

# Single-board computers provide solutions at nominal cost

Erik Arnesen  
Oregon State University  
Marine Technician Group

## Overview

The Raspberry Pi and Beagle Bone Black computers provide an economical and versatile platform that can be utilized for many situations. Their small size allows them to be easily located without the need for traditional rack space (see figure 4). The ease of use of the RPi (Raspberry Pi) allows users to quickly setup a working PC within a matter of minutes. The two boards retail for roughly the same amount.

## Raspberry Pi



Figure 1. Photograph showing relative size of Raspberry Pi, note SD card. [www.raspberrypi.org]

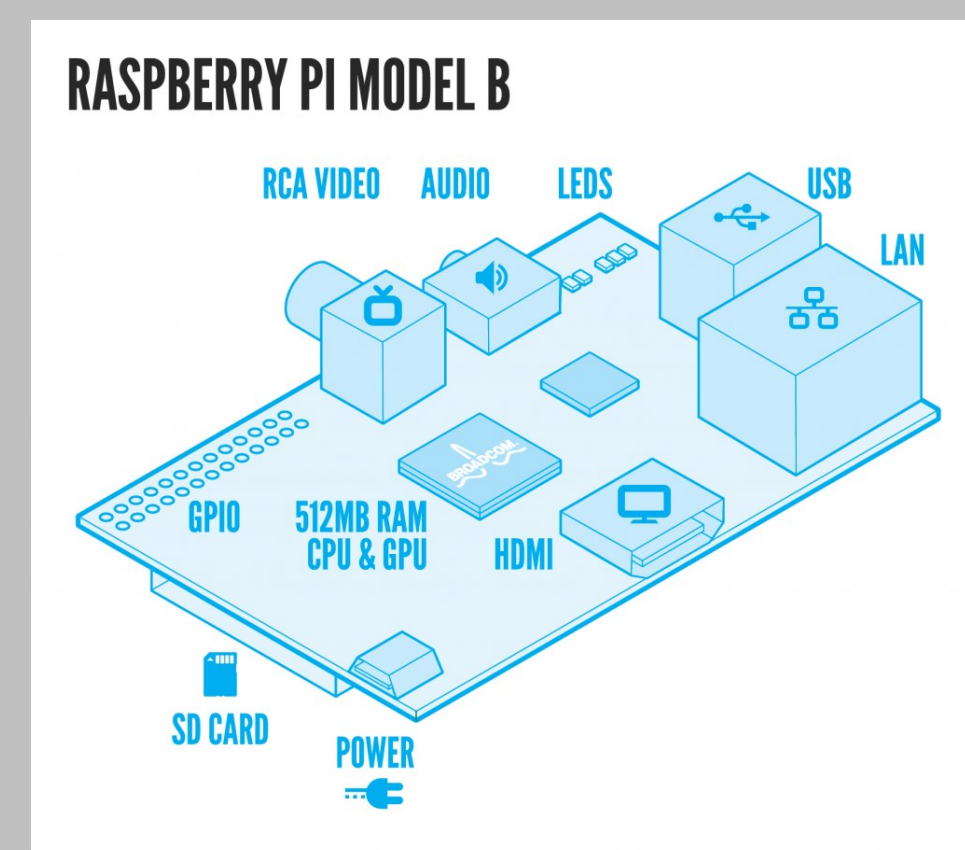


Figure 2. Diagram showing components of Raspberry Pi. [www.raspberrypi.org]

### Raspberry Pi Technical Specifications:

- Broadcom ARM CPU (700 MHz) & Memory (512MB)
- SD Memory Card (Contains Operating System)
- Ethernet Network (100MBit)
- HDMI Video Output
- Micro USB Power Connection (5VDC / 800mA)
- 2x Full Speed USB (480MBit)

