What is ‘FAST’?

- Programme for Wed 5th April 2023
- 1945 Introduction
- 1950 Performance 1994 to 2023
- 2010 What is ‘FAST’?
- 2030 Building it yourself
- 2045 Question & answer
- 2100 Close

Presentation

- Aim is to promote questions & discussion
  - Performance measurement;
  - Comparison of recent hardware
    - Pinebook Pro, CM4, Titanium, 4té², FAST.
  - FAST
    - Is it an acronym?
    - A description of what is available now.

Who am I?

- I have been interested in computer programming, in BASIC, since 1972
- My name is Chris Hall
  - Chartered Mechanical Engineer
  - Career in Nuclear Safety, now retired
  - Have used RISC OS to publish several books
  - Maintain a web site
  - Volunteer on a Heritage Railway

Notes of the talk

- I shall be using a printed set of notes for the talk which are available at:
  - http://www.svrsig.org/WROCC3.pdf
- Aspects of performance
  - Processor raw speed (MHz)
  - Processor efficiency (pipeline, cycles, cache)
  - Memory speed
  - Filing system efficiency

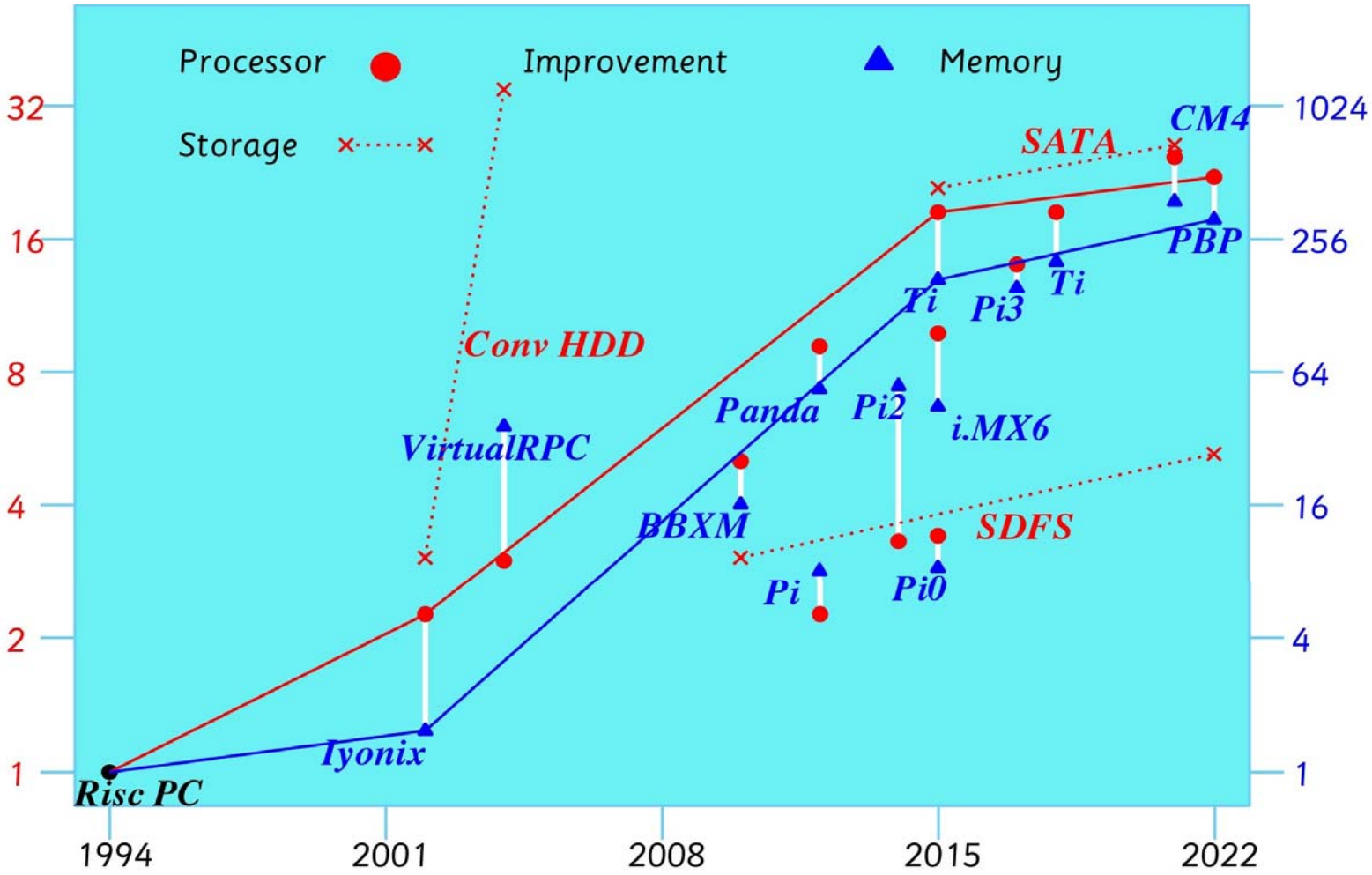
Recent developments

- 2012 – SDFS & Raspberry Pi
- 2015 – AHCI (SATA), Titanium & ARMX6
- 2019 – Pi model 4B
- 2022 – RISC OS on Pinebook Pro
- 2023 – AHCI for Compute Module 4
- 2023 – NVMe and WiFi drivers?
- 2024 – USB 3 speeds?

Performance

- Difficult to measure ‘overall’ performance
- Different tasks perform best on different hardware
  - Screen resolution (1920x1200 on Titanium)
  - Hardware acceleration of graphics?
  - Floating point in hardware?
  - Some of these are ‘invisible’

Performance since 1994



Limitations

- Storage speed is limited by interface clock
  - SDIO (SDFS) 50MHz (50MB/s)
