Raspberry Pi 400

A low-cost alternative to a conventional PC

U3A Brisbane

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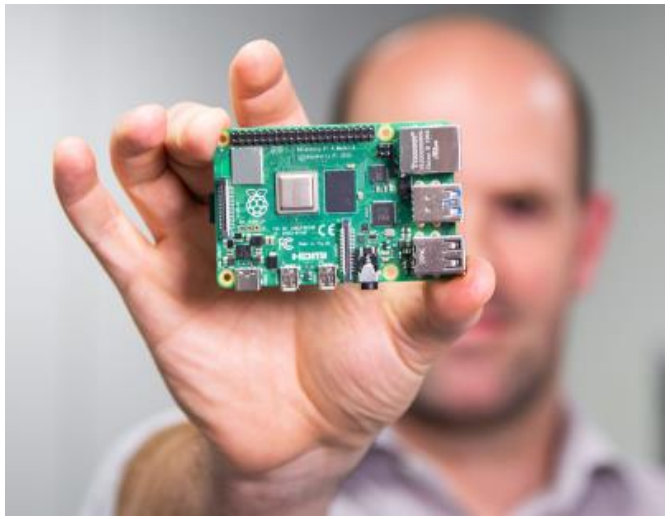
Raspberry Pi history

Originally developed in UK as a basic low-cost educational computer to teach computer science.

First released in 2012 with only 512Mb RAM, priced at $30-40.



Linux-based operating system.

Several models have been released since 2012 with increasing power and capability.

Raspberry Pi Foundation

Pi devices are developed by the *Raspberry Pi Foundation*, a UK-based charity whose motto is:

Empowering young people to use computing technologies to shape the world

A word about Linux

Linux is a family of open-source Unix-like operating systems based on the Linux kernel, first released in 1991 by Linus Torvalds.

There are many variants, called Distributions, which vary in the user interface and package methodology.

Linux servers power about 95% of the world's websites, but it is less common on desktops.

Android and *Chrome OS* are Linux-based.

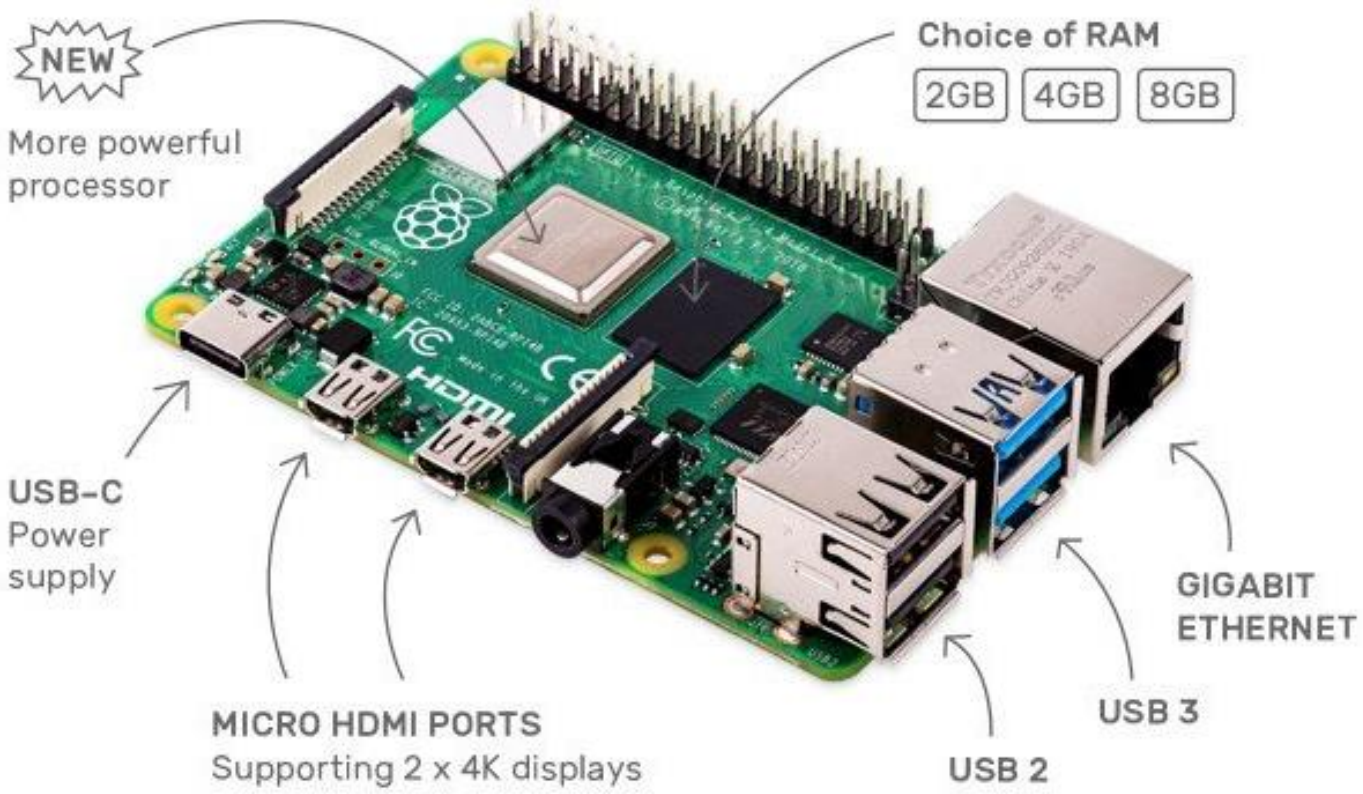
Apple Mac OS X is built on a Unix-like base.