## What can they be used for?

- PBX: Private Branch eXchange VoIP system
- General-Use PCs: Open Office software
- Network Monitor: NTOP, MRTG, Cacti
- Server: ELOG server, general webpage server
- Linux: If you need for a Linux machine for anything
- Hardware Hacking: General purpose I/O pins
- DAS system: UDP network broadcaster

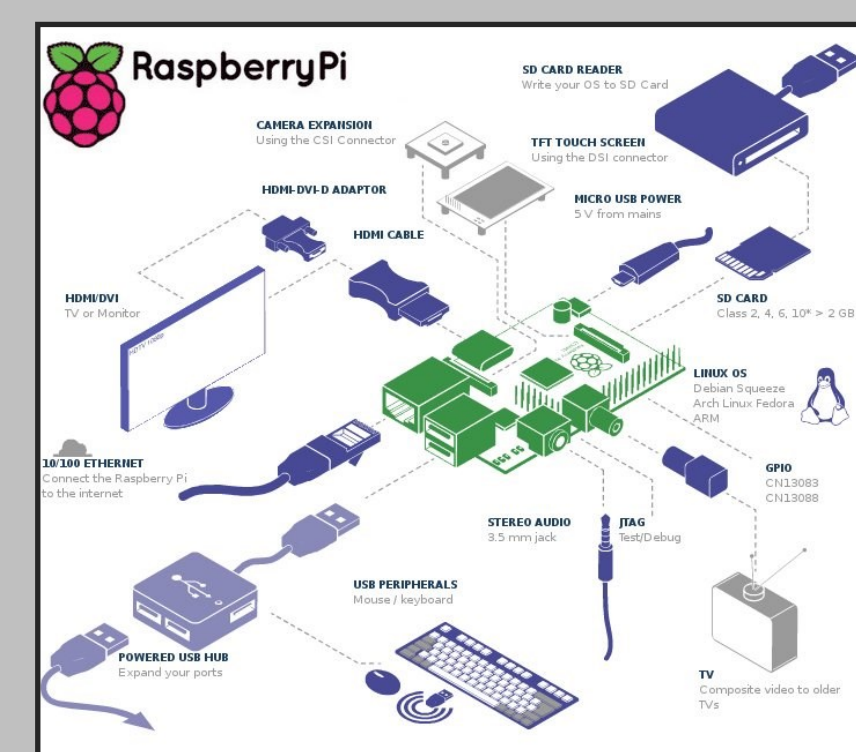


Figure 3. Exploded view of peripheral devices. [http://www.wvshare.com/img/devkit/RPI-B-CN/RPI-B-CN-set-up.jpg]



Figure 4. Picture showing Raspberry Pi mounted as a "web-head" in the aft-staging area of the USCGC Healy. [photo by Toby Martin, OSU Marine Technician Group, 2013]

