specific tasks alone. Open source embedded hardwares [16] are those whose design schema, circuit diagram, Bill of Materials are available to recreate it. The ideology of open source hardware is initiated by Bruce Perens in the year 1997. Later many companies came forward to release documentations [17] and device-drivers for their open source hardwares. Both free and open source software (FOSS) as well as open source hardware is created by this open source culture movement and applies a like concept to a variety of components. But the open source embedded hardware [18] used in this project are not only used to perform specific tasks, it acts as a Single Board Computer (SBC). Any external hardware modules like Bluetooth, wireless sensors, USB hubs can be installed easily.

Networking, as the world always states, it is used for the interconnection of devices. This can be either wired or wireless. For portability wireless is used like 3G dongles, Wi-Fi dongles. For wired connectivity [19], Ethernet shields and RJ (Reserved Jack)-45 cables are used. This network acts as a backbone for the entire communication of the project.

2. RELATED WORKS

Newton Software Private Ltd. Et al., invented E-GATEPASS FOR IT PARK [1] which can be added as an essential feature for IT Park. It is added to the security of the park and also maintain data of visitor. This data is stored date wise and can be accessed at a later date. In IT parks, the facility of adding multiple companies with their respective departments is maintained. This E-GATEPASS controls the entry as well as the exit hence at any given point of time we can have a record of no. of visitors in the premises. Company wise reports can be arrived at Admin login. This added security device [20] the e-gatepass is a must have for all corporates to maintain the standards for security in this uncertain world.

Moty Grossman Et al., introduced C-PASS E-GATE [2], a pass system which is used to generate the pass and store information about the person using face recognition technique .This system is mostly used in borders when a person needs to cross the border of the country their face is recognized according to that their passport id which is stored in the database is matched and then he is allowed to cross the border.

Er Kumar Aneesh Et al., found E-OUT PASS SYSTEM [3] which is used to check out the In and out of the products. The product detail and the cost of the product is stored in database and according to that dispatch of the products can be identified It keeps monitoring [21] the materials which are coming inside or going outside of the company. For that we need to maintain a database. Fields like specification of the material, item number, Date of dispatch, Expected date of the return and actual date of return.

3. PROBLEM STATEMENT

In order to reduce the man-work and the time elapsed by using the traditional out pass system, this system has been devised. This system is developed in the sense it handles he request in the queue and forwards them to the authorizing devices and finally the pass is generated as the printout using the thermal printer which is attached to the device. This kiosk uses the minimal level of Linux based embedded operating system which is arm ported, as embedded hardware uses the ARM [11] [Advanced Risc Machine] processor.

4. IMPLEMENTATION

This system is developed with the following
In this project, we made use of open source technologies [8] as follows:

- Operating System- Linux Mint
- Hardware- Raspberry pi as a server & Arduino as a slave
- Language Used- Python and MySQL
- Raspberry Pi is an open source hardware and it is a user terminal
- Arduino is also an open source hardware and it is used for authorizing the requests

4.1.1 TOOLS

The Tools Used are Listed Below

- QEMU (Emulator)
- Python IDE 2.7.2
- Putty (Remote connection)
- VNC server (Virtual Network Computing)

The QEMU is an Emulator which is used to encode the Programs and test the constraints before loading it to the entire system.

Python IDE is used to develop the front end of the web framework using the Django module [21].

Putty is the open source terminal which is used to assign the IP address for the embedded hardware terminals which are used in this system

VNC [virtual network computing] server is a graphical desktop sharing which is used to access the Raspberry pi from the host machine.

4.1.2 TECHNOLOGIES

- MySQL (Structured Query Language)
- Python
- Linux Based Operating System
- Arbian Operating System

MYSQL is an open source database which is used to store the details about the individual.
Python is used as the interface between the front end and the databases.
Linux Based Operating System -the host machine uses the debian operating system.
Arbian is the Linux based embedded operating system which is ARM ported Debian based kernel.

4.1.3 COMPILING A NEW DEBIAN BASED LINUX OPERATING SYSTEM

Every Linux based operating system is created with the Linux kernel
The operating system at its start-up includes the following

- Software boot loader
- eMMC mounting
- GRUB (GRand Unified Boot loader)
- ARM ported kernel
- Board Supporting Packages

4.1.4 TOOL CHAINS USED IN ALL SORTS OF LINUX BASED OPERATING SYSTEM

Generally a Linux From Scratch (LFS) includes 45 packages.

The operating system that is designed will include the following tool chains

- GCC compiler
- Bin
- Text editors
- Shell scripting editors
- File handling
- CPU monitoring

4.1.5 STEPS INVOLVED IN DEVELOPING A DEBIAN BASED ARM PORTED OPERATING SYSTEM

The scenario goes like the following; we take minimum four devices for communication [12]. In addition two more devices can be used for rare cases.