Latest Pi model

Raspberry Pi 4B

Faster processor

Up to 8GB RAM.



Raspberry Pi 400

Based on Pi 4 but built into a keyboard.

Released in 2021.

Quad-core 64-bit processor, 4GB RAM, WiFi, Bluetooth, gigabit Ethernet.

Dual 4K monitor capability, three USB ports.

Cost $160-175.

Raspberry Pi 400

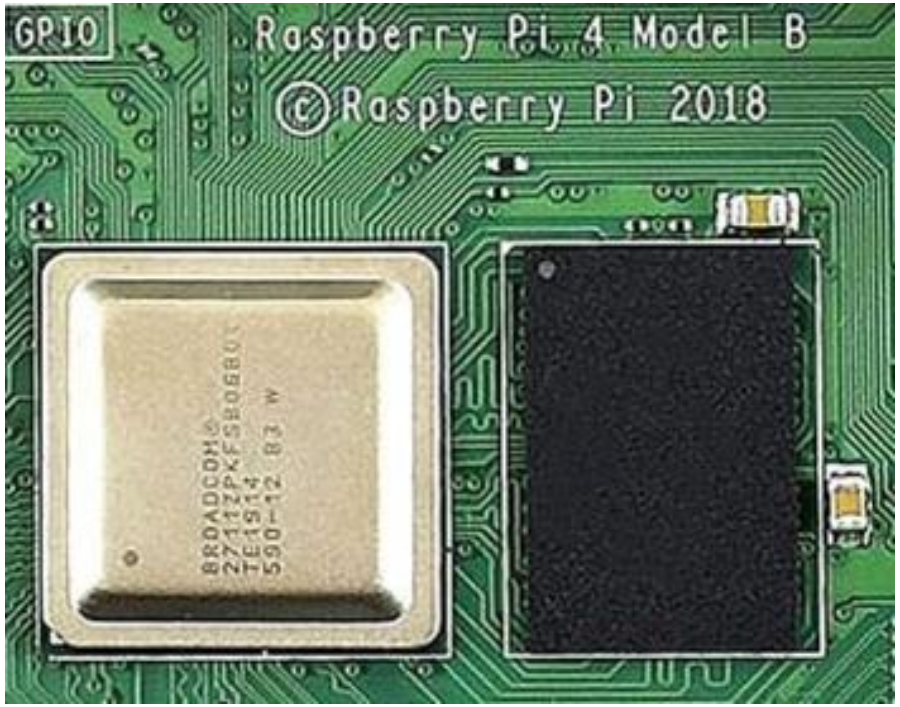
Inside the keyboard is a circuit board with rear-mounted ports for power, USB, monitors etc.

The board is covered with a full-length metal heat shield.

Raspberry Pi 400 – rear ports

Processor

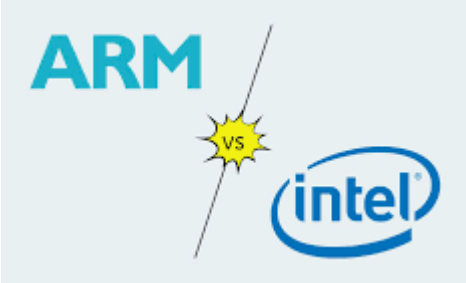
Pi 400 and other recent Pi models use a quad core ARM Cortex-A72 64-bit SoC processor at 1.8GHz. (SoC = System on a Chip).