  - PCIe (SATA) 3Gb/s (400MB/s)
- And by filing system (Filecore/fat32fs)
- Processor speed by Quantum effects
  - RISC OS only uses one core
- Memory runs at full clock speed

Compear apples and pairs

A comparison of the recent hardware that can run RISC OS								
	VRPC	ARMX6	Pinebook	Titanium	Pi 400	CM4	CM4 Lite	Pinebook Pro
Processor MHz	3504	1008	1152	1500	1800	2000	1500	1800
Processor type	x86	A9	A53	A15	A72	A72	A72	A72
RAM	160MB	2GB	2GB	2GB	4GB	4GB	1GB	4GB
Proc speed	4x	10x	9x	20x	25x	28x	20x	25x
RAM speed	65x	45x	90x	200x	340x	380x	280x	330x
Disc speed	****	***	*	***	**	***	**	**✱
HD read MB/s	618	79	22.3	119	31	350	34	23
random read kB/s	6338	1982	146	2557	356	3100	439	1366
Hard disc	m.2 SSD	SATA	USB/SATA	SATA	USB/SATA	SATA	USB/SATA	eMMC
Price	£60 + PC	£299	£450	£899	£150	£250	£100	£520

- Clear win: Titanium, CM4 & Pinebook Pro
- Portability, screen size, case size, silence
  - These will be as important as performance

Pi model 4B versus CM4

- Pi 4B relies on USB3 for fast storage
- CM4 deletes USB 3 and adds PCIe
  - Minor problem – RISC OS needs PCIe to be populated (but this may be solved in 5.30)
  - Various PCIe boards are available offering NVMe, USB 3 or SATA for fast storage
  - Waveshare offer an IO board with NVMe
  - CM4 availability poor (also Pi 4B)

FAST – what is it?

- FAST – Fast ADFS Storage Technology
  - Waveshare PCIe to SATA board for CM4
  - Pi model 4 range (model 4B & CM4) already has fast clock for memory and processor
  - Other PCIe boards exist (e.g. NVMe, USB)
  - No NVMe driver yet for RISC OS
  - RISC OS requires PCIe populated with CM4
- RISC OS Bits offer a SATA-aware ROM

