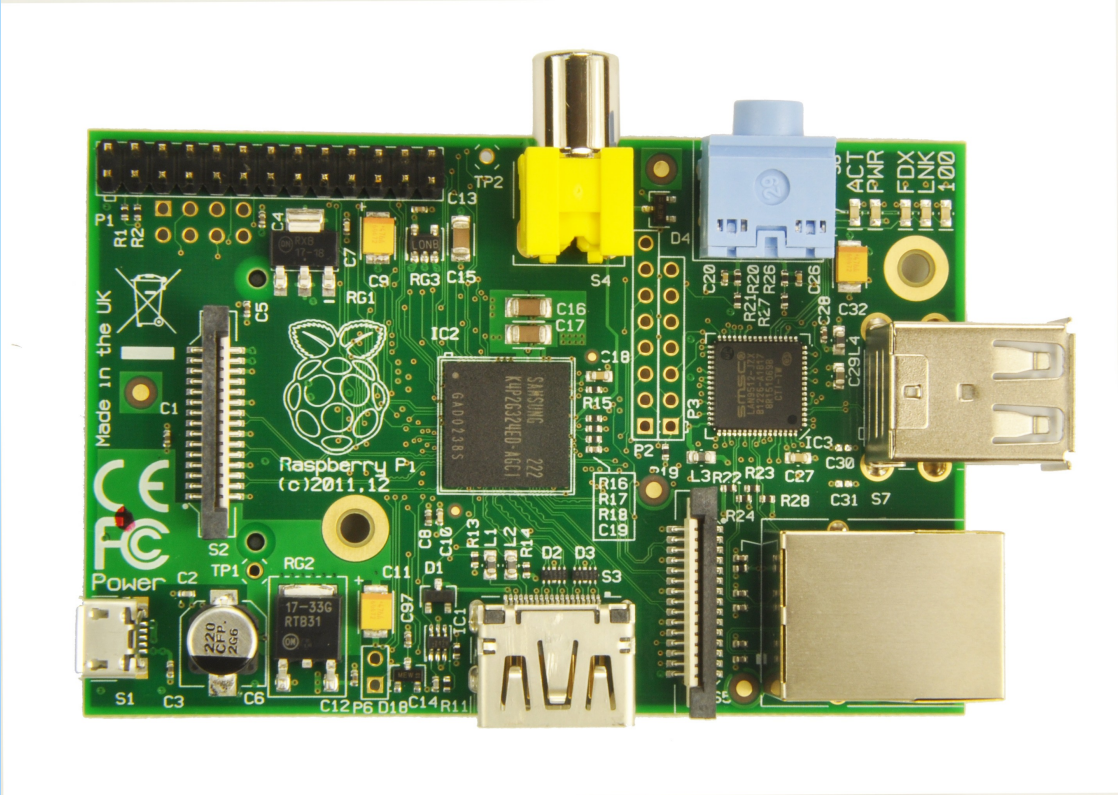
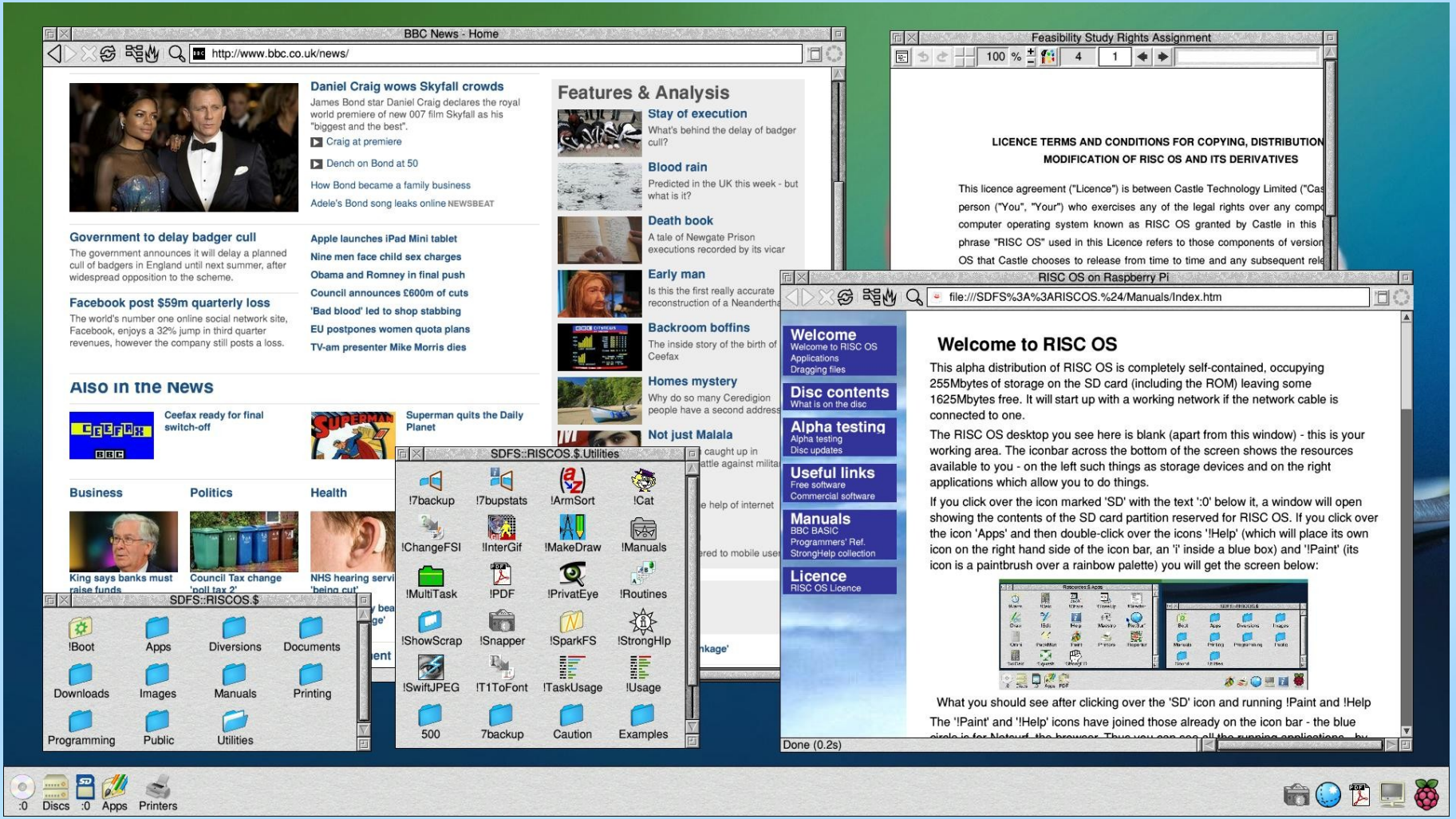
Raspberry Pi, RISC OS, Raspbian and the Big Picture



