



CarpentriesOffline - A mini HPC

Dr Jannetta S Steyn

Newcastle University

Tue 2025th Mar, 27

If luck is on our side, this might be the first ever slide show delivered from a high performance computer
If not, I'll just use it as a prop.

Introduction

A mini HPC from Single Board Computers

- ▶ **Why:** Is it a helpful thing to do or just for fun?
- ▶ **How:** Hardware and Software Selection.
- ▶ **Cost:** How much will this cost
- ▶ **Conclusion**

Why?

Some Questions and Issues

- ▶ How many people ever get to see an HPC?
- ▶ Hardware less abstract
- ▶ Real system are busy doing actual research (85 - 95% load on systems)
- ▶ Fear amongst learners that they are going to break the multi-million £ system they are playing on
- ▶ Resource limits more apparent
- ▶ More control over the environment
- ▶ No need to have accounts on a real HPC
- ▶ No need for expensive cloud hosting
- ▶ Own access point, so independent of university networks or the Internet

Hardware

6 Node Specification

- ▶ 1 x Login node
- ▶ 5 x Compute nodes
- ▶ 1 x Access point
- ▶ 1.8GHz Broadcom BC2711, Quad core Cortex-A72 (ARM v8 64 bit SoC)
- ▶ 4GB RAM

Hardware

Shopping List and Costs

Item	Cost	Qty	Total
Raspberry Pi 4B	£34.00	7	£204.00
PoE Hat	£20.00	7	£140.00
10 port switch with 8 x PoE	£190.00	1	£190.00
Patch cable - pack of 8	£10.00	1	£10.00
USB to SATA Adapter	£9.00	1	£9.00
120GB SATA SSD	£10.00	1	£10.00
80mm 5V USB fans - pack of 2	£10.00	1	£10.00
10" GeeekPi Rack	£110.00	1	£110.00
Total			£683.00

Raspberry Pi 4B option

HardWare

The three stages of a miniHPC



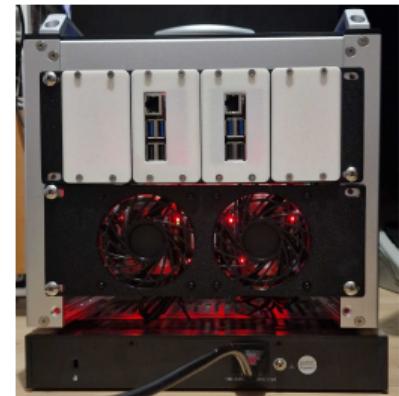
(a) Prototype 1



(b) Prototype 2



(c) Prototype 3 front



(d) Prototype 3 back

The Evolution of a miniHPC

Software

Standard HPC Software - Typical Hardware Configuration

- ▶ Slurm scheduler
- ▶ Shared NFS mounts
- ▶ lmod
- ▶ munge
- ▶ EESSI for software installations



The Carpentries Offline Solution

Making it easier for non-specialists

- ▶ Downloadable image for booting RPi
- ▶ No specialised HPC knowledge required to set up
- ▶ Community maintained (The Carpentries way)
- ▶ HPC Lesson material adapted for miniHPC
- ▶ Expandable with regards to hardware and software
- ▶ Also suitable for HPC hardware and config training



Thank You For Listening
Any Questions?



www.jannetta.com



carpentriesoffline.org