

LAC2007



OLPC Audio Subsystem



Jaya Kumar



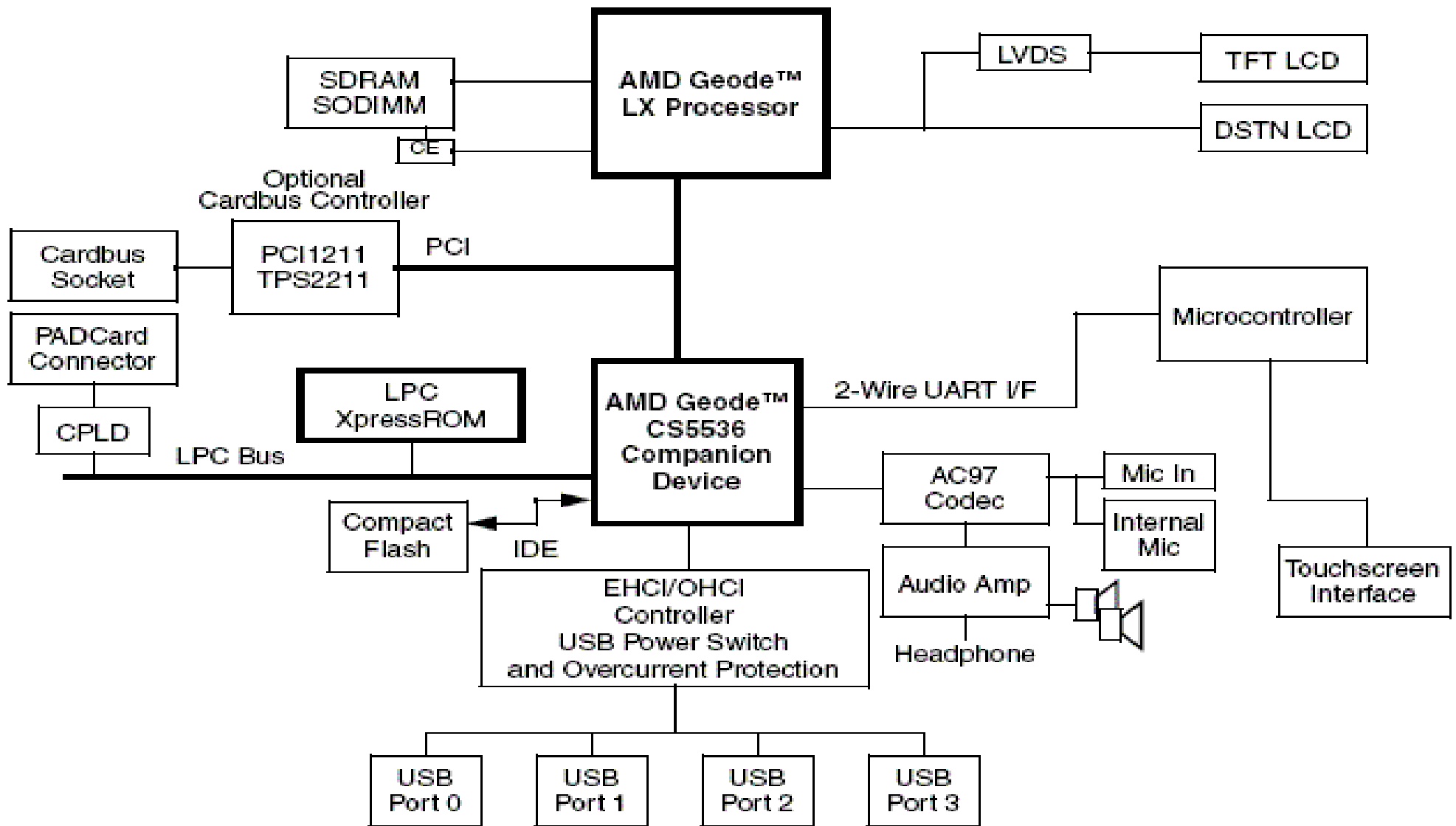
Goals Of This Talk

- talk about hardware
- talk about ALSA drivers and OLPC
- cs5535audio, AD1888 AC97 driver
- talk about issues encountered
- talk about applications
- talk about future

