START-UP OF A INTEGRATED WEATHER STATION IN A WEB SERVER IN A RASPBERRY PI WITH OPTIMAL FEATURES

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Summary. This document is based on the "Start-Up of a Integrated Weather Station in a Web Server in a Raspberry Pi with Optimal Features", this explains step by step implementation of the Ambient Weather WS-2080 wireless weather station from the assembly of the sensor set to the reporting weather data on the web.

The WS-2080 weather station consists of a display console as receiver, a thermo-hygrometer transmitter unit, a rain gauge, a wind speed sensor, a wind direction sensor, mounting hardware, USB cable.

The installation and configuration Raspbian free operating system as a platform in a small machine Raspberry Pi of open hardware that meets the computer server functionality.

Installing and configuring the software weewx in Raspbian to capture data from the weather station, which stores them in the SQLite database and generates the screens in html periodically, which are stored in the Raspberry Pi and can be uploaded to a web server via FTP service, to be displayed on any browser including browsers of mobile devices.

Keywords: Free Software, Free Hardware, Web Server.

1. INTRODUCTION

Currently the Ecuadorian Association of Pilots and Professional Paragliding and local tourist agencies do not have a benchmark to use this weather information.

The purpose of this paper is to investigate, configure and launch an integrated web server on a pi raspberry optimal features and is accessible from anywhere in the world either from a computer or mobile and share and weather station such information to both local and international athletes.

The idea of using reliable and inexpensive equipment instead of expensive equipment, makes us believe that this research and begin setting will be useful to us in an educational way and also economic, increasing tourism by providing this information online or through local historical information to foreigners. At the same time learn a lot about networks, Linux and hardware.

2. OBJECTIVES

- **General objective**

Launch an integrated web server on a raspberry pi optimal features to provide climate information service online in the city of Ibarra weather station.

- **Specific objectives**
  - Select a basic meteorological station optimal characteristics.
  - Evaluate the raspberry pi model supports appropriate weather station.
  - Investigate and install the software to view data in real time and in history.

- Set the most used for web server (http, ftp, ssh) services.

- Synchronize data in real time and history on the web server.

3. SCOPE

The project's main objective is to develop, implement an integrated web server on a raspberry pi, meteorological data for online weather station.

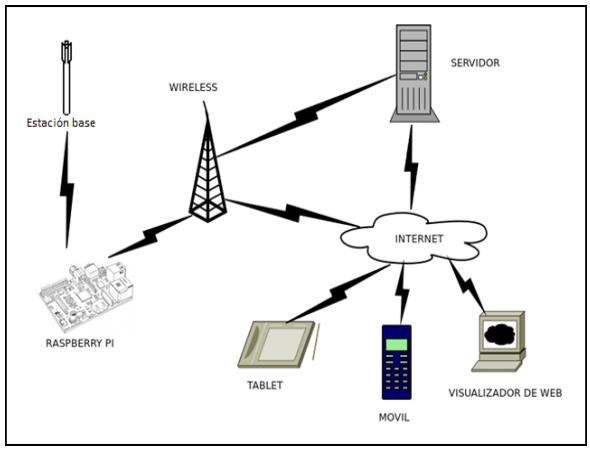

Figure 1: Project Scope

Source: Own

For which a weather station optimum characteristics from those available in the market today with USB or Ethernet connection and is low cost is required.
In addition to a raspberry pi model that is portable and energy-efficient hardware whose version is compatible with selected weather station.

You want to use an operating system that has free software license, support for web programming languages and database. The possibility of using software to read the data from the weather station and appropriate software to upload data to a web page that can be accessed historical data is contemplated. The data made public through the web must be updated, for which you want to synchronize data in real time from the raspberry pi to the web server.

4. JUSTIFICATION

This project aims to provide an integrated web server on a raspberry pi optimal characteristics, one of the main reasons to start this project, the research area weather station from a server that meets the requirements of portability, low power consumption , USB network connections and possesses the flexibility to install free and compatible operating systems with hardware and the benefits of saving electricity influence both environmentally and economically.

One of the most important reasons is the reduced software licensing costs in the decision to use open source operating systems in free hardware servers besides the reduction of costs compared to those of a professional weather station.

Another important point is that it is designed to prevent accidents occurring to pilots as a result of bad weather. In addition to the advantages obtained by its use, it is the benefit to broaden and deepen knowledge in the configuration and administration of the weather station and the hardware itself open type.

5. THEORETICAL FRAMEWORK

Free Software Definition

(GNU Operating System, 2014) Based on the ethical and philosophical aspect of freedom, free software respects the users' freedom to use, run, copy, study, modify and distribute the software whether the amended or without modifications. One must understand that the term "free software" is not synonymous with "free software" because it can be found free or at cost of distribution, we must also make it clear that "free software" does not mean "not commercial "Regardless of how he got a free program, this should be available for commercial use, commercial programming and retaining its character can be distributed commercially free. Nor should we confuse "free software" with

"public domain software" as the second means strictly without copyright.