Gordon Taylor

RISC OS at 1920 x 1080



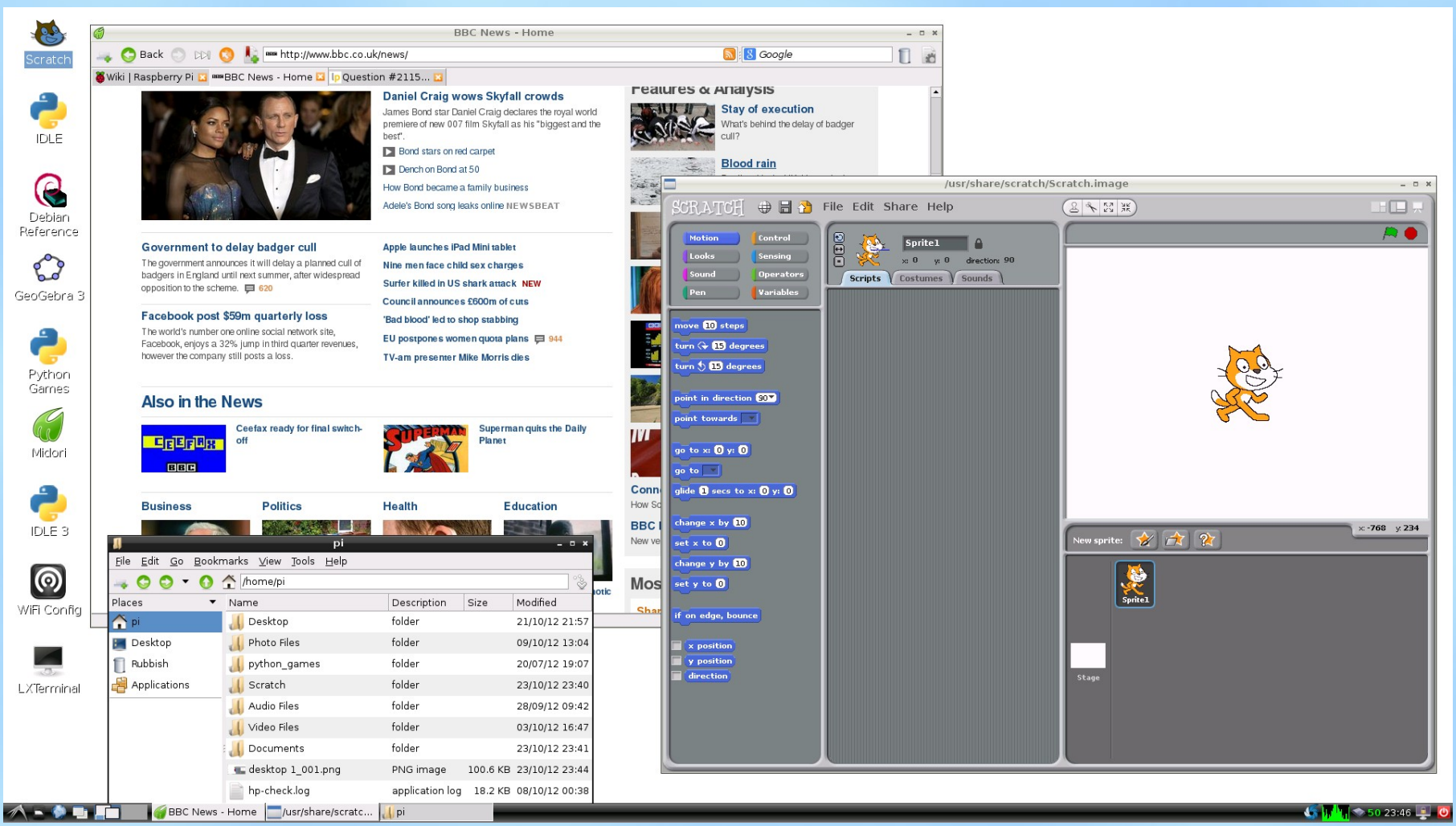
RISC OS

- A fast and lightweight platform, requiring little RAM
- Runs paid-for software, from small businesses
- Runs open-source software, from the community
- Can drive paid-for hardware expansions
- Can drive open-source hardware projects

RISC OS

- Is proven in schools, both UK and overseas
- Is particularly suitable for Primary schools
- The usual interface is Graphical – with Icons
- For textual programming, BBC Basic is included
- For graphical programming, Scratch can be added

