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## **Assignment No. 2**

**Title :** Study of different operating systems for Raspberry-Pi/Beaglebone/Arduino.

Understanding the process of OS installation on Raspberry-Pi/Beaglebone/Arduino

**Objective :** The objective of this assignment is to explore various operating systems available for Raspberry Pi, Beagle Board, and Arduino, and to understand the step-by-step installation processes for each platform. It aims to provide practical experience in installing and configuring an OS on these devices, enhancing technical skills in both hardware and software installation. Additionally, the assignment includes analyzing the performance of different operating systems to determine the best fit for various applications.

### **1. Raspberry Pi**

The Raspberry Pi supports a variety of operating systems tailored for different applications.

Here are some of the notable ones:

- **Raspbian (Raspberry Pi OS):** The official OS, based on Debian, optimized for the Raspberry Pi.
- **Ubuntu MATE:** A lightweight version of Ubuntu suitable for the Raspberry Pi.
- **Snappy Ubuntu Core:** A minimal version of Ubuntu designed for IoT devices.
- **OSMC and LibreELEC:** Kodi-based media centers for turning the Pi into a powerful media player.
- **Risc OS:** A non-Linux OS for enthusiasts of 1990s Acorn computers.
- **Windows 10 IoT Core:** A specialized version of Windows for IoT applications.

Other OS options include Pidora, Linutop, SARPi, Arch Linux ARM, and Gentoo Linux.

### **How to Install Raspbian on Raspberry Pi**

**Step 1: Download Raspbian.** Visit the official Raspberry Pi website and download the latest Raspbian image.

**Step 2: Unzip the File.** The Raspbian image is compressed in ZIP64 format. Use an appropriate tool to unzip the file, such as 7-Zip or WinRAR.

### **Step 3: Write the Disc Image to Your microSD Card**

1. **Insert the microSD card** into your computer.
2. **Use an image writing tool** like Balena Etcher:
  - Open Balena Etcher and select the unzipped Raspbian image file.
  - Choose your microSD card as the destination.
  - Click "Flash" to write the image to the card.

### **Step 4: Boot Up the Raspberry Pi**

1. **Insert the microSD card** into your Raspberry Pi.
2. **Connect peripherals** such as a keyboard, mouse, and monitor.
3. **Plug in the power supply** to boot the Raspberry Pi.
4. The Pi will boot directly to the desktop environment. The default login credentials are:
  - **Username:** pi
  - **Password:** raspberry

Your Raspberry Pi is now ready to use with Raspbian OS.

## **2. BeagleBone Black :**

The BeagleBone Black includes a 2GB or 4GB on-board eMMC flash memory chip and comes with the Debian distribution factory pre-installed. However, it supports various other operating systems, including Angstrom, Ubuntu, Android, and more.

### **Operating Systems for BeagleBone Black:**

- Angstrom
- Android
- Debian
- Fedora
- Buildroot
- Gentoo

- Nerves Erlang/OTP
- Sabayon
- Ubuntu
- Yocto
- MINIX 3

### **How to Install Debian on BeagleBone Black:**

**Step 1: Download Debian** Download the Debian [.img.xz](#) file from the official Debian website.

**Step 2: Unzip the File** Use an appropriate utility to unzip the downloaded [.img.xz](#) file.

**Step 3: Prepare the MicroSD (uSD) Card** Insert the MicroSD card into its adapter (if necessary), then insert it into your card reader.

**Step 4: Write the Debian Image to the MicroSD Card.** Open Win32 Disk Imager. Click the blue folder icon and navigate to the location of the Debian image file. Double-click the file, then click "Write" and wait for the process to complete. This may take around 5 minutes, depending on your computer's performance.

**Step 5: Insert the MicroSD Card into the BeagleBone Black.** Remove the MicroSD card from the adapter and insert it into the BeagleBone Black with the USB cable disconnected.

**Step 6: Power Up the BeagleBone Black.** Connect the USB cable and wait for the flashing process to begin. The four LEDs above the USB cable should start blinking in a sequence. This process can take up to 45 minutes.

**Step 7: Troubleshooting Flashing Process.** If the LEDs do not start blinking, unplug the USB cable. Press and hold the user button above the uSD card slot (next to the two small 10-pin ICs), then plug in the USB cable. Release the button and wait for the LEDs to start blinking. This indicates the flashing process has started.

**Step 8: Complete the Installation.** Once all four LEDs stay lit simultaneously, the flashing process is complete. Remove the MicroSD card and reboot the BeagleBone Black by either reconnecting the USB cable or pressing the reset button near the USB port.

**Step 9: Connect to the BeagleBone Black.** Use an SSH client like PuTTY to connect to the BeagleBone Black using the IP address [192.168.7.2](#). Log in with the username [root](#). There is no default root password, but it's recommended to set one if you plan to connect the BeagleBone Black to a network.

### 3. Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. It consists of a microcontroller board and an Integrated Development Environment (IDE) for writing and uploading code. The board interacts with sensors, actuators, and other electronic components. Unlike systems with full operating systems, Arduino runs on firmware, meaning that you develop and upload code directly to the microcontroller. The Arduino IDE is available for Windows, Mac, and Linux, and allows you to program the board to perform a wide range of tasks.

#### Steps to Install the Arduino IDE and Upload Code to Arduino

1. **Download the Arduino IDE:** Visit the Arduino homepage. Download the IDE for your operating system (Windows, Mac, or Linux).
2. **Install the Arduino IDE:** Follow the installation instructions specific to your operating system.
  - **For Windows:** Run the downloaded installer file and follow the prompts.
  - **For Mac:** Open the downloaded .dmg file and drag the Arduino application into the Applications folder.
  - **For Linux:** Extract the downloaded tarball and run the `install.sh` script.
3. **Connect Your Arduino Board:** Use a USB cable to connect your Arduino board to your computer.
4. **Open the Arduino IDE:** Launch the Arduino IDE from your desktop or applications folder.
5. **Select Your Board and Port:**
  - Go to **Tools > Board** and select the appropriate Arduino model.
  - Go to **Tools > Port** and select the COM port corresponding to your Arduino board.
6. **Write or Open Your Code:** In the Arduino IDE, write your code or open an existing sketch (File > Open).
7. **Upload the Code to the Arduino:** Click the **Upload** button (right-pointing arrow) in the IDE toolbar. Wait for the IDE to compile the code and upload it to the Arduino board.
8. **Verify the Upload:** Ensure the code is running on the Arduino by observing the board's behavior or using the Serial Monitor (Tools > Serial Monitor) to view serial output.

**Conclusion :** The assignment reveals that Raspberry Pi and BeagleBone Black use microSD cards for OS installations like Raspbian and Debian, while Arduino uses the IDE for direct code uploads without a traditional OS. Each platform suits different needs: general computing, embedded systems, or real-time control.