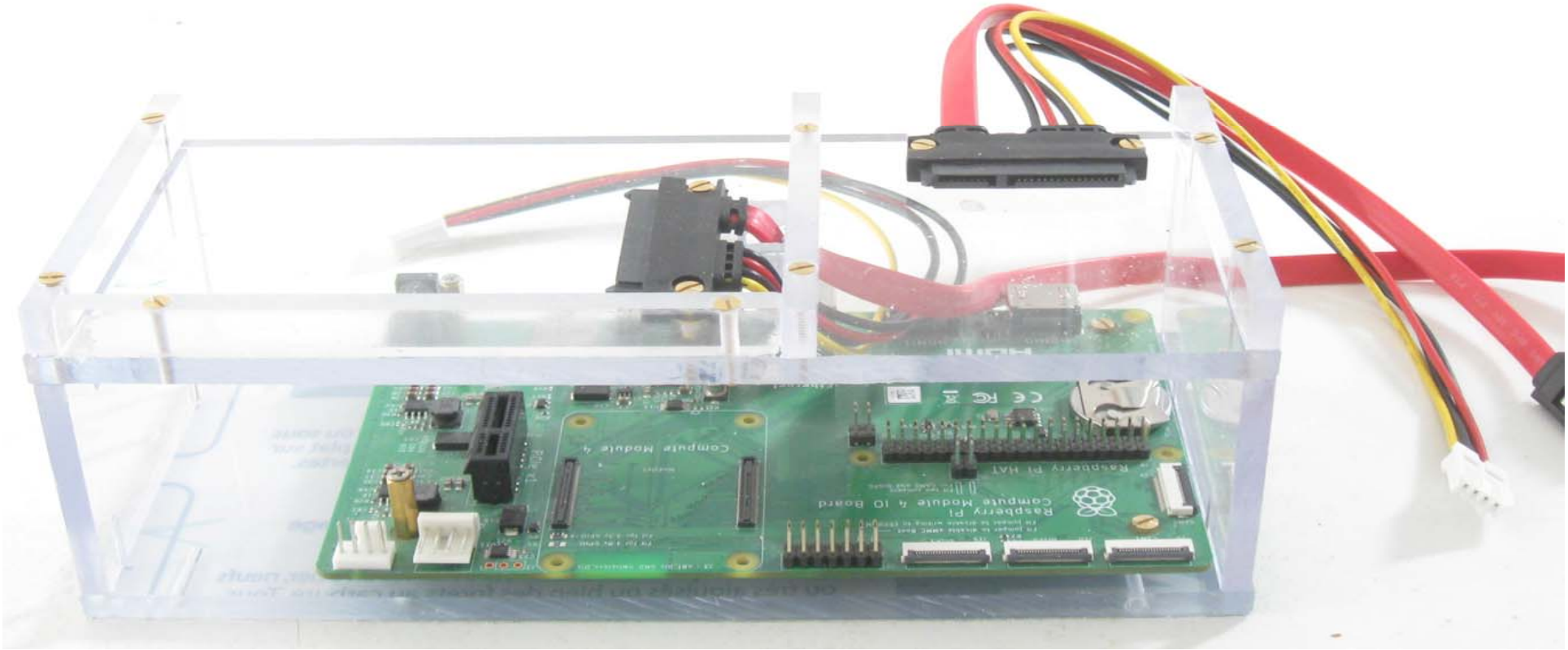
What is available now?

- I/O board and PCIe/SATA boards in stock
- CM4 module sold out
  - Can obtain CM4 on ebay at a price!
  - New stock expected Q3 2023
  - Some pre-built systems available from RISC OS Bits
- So I built my own case!

Build it yourself

- It is simple to put together, the most difficult bit is to get hold of a CM4!
- A 12V power supply is required for SATA
- The ‘Lite’ version of CM4 is recommended
  - The RISC OS Bits ROM cannot yet ‘see’ eMMc
  - A ‘dual boot’ solution is complicated
- SD card & ROM supplied by RISC OS Bits

