School of Computer Science & Engineering

Trustworthy Systems Group

In and Around LionsOS

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Outline

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- What progress have we made in the past year?
- What do we have now?
- ‘Unique’ problems and how we’re solving them.
- Demo.

LionsOS design

- You start with a clean slate. The system designer chooses what components, I/O systems, client programs to have.

Microkit

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- Asynchronous or synchronous communication.
- Microkit lowers the bar to seL4 but does not include drivers or other higher-level OS services.

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- Most effort around implementing/upstreaming requested features:
  - Hypervisor/Virtual Machine support.
  - Architecture support (RISC-V merged, x86 still in-progress).
  - More platform support.
  - Various fixes, quality-of-life improvements.

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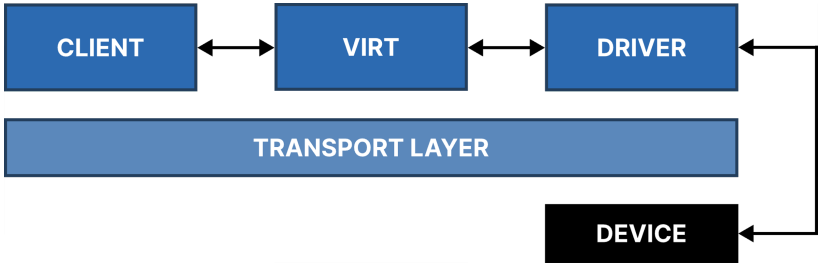

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  - Audio
- And have made various progress on:
  - Graphics (2D)
  - GPIO
  - Pinmux
  - Clock

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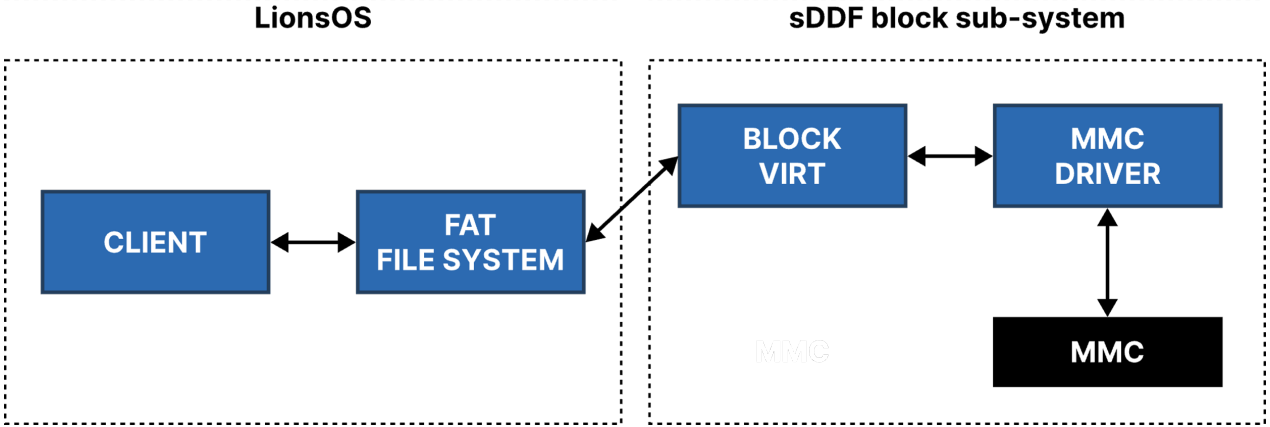

Virtualisation

- Main updates are that:
  - RISC-V support is now working.
    - Although it depends on seL4 changes that are yet to be mainlined.
    - Plan to create an RFC and start upstreaming the changes.
  - virtIO devices.
    - We now have virtIO implementations for console, block, network and audio devices.
  - Multi-core guests are being worked on as well.

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- But, there is a spectrum.
- Two approaches to address this:
  - Template protection domains.
  - Introducing more dynamism into sDDF, specifically with hot-plugging.
    - Able to eject/insert MMC cards in a live system.
    - Yet to apply hot-plugging to other device classes.