Raspbian at 1920 x 1080



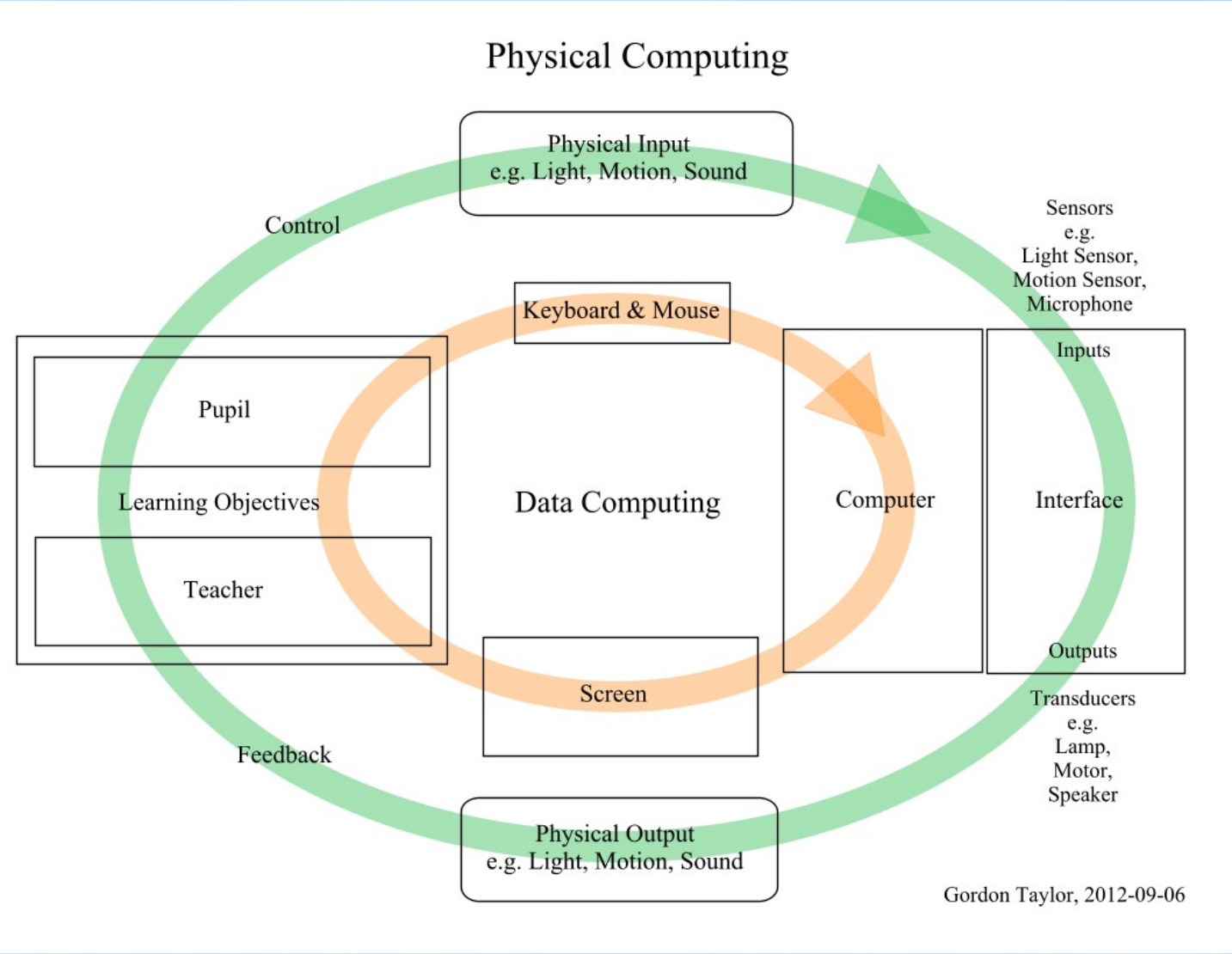
Raspbian (Linux)

- Is proven in universities, both UK and overseas
- Yet can also be used in schools and at home
- For Primary, it can start with a Graphical interface
- For graphical programming, there is Scratch
- For textual programming, Python – and many more

Raspbian (Linux)

- Over 10,000 apps can be downloaded for free
- Linux can be used on x86 PCs at home or at work
- (K)Ubuntu Linux is very similar to Raspbian
- Both are based on Debian Linux
- Linux is available for every processor & platform

Data Computing, Physical Computing



Data Computing

- This uses only the keyboard and screen + printer
- Major apps are word processing and spreadsheets
- Others include 'painting', 'drawing' and CAD
- All these are available for RISC OS and Raspian
- They already run fast enough and will be faster

Media Computing

- This uses a remote control and a TV screen
- The Media Player can be a Pi running Raspbmc
- It has power enough for HD video and audio
- The Media Server can be a Pi running SqueezePlug
- It consumes only 3-5 W, for 'always-on' operation

Physical Computing

- Physical computing interacts with the real world
- Thus the inputs are from sensors e.g. temperature
- And the outputs are via actuators e.g. motors
- Most such systems are 'embedded' in devices
- Some run continuously, so low power is important

Physical Computing

- Is taught as 'Measurement and Control'
- All measurements should be calibrated
- Most controls are 'closed loop', with 'feedback'
- For stability, the feedback must be negative
- Such control loops operate also in natural systems