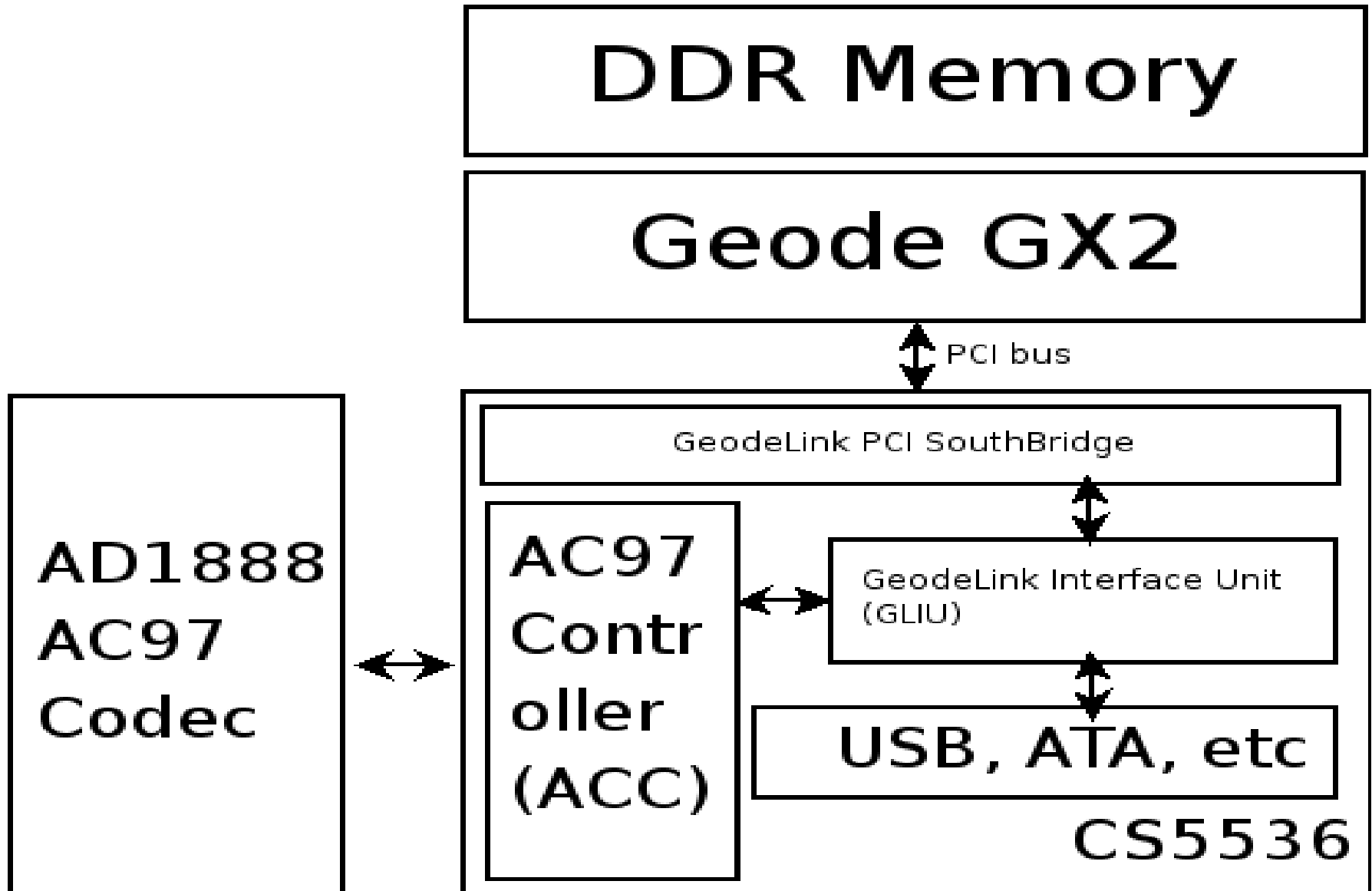
Disclaimer

- I am not employee of OLPC, Redhat, AMD, Quanta or any OLPC associated company
- no financial relationship
- volunteering driver support and beta testing
- I am author of cs5535audio and misc bits
- impartial developer
- happy to help with any inexpensive computing project