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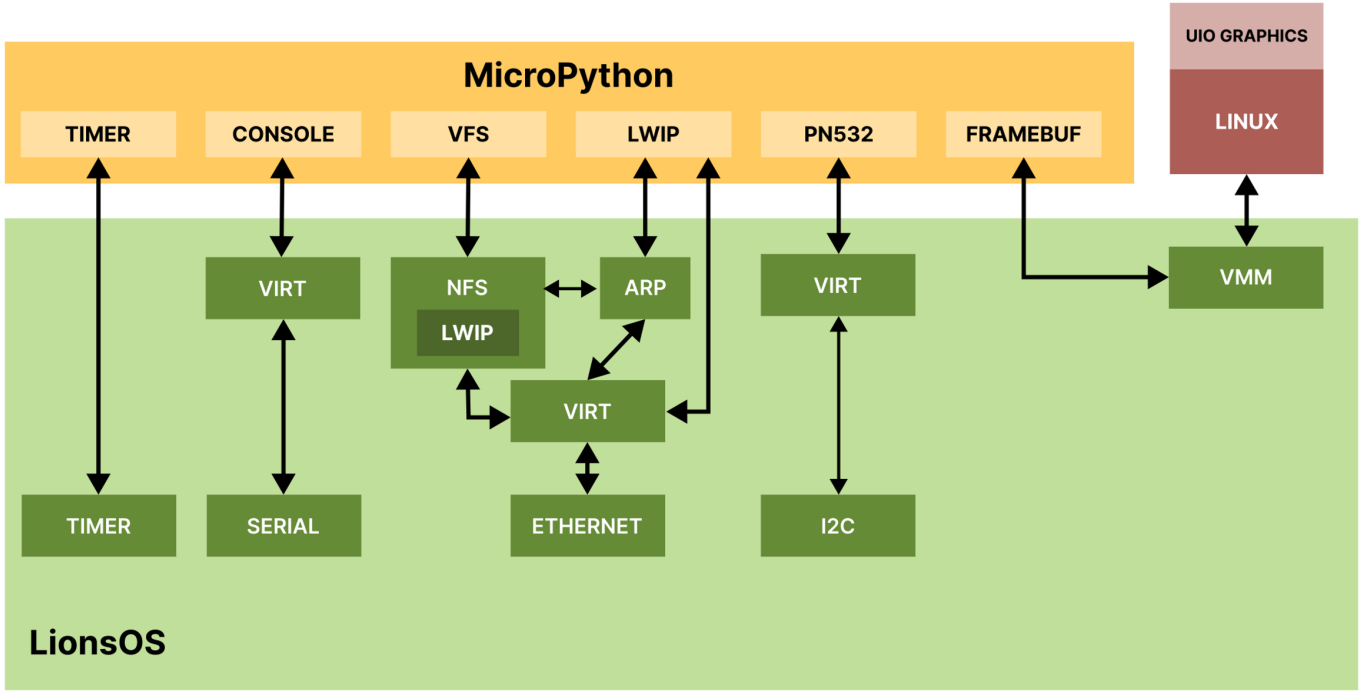
- Web server, serving the seL4 website (https://sel4.systems).

Reference system (Kitty)



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  - Combining various components and I/O sub-systems in a single system does not scale well.
- With a static architecture, some of the run-time complexity in a typical OS shifts to build-time in LionsOS.