Control in Natural Systems

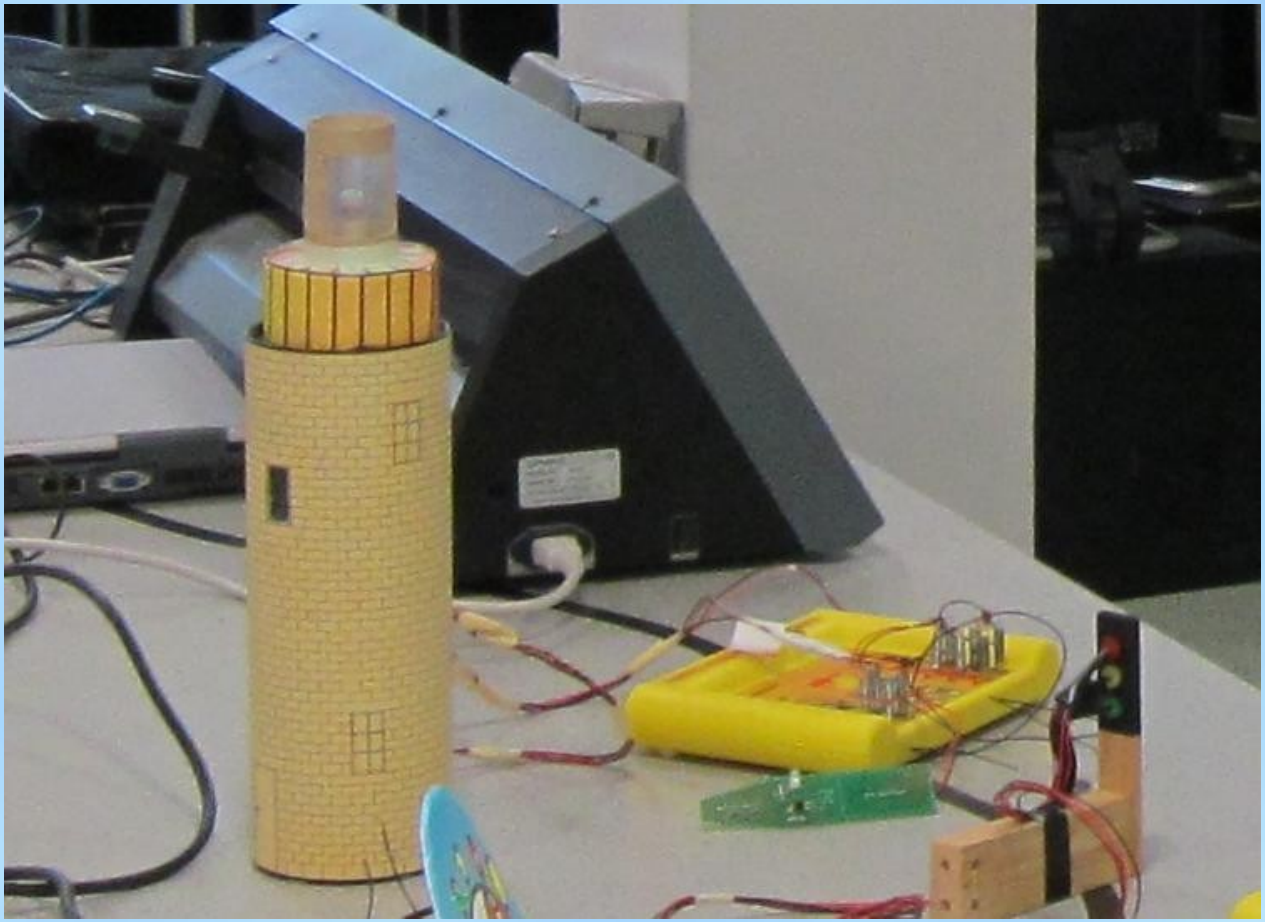
- Human body temperature – usually stable at 37 C
- Global average temperature - rising
- Polar temperatures – rising faster
- Rising temperatures are due to positive feedbacks
- Such temperature rises are almost irreversible