Generic Geode/CS5536 architecture



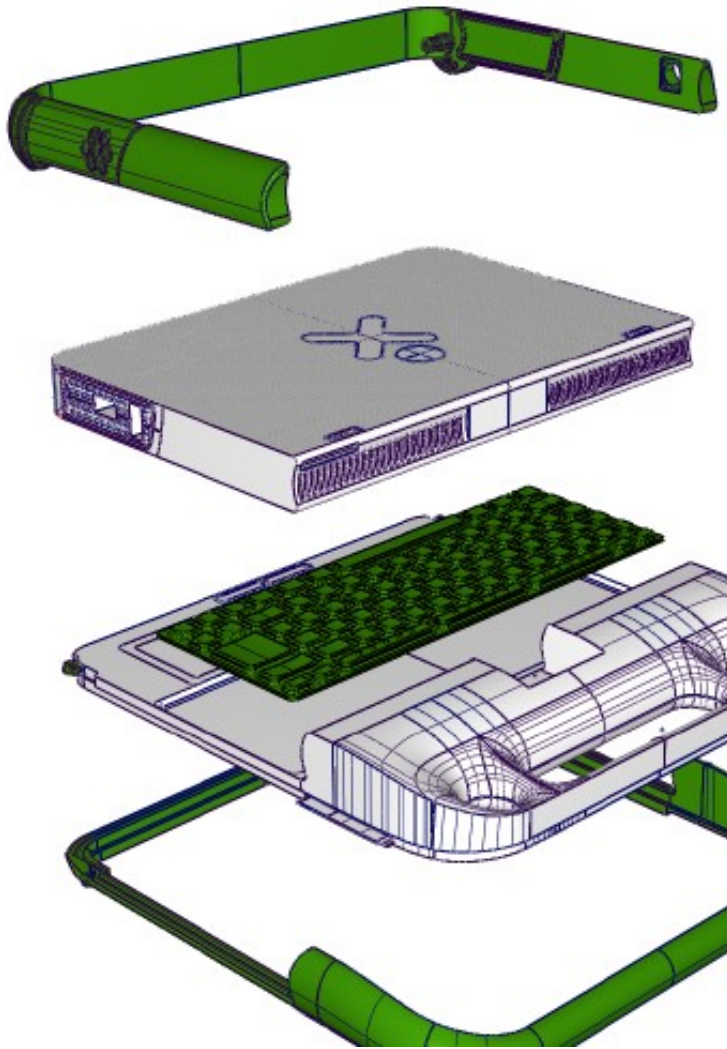
OLPC Audio Architecture



OLPC Hardware

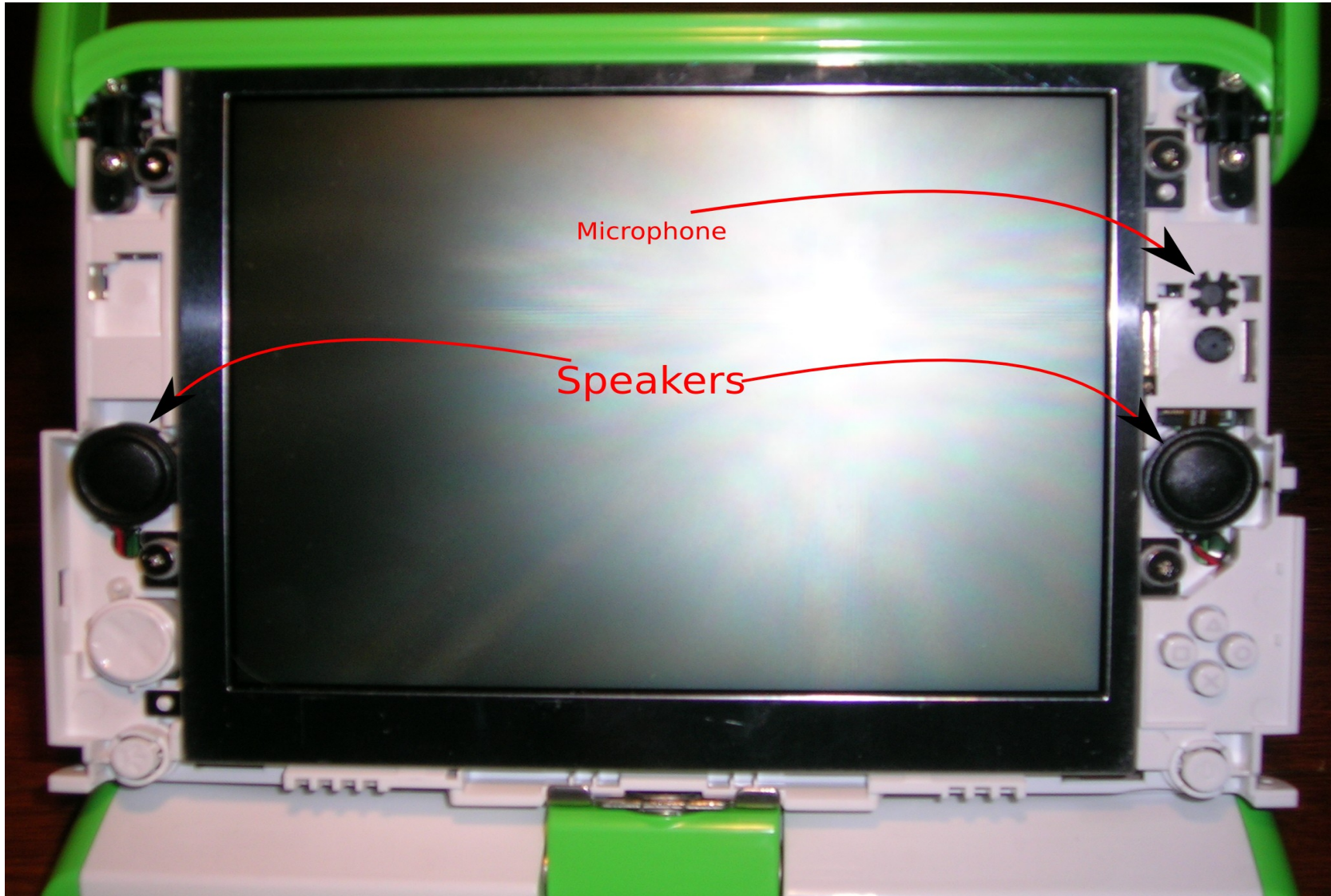
- Getting cost down while maintaining quality means innovative design
- Mechanical issues affect audio quality
- Examine design to understand whole system better