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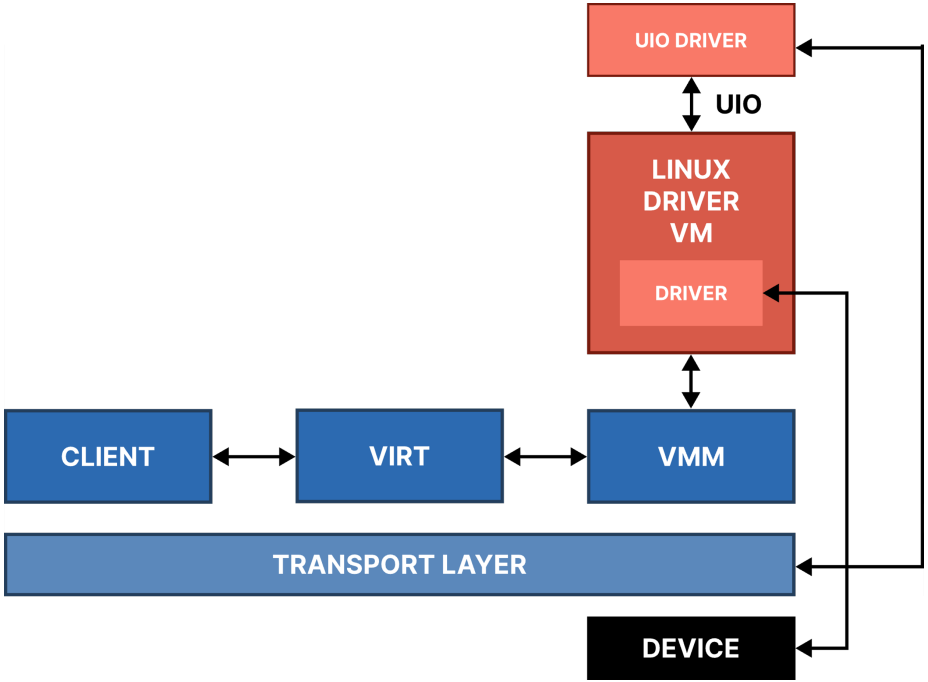

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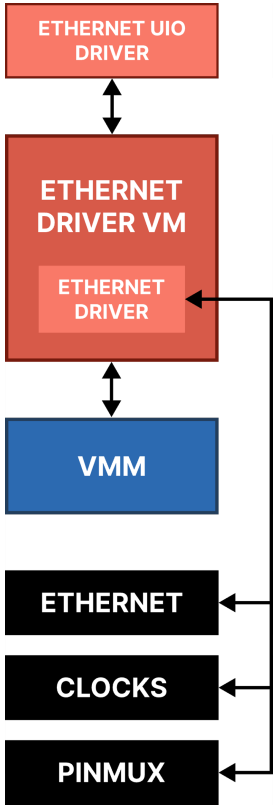

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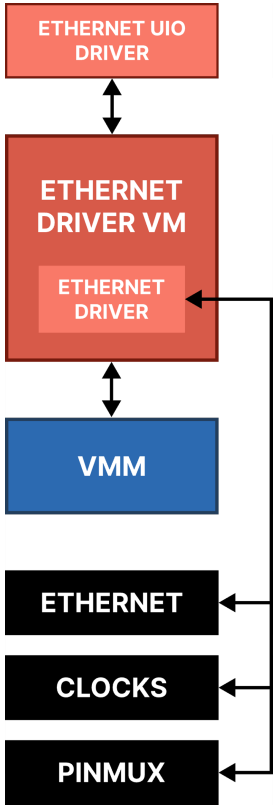
- Trap and emulate access to clocks/pinmux devices and rely on native drivers instead.



