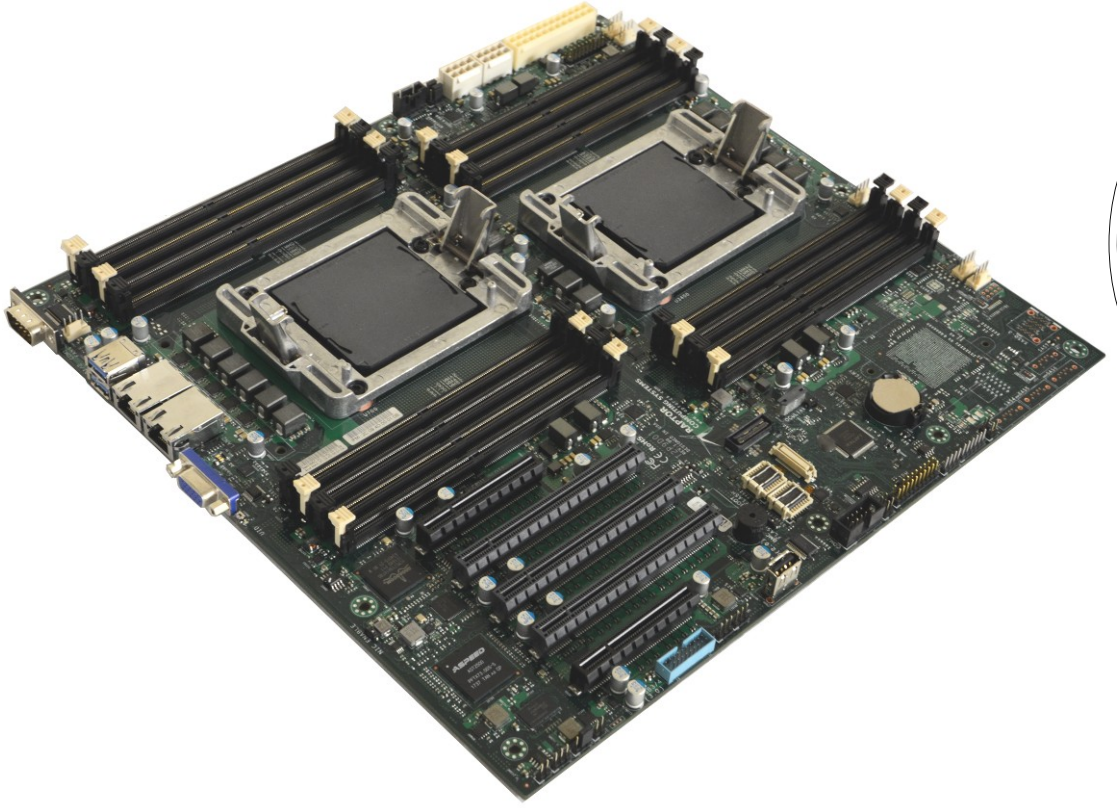
The Libre-SOC Project

GNU Binutils and a Freedom Respecting
Hybrid 3D GPU / CPU / VPU using Power ISA

Tobias Platen
GNU's 40th anniversary Hacker Meeting

Talos II Mainboard



Talos II Software (fully free)

- GCC and GNU Binutils for ARM and PPC
- OpenBMC on AST2500 (also used as GPU)
- Hostboot as a free BIOS for OpenPOWER
- Petitboot as replacement for GRUB
- Trisquel as OS, also ported to Rockchip

The Libre-SOC Project

- Building a mobile SOC with RYF in mind
- FPGA prototype using OrangeCrab
- Needs more work to get DDR3 working
- SVP64: Cray-style Scalable Vector for PPC
- GNU Binutils branch at: git.libre-soc.org

Cray-style Scalable Vector ISA

- Extends scalar Power ISA using prefixing
- No instruction-overloaded meanings
- Only 6 new instructions added for SVP64
- Implements a hardware for loop
- Designed for Supercomputing: CDC 6600

CDC 6600 Micro-Architecture

- 1960s computer by Seymour Cray
- Out-of-order superscalar execution
- Well-known documentation: 1967 patent
- Book by James Thornton now public
- We have our own implementation

GNU Binutils

- We extended the assembler for Power ISA
- Adding support for SVP64 in gas
- Before: hardcoded in the simulator tests
- Now: tests for SVP64 called patched gas
- Live demo on GUIX System (not Debian)

Future work needed

- Port AMD GPU driver to libre-soc
- Support more FPGA boards
- Implement multi-issue in core/issuer
- Add massive SIMD backends
- Build an ASIC that works with the Talos II

Beep Saber on future RYF HMD

Thank You

https://libre-soc.org
https://www.gnu.org/software/binutils/
https://ryf.fsf.org/
https://www.defectivebydesign.org
https://codeberg.org/LibreVR/BeepSaber