Using the Libre-SOC for building a mobile VR headset

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Pronouns: they/them

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The Libre-SOC Project

- Building a mobile SoC, no binary blobs needed
- Lots of peripherals and a VPU and 3D GPU…
- OpenPOWER ISA + Scalable Vectors
- Prototyped on an FPGA + test ASIC tapeout
- Micro-Architecture based on CDC 6600

The Libre-SOC Project - Hardware

- Hardware design using nMigen (python DSL)
- Output of nMigen is standard Verilog
- Yosys reads Verilog, transforms it other formats
- For ECP5 nextpnr and ecpprog are used
- ASIC synthesis using Coriolis VLSI CAD Tools

The Libre-SOC Project - Software

- Can run Debian and Trisquel GNU/Linux'es
- Mesa as a Vulkan driver, not yet mainlined
- GNU Binutils currently being ported to SV
- Shader compiler needed for GPU workloads
- Simple bootloader: coldboot.c for ls2

Pocket Drone and Lighthouse

- Crazyflie is using ICE40 FPGA for tracking
  - supported by yosys
  - since end of 2015
  - FGPA config is free
  - I do not have one

POWER9 compatible VR Hardware

- SlimeVR Full Body Tracking using an IMU+ESP

- Valve Index HMD using LibSurvive and Monado

- Wii Remote and Nunchuck (I2C connection)

- HTC Vive and Tundra Trackers

- Webcam/Kinect using Apriltag/Skeltrack

Won't work with P9: Oculus devices

- No SteamVR on P9

- Android is non-free

- I want GNU/Linux
  - on Smartphones
  - and mobile VR HW

Building my own mobile VR Headset

- Existing SOCs from Allwinner and Rockchip
- Display and tracking board on VR Shinecon
- SBC on the back of your head
- Connected to PC running Monado using WIFI
- Future: Libre-SOC Hardware + OpenWIFI

Libre-SOC as part of a VR HMD

- Current FPGA prototypes to slow, ASIC needed
- Also incomplete, no GPU in Arctic Tern yet
- Phys needed for DisplayPort, MIPI, Camera
- Scalable Vectors for the Power ISA are WIP
- See 22nm PowerPI for other interfaces

The End

- Any questions
- https://libre-soc.org/
- https://codeberg.org/librevr
- https://www.bitcraze.io/
- https://github.com/cntools/libsurvive