## How to build a GPU cluster

Christopher Milan

AI Safety at UCLA

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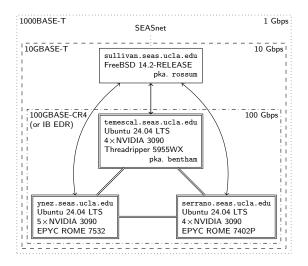
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- I spent a significant amount of my time this past year building out our servers.
- These slides will be available online at ais-ucla.org/~chris.

While setting up and administrating our servers, I ran into many interesting challenges.

This talk will focus on how we chose our hardware.

There are many other interesting things to learn from this cluster, check out our  ${\rm blog.}^1$ 

<sup>1</sup>blog.aisafetyatucla.org



• Memory bandwidth:

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- PCIe lanes: EPYC ROME has 128 PCIe 4.0 lanes.



Figure: ASRock Rack ROMED8-2T

• Reasonably priced (at the time...)



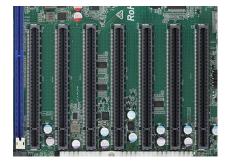
## Figure: ASRock Rack ROMED8-2T

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### Figure: ASRock Rack ROMED8-2T

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### Figure: ROMED8-2T PCIe slots

- Reasonably priced (at the time...)
- 7×PCle 4.0x16 (but slot #2 is cursed)
- The slots are too close!

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- Solution: PCIe risers

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- Solution: PCIe risers
- Surely nothing could go wrong...

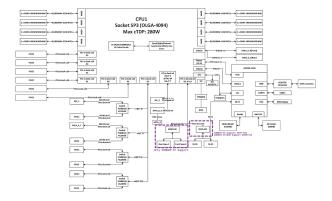


Figure: PCIe risers on temescal

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Figure: AER errors, image from Nathan Odle

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#### Figure: ROMED8-2T block diagram

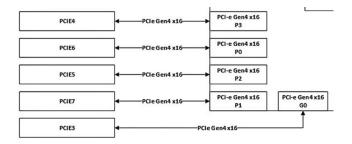
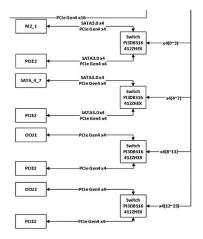


Figure: PCIe slots on ROMED8-2T



#### Figure: Remember slot 2? This is him now

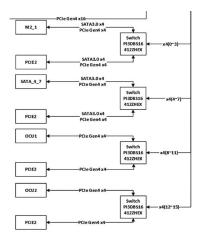


Figure: Remember slot 2? This is him now

All this switching causes signal loss!

Similarly, adding risers does too.

Why is this a problem?

Why is this a problem? Because at 350W/ea. one power supply is not enough for 6 GPUs.

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Taping off the PCIe slot power just causes the cards to fail to be recognized.

 Just ignore it and have fewer GPUs.

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## Figure: SlimSAS/MCIO connectors

## Dartmouth Summer Research Project on AI

An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves.

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- A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence, August 31, 1955

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Solving problems requires tons of repeated trial and error.

For a sufficiently advanced system, ensuring its goals are the same as ours is a non-trivial task (see universal paperclips). For a sufficiently advanced system, ensuring its goals are the same as ours is a non-trivial task (see universal paperclips).

It stands to reason that alignment will be similarly difficult.

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However, we only get one try.

Visit our website at ais-ucla.org.

Some programs we run:

- Intro to AI Safety Fellowship (ais-ucla.org/fellowships).
- Upskilling Tracks (ais-ucla.org/upskilling-tracks).
- Reading Group (ask Will).
- Server access (ask me).