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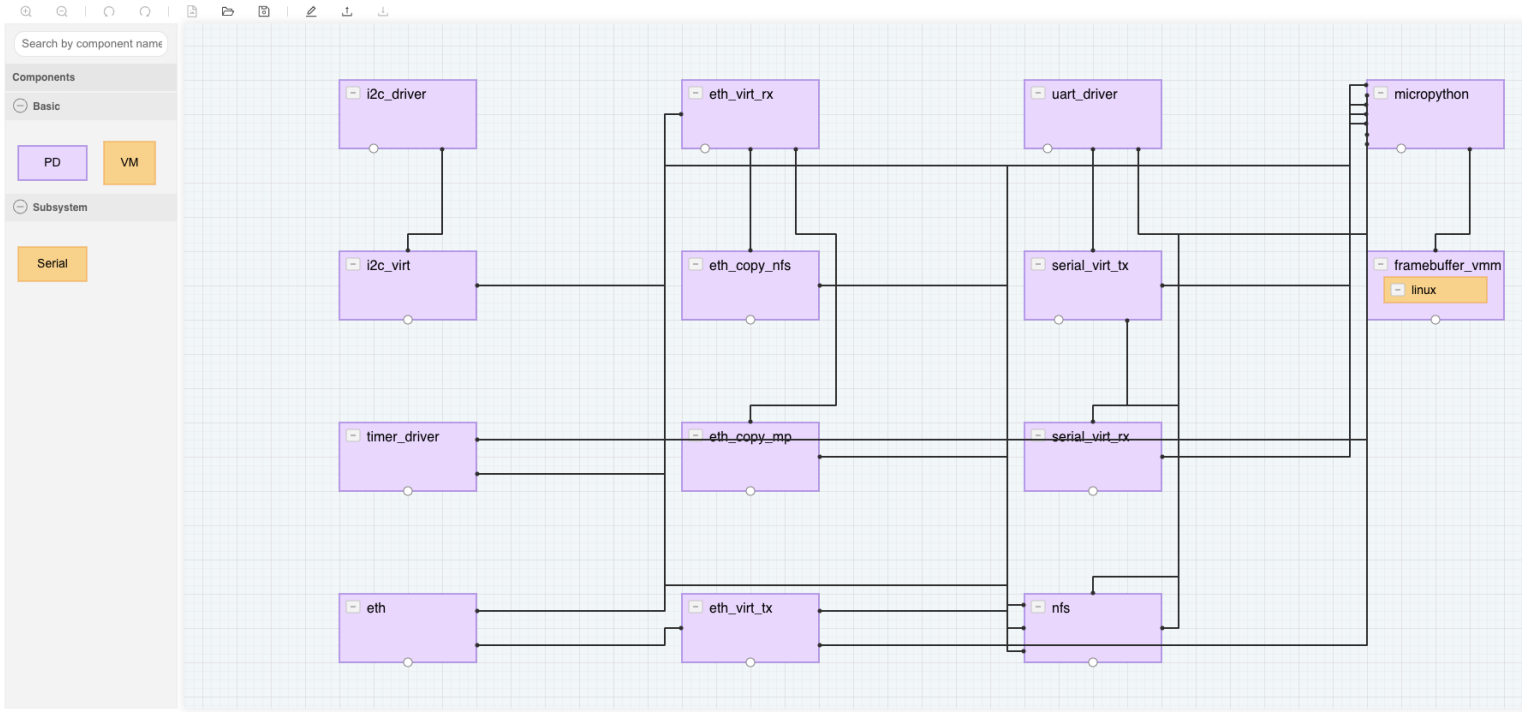
- Starting to receive internal use, still experimental.

System visualiser/editor



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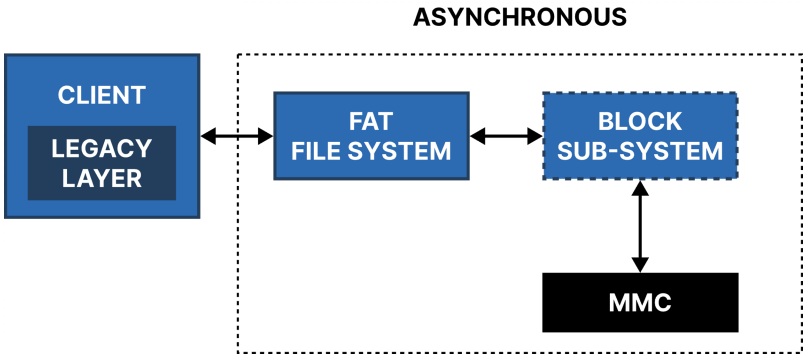