Making a start



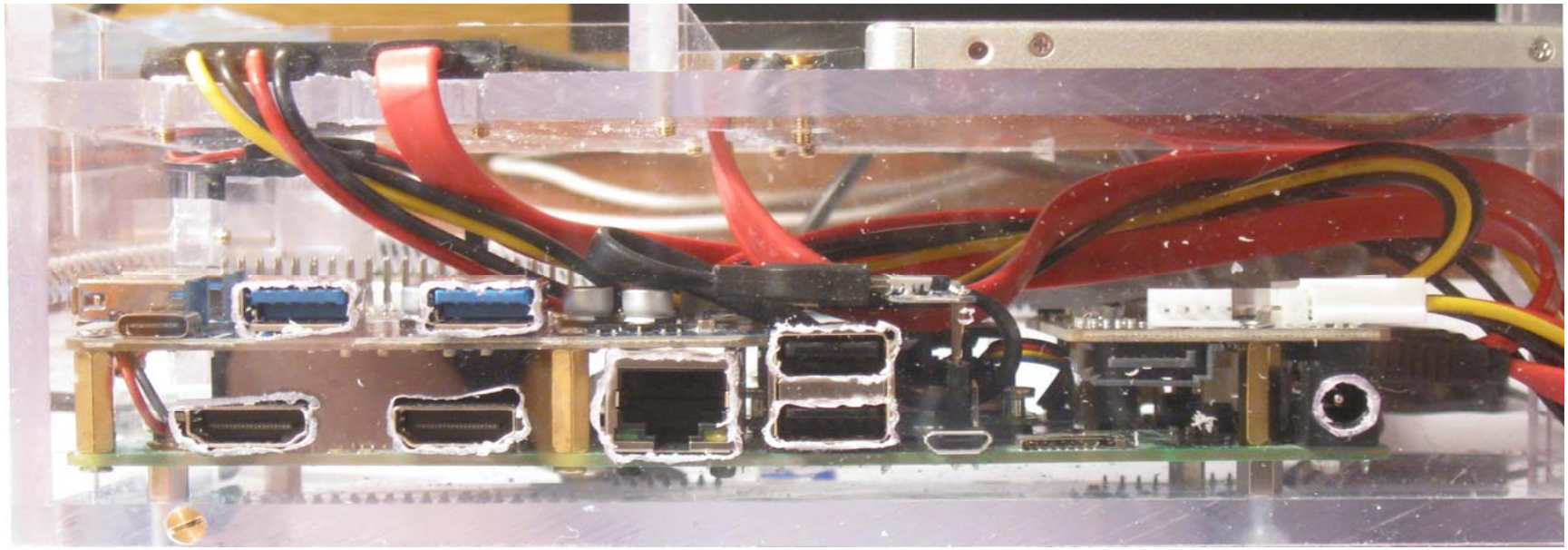
- Case with IO board and SATA cables

The ‘extra’ bits

- USB hub HAT – connects to USB header
  - Offers two extra USB 2 sockets
- PCIe to SATA board – plugs in to PCIe slot
- Fan & heatsink for CM4 board
- Solder a header to ‘RUN’ pad for reset switch (if required)

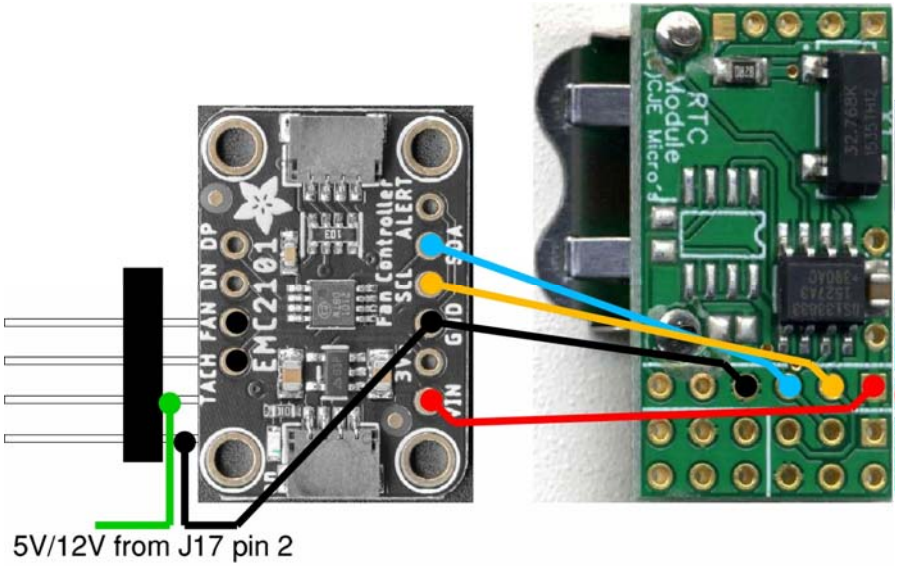
WROCC 5th April 2023

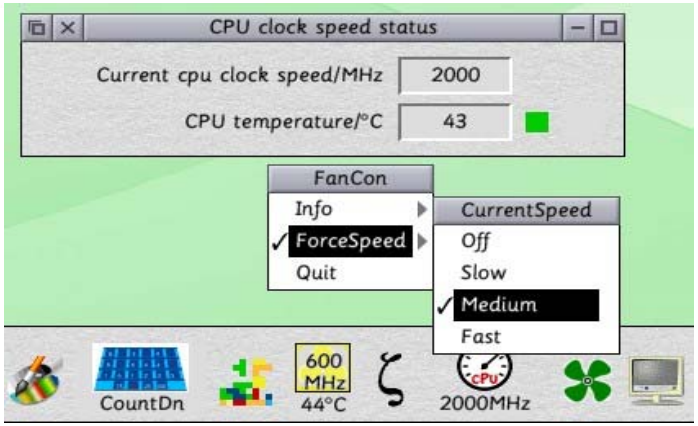
The back panel



- 2xHDMI; 4xUSB; 1xEthernet; 12V power
  - Cutting polycarbonate is not perfect!
  - Drive bay for second SSD drive (cold plug)