- Get the sources
- Add missing dependencies
- Build the kernel (takes lot of time)
- Cross-compiling
- Install tool chains
- Get source packages
- Build sources
- Install packages
- Mount volumes
- Install modules
- Flash the image to the SD card
- Load in to the pi board

4.1.6 FROM WHERE THE NEW LINUX OPERATING SYSTEMS EMERGE?

- The Linux Foundation (TLF) - Non-Government Organisation (NGO)
- *Yocto project*
  - not an embedded Linux distribution
  - project that provides templates, tools and methods -- custom Linux-based systems
- Linaro - many complex projects [22] that map across various teams and groups.
- ARMv8, Digital Home, Mobile & Android, Networking, Server, and Test & Validation.
- In this project, the Linaro Project is used to build the operating system.

4.1.7 ARCHITECTURE OF ARBIAN OPERATING SYSTEM

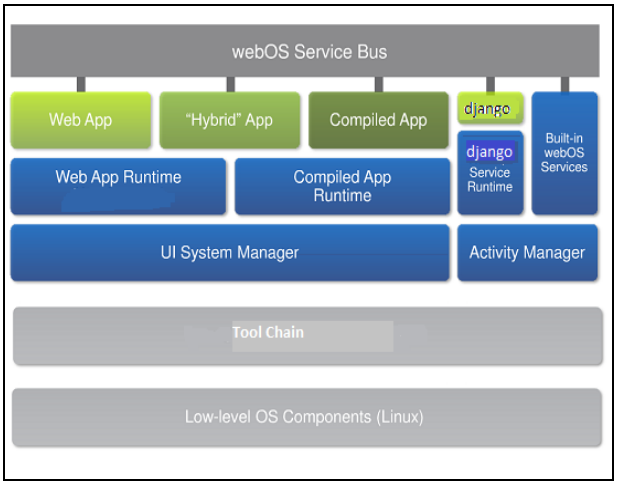

Figure.1. Architecture Diagram of ARBIAN OS

5. WORKING MODEL

The scenario goes like the following; we take minimum four devices for communication. In addition two more devices can be used for rare cases.

The three devices are as follows

- User terminal
- Preliminary Terminal
- Intermediate terminal

5.1 User Terminal

Initially when a candidate stands in front of the device, the device awakes from sleep mode. Before accessing the device, he has to look for the busy mode LEDs. Only if all the LEDs are green he has to access the device. The user can enter his enrollment number as username and a unique password for accessing the device. From the database, the details are fetched and displayed in the device [24]. Then he can enter the desired reason and initiate the request. Based on the inputs fed the request will be redirected to the preliminary terminal concerned. He should wait for the response from the authorizing persons. Finally a printout is generated as a gatepass along with the digital signatures

5.2 Preliminary Terminal

The request from the user is received here with a beep sound. The preliminary terminal can accept or deny the request. If the preliminary terminal does not respond for the next 60 seconds, the request will be forwarded to his smart phone. If the preliminary terminal doesn't respond for the next 120 seconds, the request will be forwarded to the INTERMEDIATE TERMINAL. If the preliminary terminal approves, it is forwarded to the intermediate terminal. The preliminary terminal can also use the busy mode if someone is not present

5.3 Intermediate Terminal

The forwarded request from the preliminary terminal is received here with a beep sound .The intermediate terminal can accept/deny the request. If the intermediate terminal does not respond for the next 60 seconds, the request will be forwarded to his smart phone. If the intermediate terminal doesn't respond for the next 120 seconds, the request will be declined and a failure notice will be displayed in the user terminal [23]. If the intermediate terminal approves, it is forwarded to the Principal terminal. The intermediate terminal can also use the busy mode if he/she is not present.

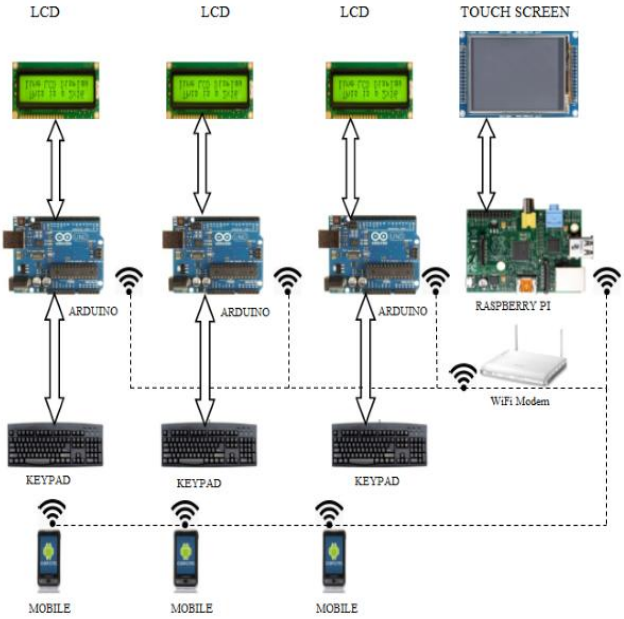

Figure 2. OutPass Architecture Diagram

6. CONCLUSION

There is a vast room for researchers who are interested in open source technologies and also OS tweaking. Here the Purpose of OS Tweaking is to expurgate[7]. Since we are using open source hardware and software it is affordable and there is no licensing issues. Thus man hours can be reduced by implementing our out pass system.

7. FUTURE WORKS

Communication is only between the hardwares [13] at present, but in near time the communication will be made possible through

mobile phones and busy mode will be activated at respective terminals.

8. ACKNOWLEGMENTS

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