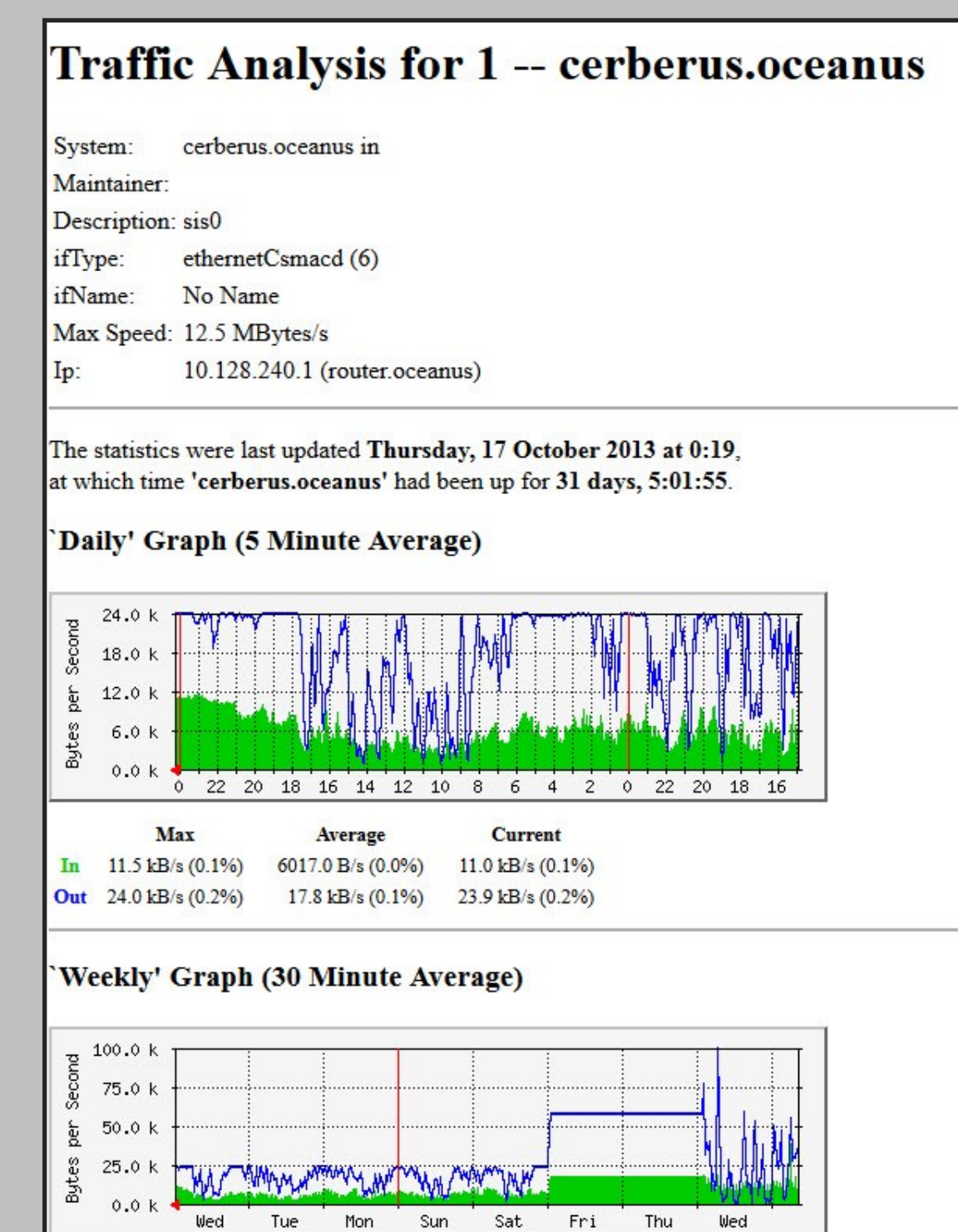


Figure 5. Screen shot from Raspberry Pi running MRTG (Multi Router Traffic Grapher) onboard the R/V Oceanus. [photo by David O'Gorman, OSU Marine Technician Group, 2013]

## Raspberry Pi

- Prices approximate, does not include monitor or S&H, \$USD
- Raspberry Pi (Model B): \$35
- 4GB SD card: \$8
- HDMI to HDMI / DVI lead: \$8
- Keyboard and mouse: \$15
- Ethernet cable: n/a
- Power supply: \$8
- TOTAL COST: \$ 74**

