Overview

A Single Board Computer (SBC) is a computer with its essential components (the CPU, RAM, etc.) are built into a single circuit board. Compared to desktop PCs, **the CPU and RAM cannot be changed and must be chosen at purchase** (Arm Ltd, 2021). But, unlike most consumer electronics (smartphones, tablets, etc.), the user must **acquire and install any additional hardware or software themselves**. They differ from microcontrollers (e.g., Arduino), as they **run a full operating system (OS)** and are generally more powerful (Ruenheck, 2019).

Figure 1.Raspberry Pi with a credit card

Usage

In industry, SBCs are used within embedded systems for products like communication and defense. In those products, computers need to be *reliable* and will require little to no *customization* (customization is actually undesirable, as it can introduce extra complexity that will make bug-fixing and troubleshooting more difficult) (BAE Systems, 2021).

In the consumer market, the original home computers of the 1970's and 1980's were SBCs, assembled manually at home by hobbyists. As the market matured and 'pre-build' PCs became dominate, they faded in relevance ('Single-Board Computer', 2021). In 2012, the release of the Raspberry Pi (RPi) created a new wave of SMC aimed at enthusiasts for projects like retro game emulation, robotics or home automation.

Figure 2.Beagle Board

Some Examples

- Raspberry Pi: Most popular consumer-oriented SBC. Originally designed to teach students and people in the developing world computer science. Now available with either 1, 4 or 8 GB of RAM (Raspberry Pi Foundation, 2021).
- BeagleBoard: Produced by Texas Instruments. Designed for colleges to teach hardware design (BeagleBoard, 2021).
- Nvidia Jetson: Designed for machine learning applications with nVidia's Tegra hardware (nVidia, 2021).
- Odriod: Designed to natively support Android, like smartphones (Hardkernel, 2021).
- LattePanda: This SBC has an Intel x86 CPU, so it can run Windows and any Windows programs, resource permitting (LattePanda, 2021).

Photo Credits

Figure 1. https://www.researchgate.net/figure/The-Raspberry-Pi-model-B-A-Kenyan-Bank-card-is-shown-for-comparison_fig3_301607979

Figure 2. https://en.opensuse.org/HCL:BeagleBoard-xM

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