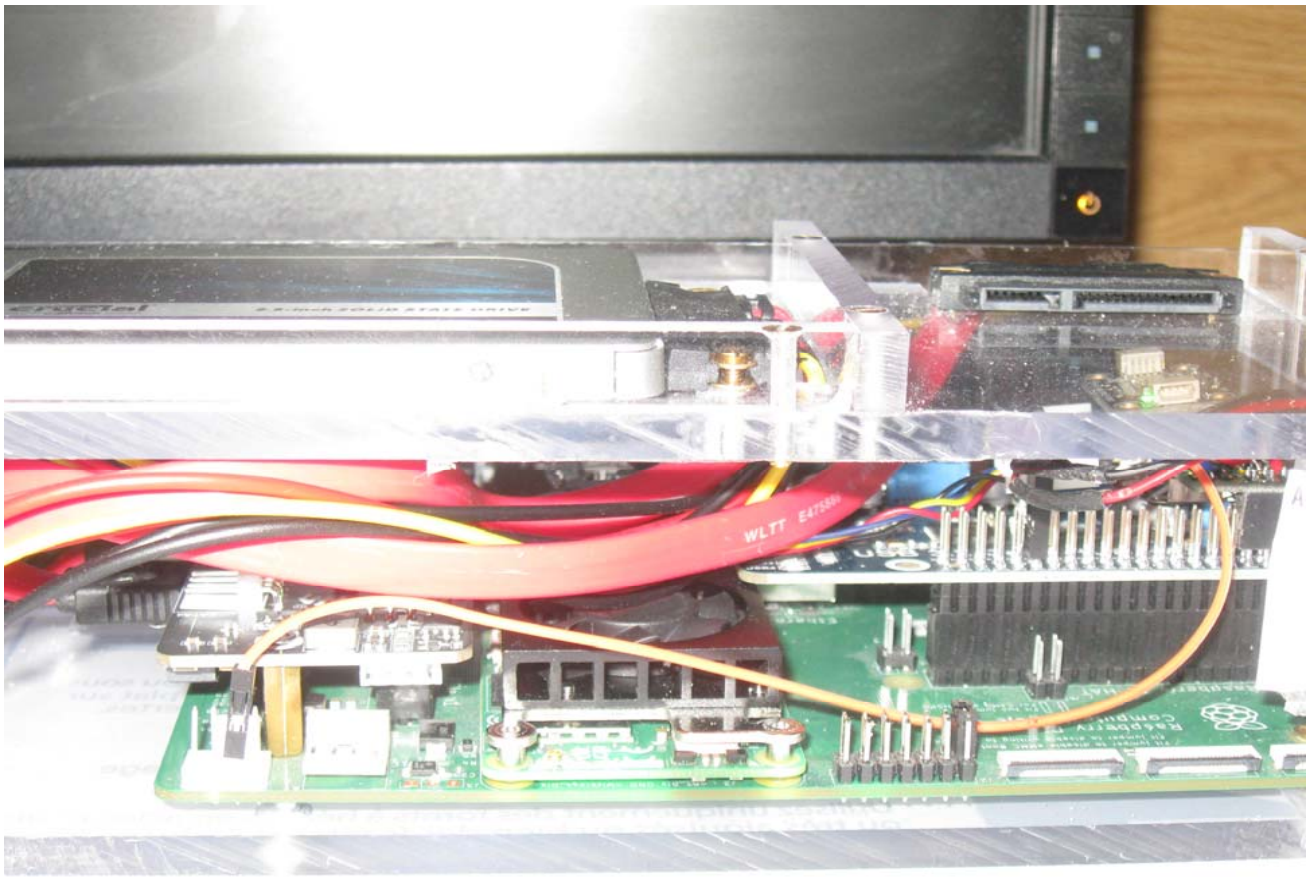
Adding a fan





- Adding a fan header to the RTC board
- The utility ‘FanCon’ controls the fan

The fan header in place



Overall impression

- Marginally faster than Titanium for most tasks and has greater screen resolution
- Much faster than ARMX6
- Large footprint compared to Pi model 4B
- Some loose ends
  - SATA CD drive; eMMc not seen; sound
- Lots of bundled software.

Question & Answer

- I will do my best to answer – fire away!