## BeagleBone Black

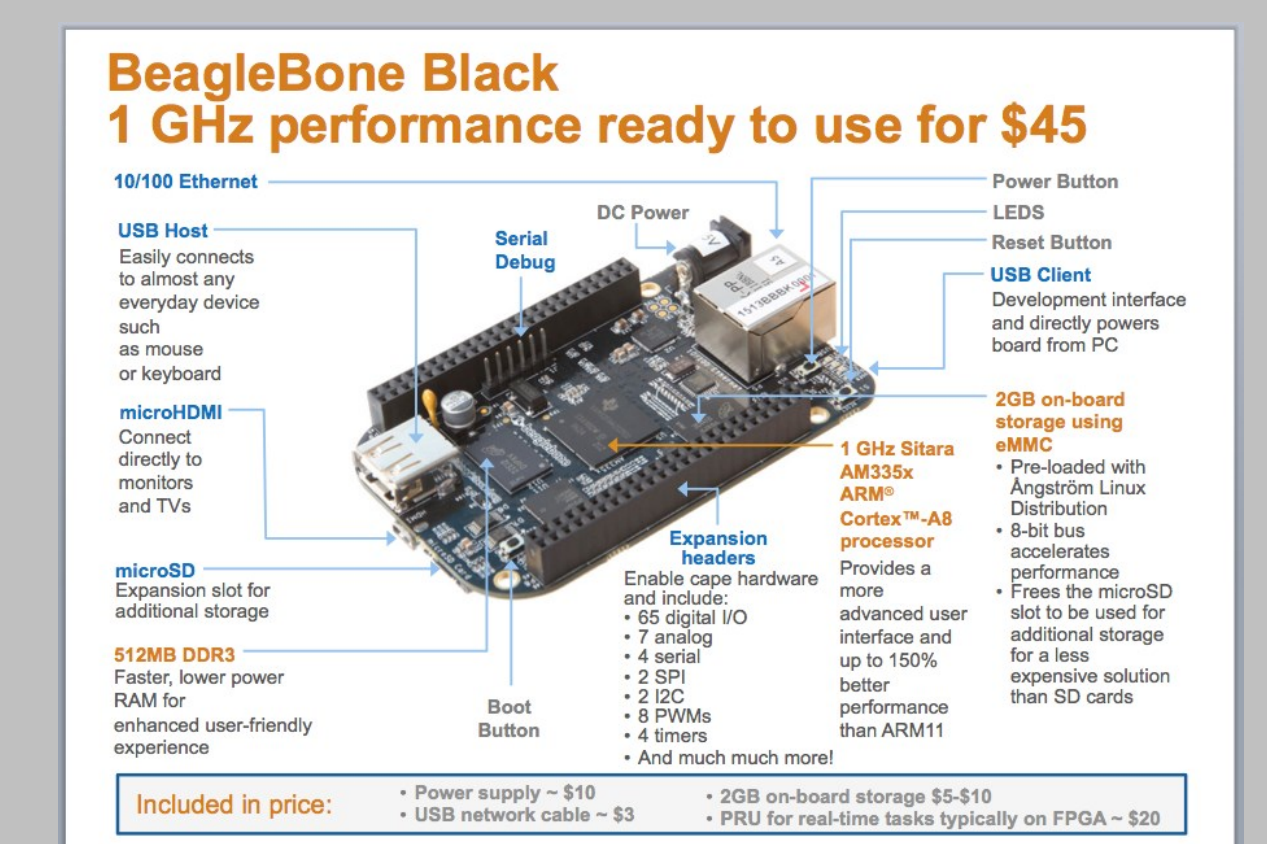


Figure 6. BeagleBone computer is used in this OpenROV project. [www.openrov.com]

Figure 7. Technical specs for the BeagleBone Black. [www.beaglebone.org]



Figure 8. Picture showing size of BeagleBone Black. [www.adafruit.com]

### Beagle Bone Black Technical Specifications:

- Sitara AM335x CPU (1GHz)
- 2GB on-board storage (eMMC)
- Ethernet Network (10/100)
- HDMI Video Output
- miniUSB Power Connection (5VDC / 500mA)
- SD/MMC Connector microSD, 3.3V
- USB 2.0 Client Port via miniUSB
- USB 2.0 Host Port

### Single-board computers currently in use:

- R/V Oceanus - RPi used as network traffic monitor using NTOP software
- R/V Oceanus - RPi used as web-head display in science main lab
- R/V Oceanus - RPi PBX back-up system (working to move to primary)
- USCGC Healy - RPi used as web-head display in science main lab
- USCGC Healy - RPi, in-work project DAS board
- OSU Martech Project: RPi "disk farm" USB hard drive manager