ARM processor chip on left.

RAM memory chip on right.

Processor (cont.)

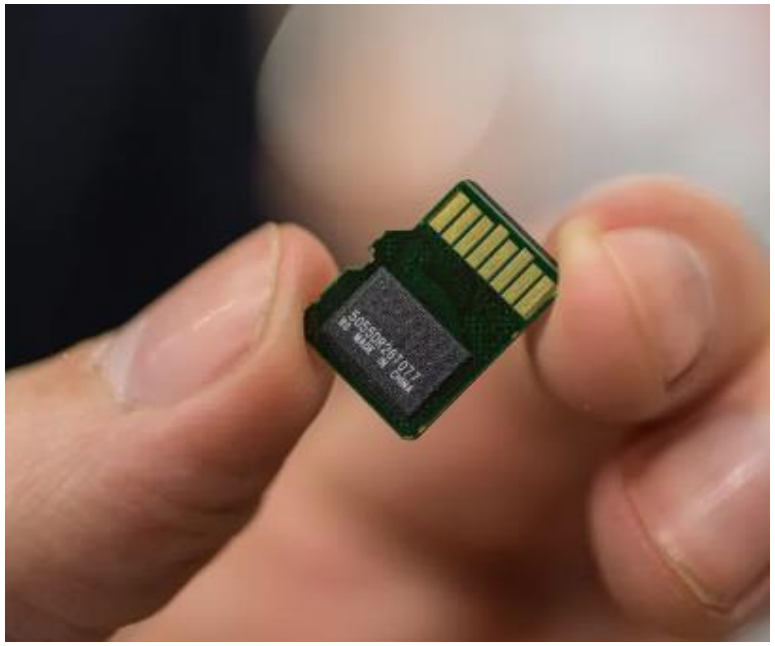


ARM processors use a different binary “instruction set” from Intel (x86) processors. They will not run native Windows applications out of the box.

There are ways to run x86 software using emulation but we will not discuss that here.

Operating System

Pi 400 is obtainable as a kit including keyboard, USB mouse, power supply, HDMI cable and a micro-SD card containing the Pi operating system (Pi OS).



Pi OS is based on Debian Linux.

Provided as 32-bit OS, but 64-bit version available.

Includes basic applications (browser, office apps etc.)

Operating System Alternatives

The Pi OS is a basic operating system designed to be easy to use for beginners. It installs in 5-10 minutes and includes several application packages.

Other OS alternatives are available, mostly different versions of Linux, and are easy to install.

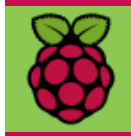
OS versions are can be downloaded and “burnt” to an SD card or USB device using *Pi Imager* software.
(available for Windows, Mac or Pi)

Operating System Storage Devices

The Pi 400 and other Pi models are designed to boot from a micro SD card.

However, it is easy to create a Pi-compatible OS on a USB thumb drive or USB SSD (solid state drive). The Pi will automatically look for the OS on a USB device if no SD card is present.

The USB ports on the Pi 400 can be used to add file storage drives, or the OS drive itself can be used for file storage. Connection to a NAS on the local network is easy, and cloud storage can also be used.



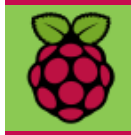
About Storage Devices

Storage devices (SD, USB or SSD) have different capabilities.

Not all SD cards are fast enough to be used as a boot device.

In general, a USB drive is faster than SD card, and SSD is faster than a USB drive.

All of these drives use the same underlying technology (flash memory) but internal architecture determines performance and cost.

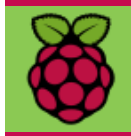


Storage Device Speeds

Typical (nominal) data transfer speeds:

Device	Transfer speed (MB/sec)	Cost and Capacity
Micro SD card	100	$20 (32GB)
USB drive	150	$23 (128GB)
SSD (solid state drive)	450	$55 (256GB)

Note: These figures are for specific models of each device type. Performance can vary greatly depending on design, quality and price.



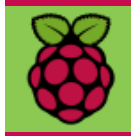
SD card burning

PCs or laptops typically have a full-size SD card slot, but micro SD cards can be used via an adaptor:

If your PC has no SD card reader, USB adaptors are available:

Pi 400 drawbacks

- No Zoom app (although some users have run Zoom via Box64 emulation).
- No inbuilt speakers or audio port, but can run speakers via USB, Bluetooth or through HDMI monitor.
- No hardware power switch, but F10 key can be used to power off.