Free Hardware Definition

(Ecured, 2014) Free hardware shares the philosophy of free software. It aims to create designs of computing devices open, so that everyone can access at least the construction plans of the devices.

Since the concept of free hardware again, there is still no exact definition of the term, but is said to be those livery hardware hardware devices whose specifications and schematic diagrams are publicly accessible, now instead of schematics also HDL code is shared.

Definition Weather Station

It is an installation in a suitable place for different instruments that allow me to measure, record and study different climatic factors to establish the atmospheric behavior and predict some time.

Definition of Raspberry Pi

(Raspberry Pi.org, 2012) is an open hardware project which consists of a small computer board developed by the Raspberry Pi Foundation of the University of Cambridge in the UK which aims to revolutionize teaching and facilitating access to technology in all schools. Since it is a highly versatile computer on all types of projects it develops.

5.1 PROJECT DEVELOPMENT

For the project AmbientWeather wireless weather station WS-2080A, which has a transmission unit called termohigrómetro which transmits data to the receiving console via radio signal at a frequency of 433 MHz is used, the range between the receiver and the transmitter in open terrain is up to 110m, the console stores up to 4080 and then complete records overwritten. From the console communicates via USB cable to the USB 2.0 port on the raspberry pi B+ whose processor works at 700MHz base has 512MB RAM and uses a micro SD card on which you have installed the operating system raspbian and weewx program for obtaining and sending weather data to the web server.

From the raspberry pi B+ cable is used with RJ-45 connectors to connect to the router through the ethernet port to wirelessly transmit that data to the server sol.quijotelu.com. The weather information on the web server is accessible to anyone and from any device including mobile and on any operating system.

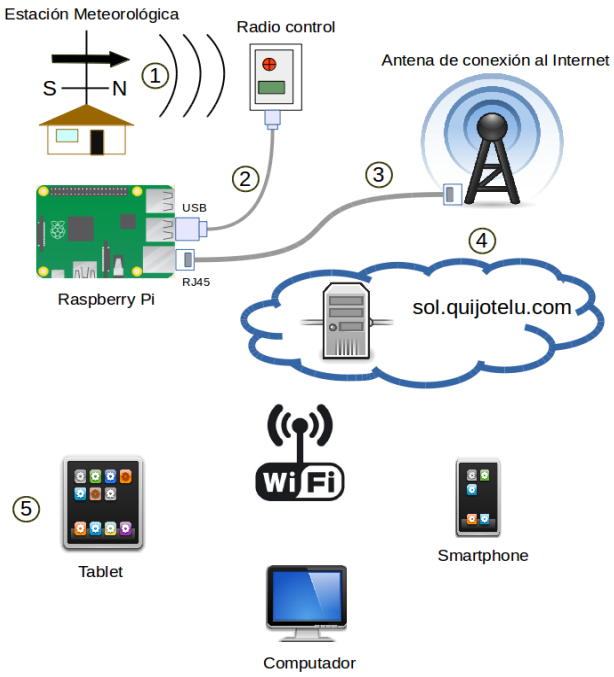

Figure 2: Graphical representation of project development

Source: Own

5.2 PRESENTATION OF DATA ON THE WEB SERVER

Below are illustrations where the report meteorological data seen in different browsers devices is shown.

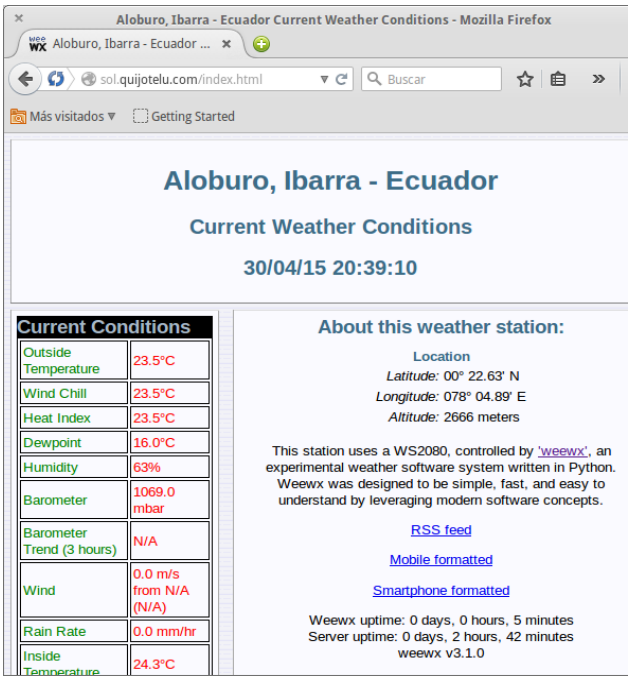

Figure 3: Web browser of a PC

Source: Own

Figure 6: Windows Phone

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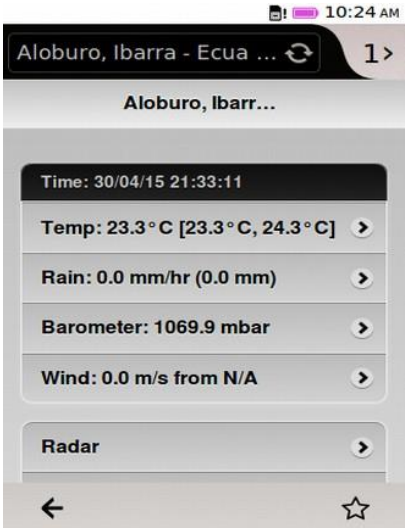

