Raspberry Pi 4 vs Raspberry Pi 5

Introduction:

The Raspberry Pi 4 and the recently released Raspberry Pi 5 differ significantly in architecture, cost, and performance. The Pi 5 offers superior CPU, GPU, memory, and I/O architecture, resulting in enhanced processing power and graphical capabilities compared to the Pi 4. However, the Pi 5 starts at a higher cost of $60 for the 4GB variant, whereas the Pi 4 begins at $35 for the 1GB RAM model. When transitioning to the Pi 5, users should note the change in power supply requirements. The Pi 5 introduces notable compatibility enhancements, including support for Vulkan 1.2, making it an attractive option for gaming and visual projects. Additionally, the inclusion of a PCIe interface simplifies high-speed peripheral connectivity, eliminating the need for external adapters.

Architecture Changes:

CPU Architecture: Raspberry Pi 5 features a Quad-Core Cortex-A76 CPU, while Raspberry Pi 4 uses a Quad-Core Cortex-A72 CPU.

GPU Architecture: Raspberry Pi 5 has a VideoCore VII GPU operating at 800 MHz with support for OpenGL ES 3.1 and Vulkan 1.2, whereas Raspberry Pi 4 utilizes a VideoCore VI GPU at 500 MHz with support for OpenGL ES 3.1 and Vulkan 1.0.

Memory Architecture: Raspberry Pi 5 employs LPDDR4X-4267 SDRAM, while Raspberry Pi 4 uses LPDDR4-3200 SDRAM. The Pi 5 offers more memory bandwidth.

I/O Architecture: Raspberry Pi 5 introduces the RP1 chip, which handles most I/O operations and enhances I/O bandwidth compared to the Pi 4.

Display Architecture: Raspberry Pi 5 supports dual HDMI 2.0 ports with 4K at 60Hz on both channels, H.265 support, and a 4-channel MIPI interface. Raspberry Pi 4 supports 4K at 60Hz on one channel, 30Hz on the other, H.265 support, and a 2-channel MIPI interface.

Audio Architecture: Raspberry Pi 5 removes the analog audio jack, retaining only HDMI and USB audio output options.

Cost Changes:

The Raspberry Pi 5, with its remarkable improvements, comes at a starting cost of $60 for the 4GB variant, while its predecessor, the Raspberry Pi 4, offers a more budget-friendly entry point at $35 for the 1GB RAM model.

Energy usage changes:

In assessing the Raspberry Pi 5, one notable aspect to contemplate is power usage. Despite the increased power efficiency of the new processor, it demands a higher power input, rendering the power supplies designed for the Raspberry Pi 4 incompatible with the latest Raspberry Pi 5. This divergence in power requirements necessitates a reevaluation of power supply configurations when transitioning to the Raspberry Pi 5.

Compatibility:

The Raspberry Pi 5 introduces a myriad of compatibility and efficiency enhancements. Particularly, gaming enthusiasts and visual project creators will find the Pi 5's support for Vulkan 1.2 to be a noteworthy advantage, surpassing the Pi 4's support for Vulkan 1.0. This elevated support further augments the Pi 5's capabilities in the realm of gaming and visual projects.

Peripheral Component Interconnect Express:

The Raspberry Pi 5 marks the first inclusion of a PCIe 2.0 x1 interface within the Raspberry Pi series, offering the ability to connect high-speed peripherals seamlessly. In contrast, the Raspberry Pi 4 lacked a PCIe interface, though the Compute Module 4 provided PCIe support through an I/O board. Prior to the Raspberry Pi 5, users were limited to the maximum speed of SPI interfaces, imposing bandwidth constraints. The introduction of PCIe now allows for the internal integration of exceptionally fast hardware with the Raspberry Pi, eliminating the need for USB cables to achieve such high data transfer rates.

Tech	Raspberry Pi 5	Raspberry Pi 4
SoC	Broadcom BCM2712	Broadcom BCM2711
CPU	Quad-core Cortex-A76 @ 2.4 GHz	Quad-core Cortex-A72 @ 1.8 GHz
GPU	VideoCore VII @ 1.1 GHz	VideoCore VI @ 800 MHz
Display	Dual HDMI 2.0 @ 4k 60Hz	Dual HDMI 2.0 @ 4k (one at 60Hz, one at 30Hz)
Memory	LPDDR4X-4267 SDRAM4GB, or 8GB	LPDDR4-3200 SDRAM1GB, 2GB, 4GB or 8GB
Storage	MicroSD card slot + PCIE lane for NVME M.2 SSD	MicroSD card slot
USB ports	2 x USB 3.0 at 5Gbps2 x USB 2.0	2 x USB 3.02 x USB 2.0
Networking	Dua-Band 802.11acBluetooth 5 / BLEGigabit EthernetPoE via POE + Hat (Incompatible with old version)	Dua-Band 802.11acBluetooth 5 / BLEGigabit EthernetPoE via POE + Hat (Incompatible with old version)
Power consumption	Up to 15W (requires new power supply)	Up to 7.5W
Thermal performance	Higher temperature and fan requirement	Lower temperature and passive cooling option
Camera/display ports	Two 4-lane MIPI ports for both cameras and displays (new cables needed)	One DSI port for displays and one CSI port for cameras
Audio output	HDMI or USB only	HDMI, USB, or analog audio jack
Connectors	2 x 4-lane MIPI camera/display transceiversPCIe 2.0 x1 InterfaceUART BreakoutRTC Clock Power4-Pin FAN Power	2 x 4-lane MIPI camera/display transceiversPCIe 2.0 x1 InterfaceUART BreakoutRTC Clock Power4-Pin FAN Power

Conclusion:

While the cost of Raspberry Pi 5 doubles Raspberry Pi 4's, it comes with a more advanced CPU architecture, higher clock speeds, an improved GPU, faster memory, and enhanced I/O capabilities, the Raspberry Pi 5 significantly outpaces the Raspberry Pi 4 in processing power, graphical capabilities, and overall efficiency. Users can expect a noticeable boost in performance, making the Raspberry Pi 5 a compelling choice for a wide range of applications, from general computing to more demanding tasks, when compared to its predecessor.

References :

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