Pi 400 kits

Pi 400 kits are available in 2 formats at about the same price ($160 to $175). Need own monitor or TV.

1. Pi 400 keyboard, mouse, HDMI cable, power adaptor, Pi OS on micro SD card, hard copy manual. (Manual is also available online as a free PDF)

2. As above, but with manual replaced by a *Pico* kit. Pico is a microcontroller board (like *Arduino*) designed for electronic interfacing projects.

Australian Pi 400 suppliers

Core Electronics (on special at $160 until 24th June):

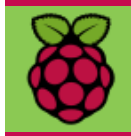
https://core-electronics.com.au/raspberry-pi-400-kit.html

Pi Australia (part of Little Bird Electronics):

https://raspberry.piaustralia.com.au/products/

Also available at *Jaycar* stores but prices are higher.

Can be found on *Amazon* but at ridiculous prices ($400+).



Useful Links

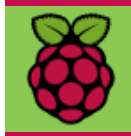
Raspberry Pi Foundation
https://www.raspberrypi.org/

Raspberry Pi Beginner's Guide (free PDF, 248 pages):
https://magpi.raspberrypi.com/books/beginners-guide-4th-ed

Pi Imager (for burning your choice of OS to SD, USB or SSD)
https://www.raspberrypi.com/software/

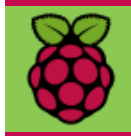
Ubuntu Mate for Pi (alternative Linux OS)
https://ubuntu-mate.org/raspberry-pi/

Numerous Pi tutorials are available on YouTube, e.g.
https://www.youtube.com/watch?v=h86D_6yh1nk



Any questions before live demonstration?

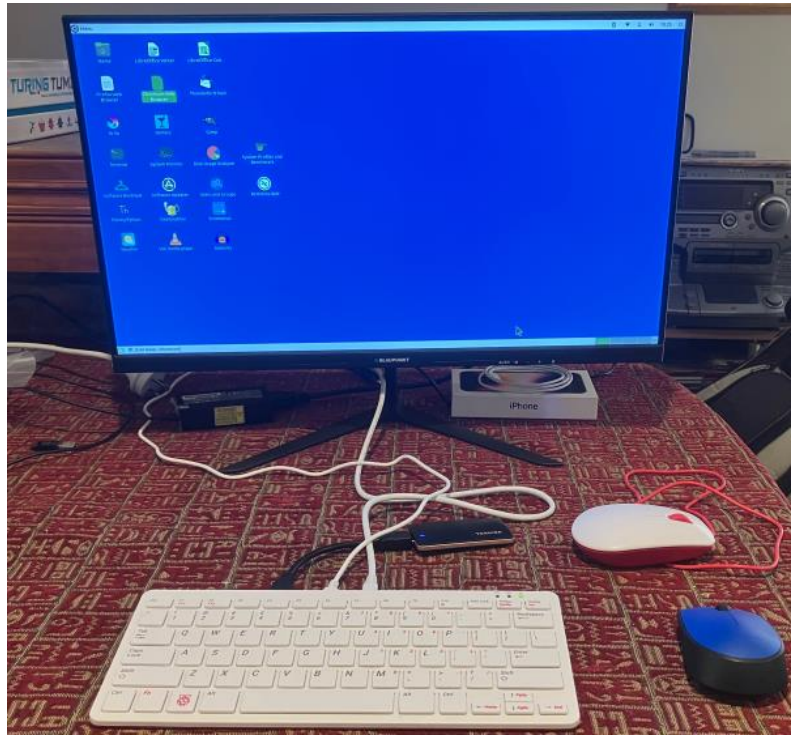
Questions can be emailed later to:
help@u3abrisbane.org.au



Pi 400 demonstration

The Pi 400 will now be demonstrated. This will be done via a *Remote Desktop* connection from my Windows PC.

The Pi 400 shown is running *Ubuntu Mate* OS rather than the native *Pi OS*, booting from a USB SSD. Connected via WiFi to local network. Wireless mouse installed.



Main applications installed (all are open source software):
Thunderbird mail, Chromium browser, Firefox browser.
LibreOffice.
GIMP (image processing app, like Photoshop).
VLC Media Player.
Thonny Python (programming language).
Audacity (audio editor).