Control in Primary Schools

Pi with e.g. Data Harvest FlowGo Interface

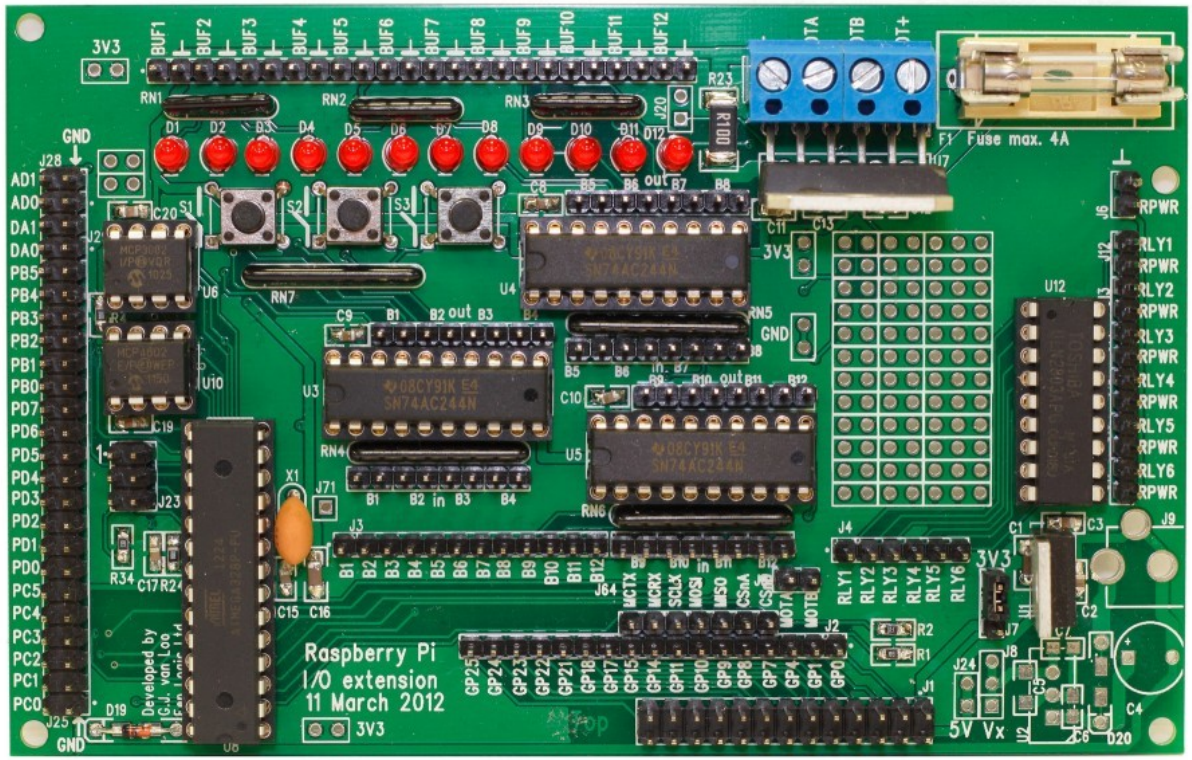
Control in Primary Schools

Data Harvest FlowGo controlling Lighthouse



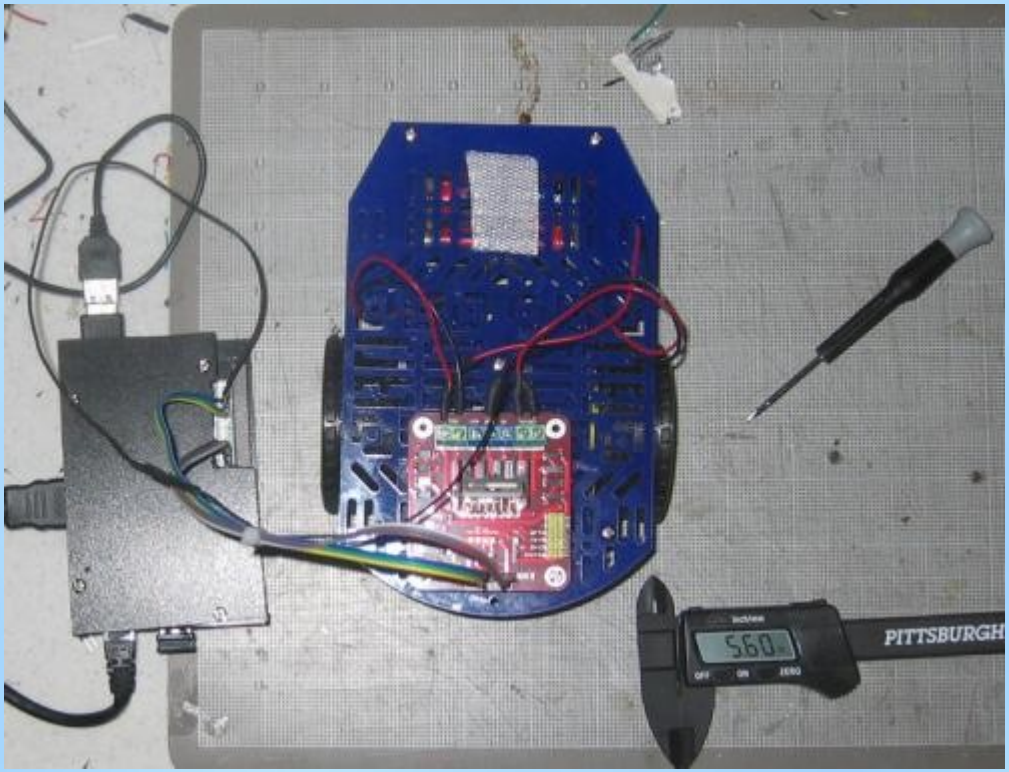
Control in Secondary Schools

Pi with e.g. Fen Logic GertBoard



Control in Secondary Schools

Pi Control of Dual H-Bridge with Software PWM



Control in Industry

Pi with e.g. Heber X10i

Control in Industry

Heber control for 'A Good Cup of Tea'

The Big Picture

- ARM processors are the most numerous worldwide
- They are dominant in smartphones and tablets
- With higher energy efficiency than x86 processors
- This is crucial for battery-powered devices
- And becoming more so for mains-powered devices