Demo

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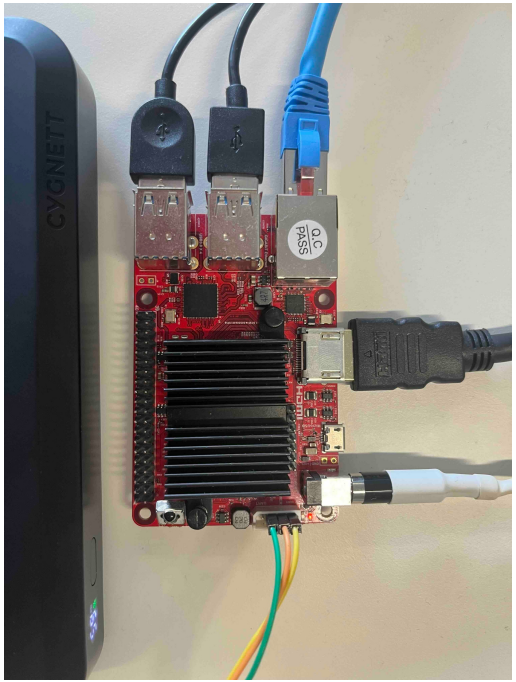
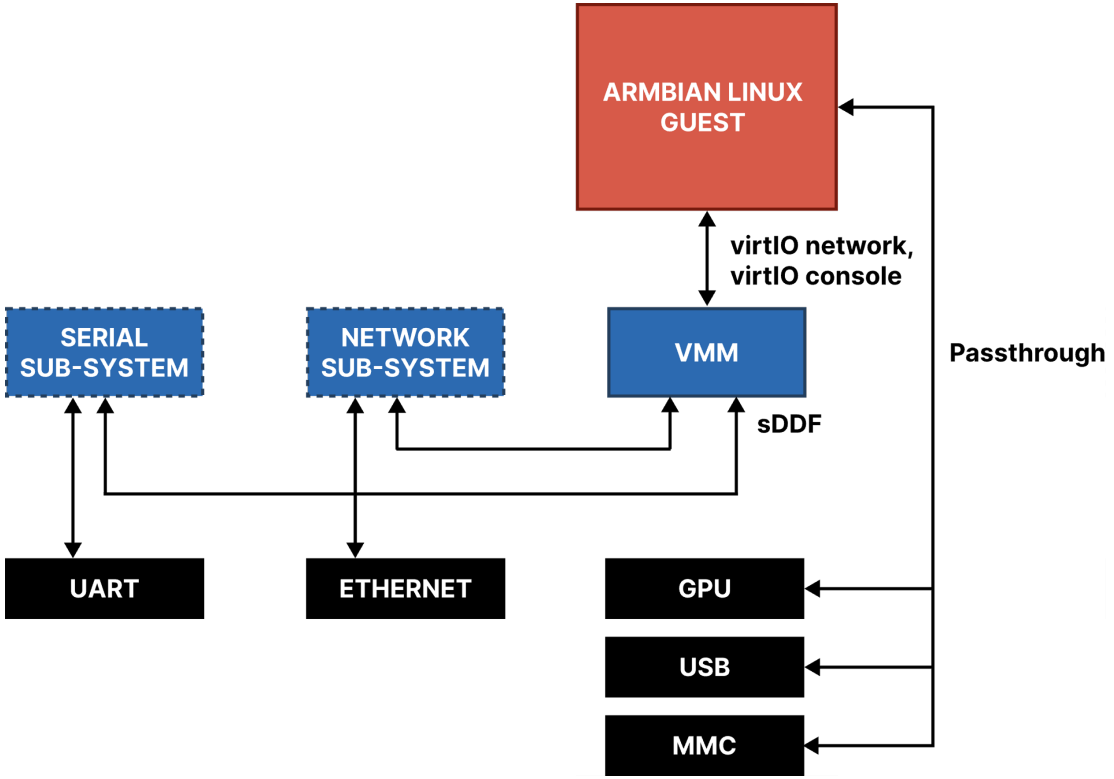
But, I lied

Demo system





Thanks! Questions?