FIGURE 4: Firefox OS

Source: Own

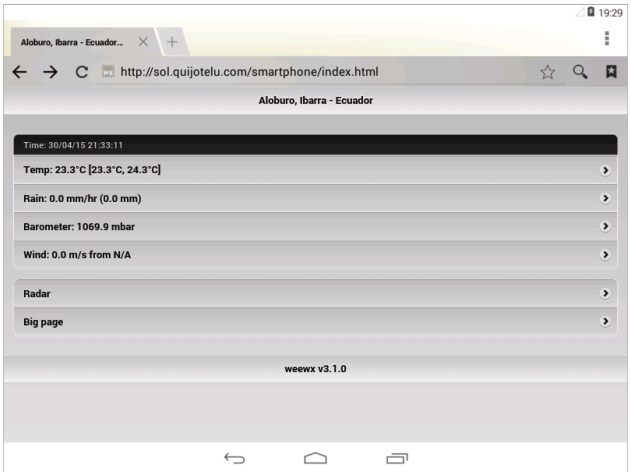

FIGURE 5: Android

Source: Own

FIGURE 7: Blackberry PlayBook

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6. PROJECT IMPACT ANALYSIS

6.1 ENVIRONMENTAL IMPACT ANALYSIS

For the analysis of environmental impact the relationship of cause and effect is interpreted under the common sense used.

The Raspberry Pi uses the memory card and rewrite many times in the SD card life ends generating obsolete computer equipment which can cause pollution to the environment, these consequences can be prevented using less swap partition and to reduce about writing on it using a card with more storage capacity and that having more space is written fewer times in the same sector.

6.2 ANALYSIS OF ECONOMIC IMPACT

What is sought with this analysis is to announce that you can use appropriate and readily available and cheaper technology solutions which provides a brief comparison between the proposed solution and a weather station using a separate module to perform the same that by using the Raspberry pi and configured.

Table 1: Solution using the Raspberry PI

Solution using the Raspberry PI	
Description	Cost
Hardware	
Weather station Ambient Weather WS-2080	134.45
-Hardware Open Raspberry Pi supports weather station - Micro SD card - USB power -HDMI cable -Protection for open hardware	75.00
Currency output 5%	4.75
Shipping Cost	12.00
Computer and Internet	100.00
Software	
GNU/Linux	0.00
Software for sending data to the web server	0.00
Drivers for reading data from the weather station	0.00
HDMI to VGA adapter	20.00
TOTAL	346.20

Table 2: Solution using professional module

Solution using professional module	
Description	Cost
Hardware	
Davies VantageVue	422.50
Hardware network interface independiente	399.95
Currency output 5%	20.00
Shipping Cost	12.00
Computer and Internet	100.00
Software	
Windows operating system	100.00
TOTAL	1054.45

Table 3: Comparison table

COMPARATIVE TABLE	
Solution using the Raspberry PI	Solution using professional module
$346.20	$1054.45

The benefits that the project is clearly identified and can say that it has successfully managed to achieve the objective of this work.

CONCLUSIONS

- The wireless weather station Ambient Weather WS-2080 meets the characteristics needed for this job as it is complete and has high reliability.
- Using the Raspberry Pi model more RAM can reduce load times, it allows more programs you run, while improving graphics performance and extend the life of the memory card as the memory usage is reduced exchange .
- The Raspbian operating system is adapted to the Raspberry Pi and is easy to install and configure not need more knowledge just run some commands in the console, just as happens with Weewx-3.1.0 that displays the information on the web are one of the best options available and are free.
- The installation and configuration of HTTP, FTP and SSH are performed in the same manner as other Linux distribution, ssh service being the most beneficial because it allows the ability to interact with all of the operating system always when you have knowledge of the Linux command.
- Free software tools allow you to have a fully functional weather station.

RECOMMENDATIONS

- It is recommended to verify in detail that the weather station meets the necessary characteristics according to the purpose for which they will use the weather information and the budget you have obtained.
- We recommend using Raspberry Pi model with more RAM memory to improve performance.
- It is recommended to have basic knowledge of Linux for deployment.
- It is recommended for the installation and configuration of HTTP, FTP and ssh install and configure the VNC service that allows remote access to the graphical interface and use commands to any distribution of Linux known.
- It is recommended for any project, first seek alternatives in free software and hardware as you can get the same result with less investment in research, encouraging more learning and sharing experiences.

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