The Big Picture

ARM 'big-LITTLE' can extend battery life by up to 70%

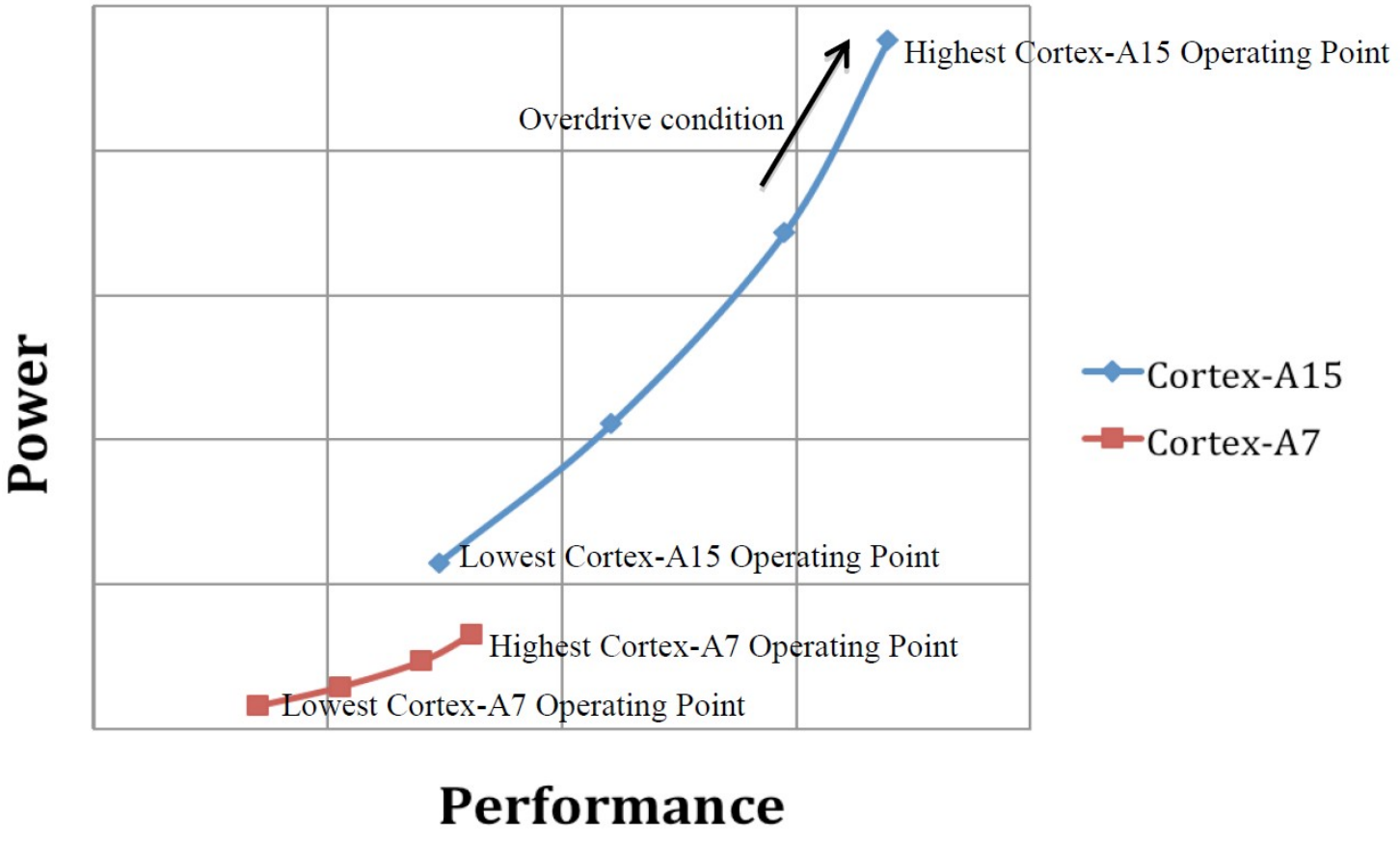
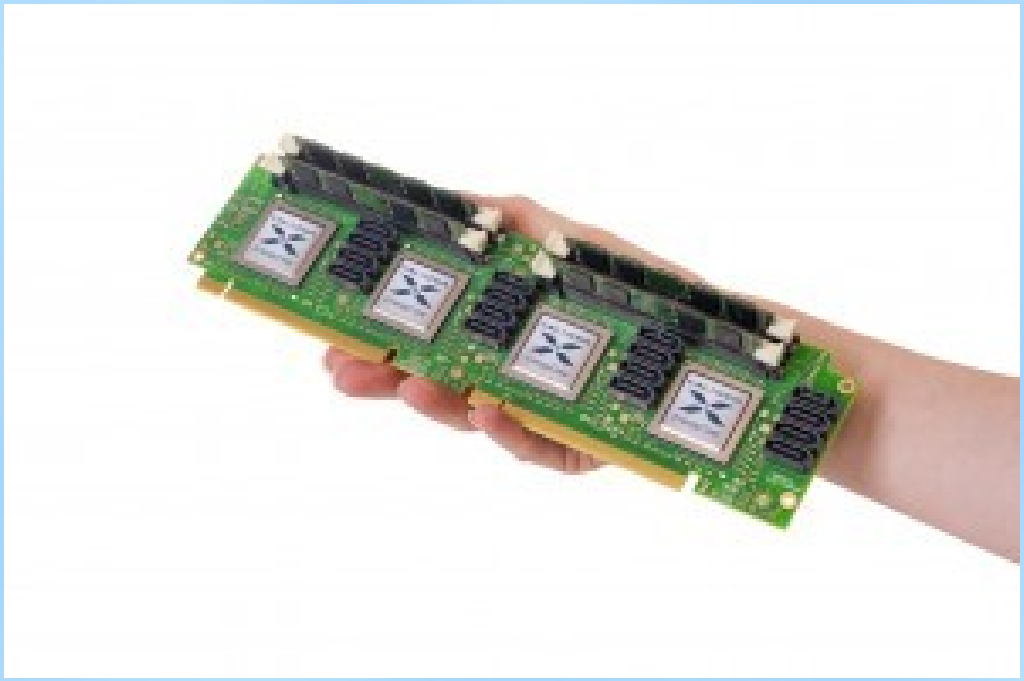


Figure 4 Cortex-A15-Cortex-A7 DVFS Curves

The Big Picture

ARM servers have ~ 10x energy efficiency of x86

Each Calxeda EnergyCore takes 5 W, idles at 0.5 W



The Big Picture

- Pi's can replace Wintel PCs in schools and homes
- This will save money for schools and parents
- So it will save money for the UK economy
- The Pi is a better platform for learning and doing
- So it will increase income for the UK economy

And Finally..

Comments and questions:

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