OLPC Hardware

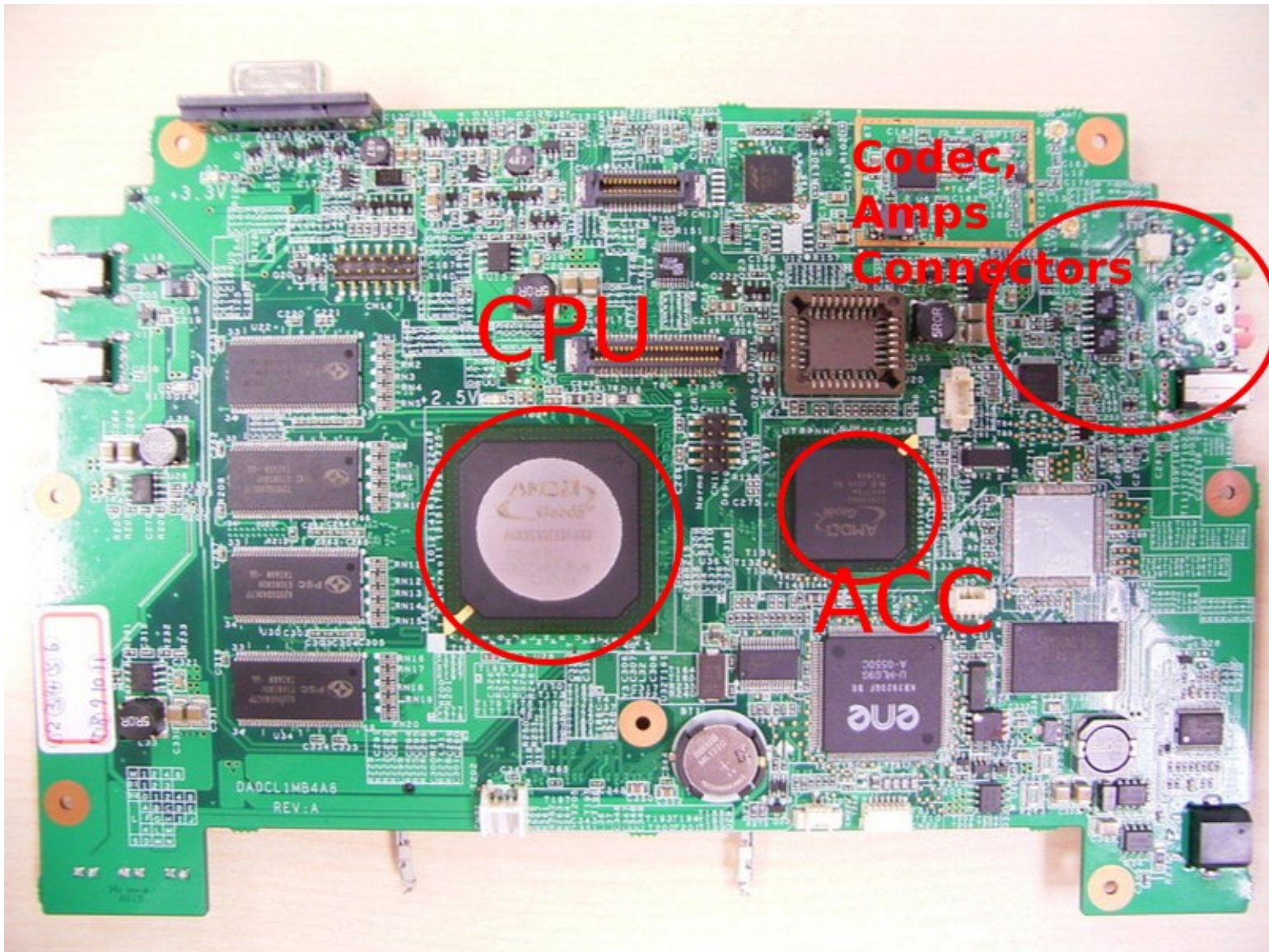


- Mainboard is behind display
- The thick part is where all of audio lives
- Mic, Speakers, ACC, Codec

Where are the speakers, mic?



The Board

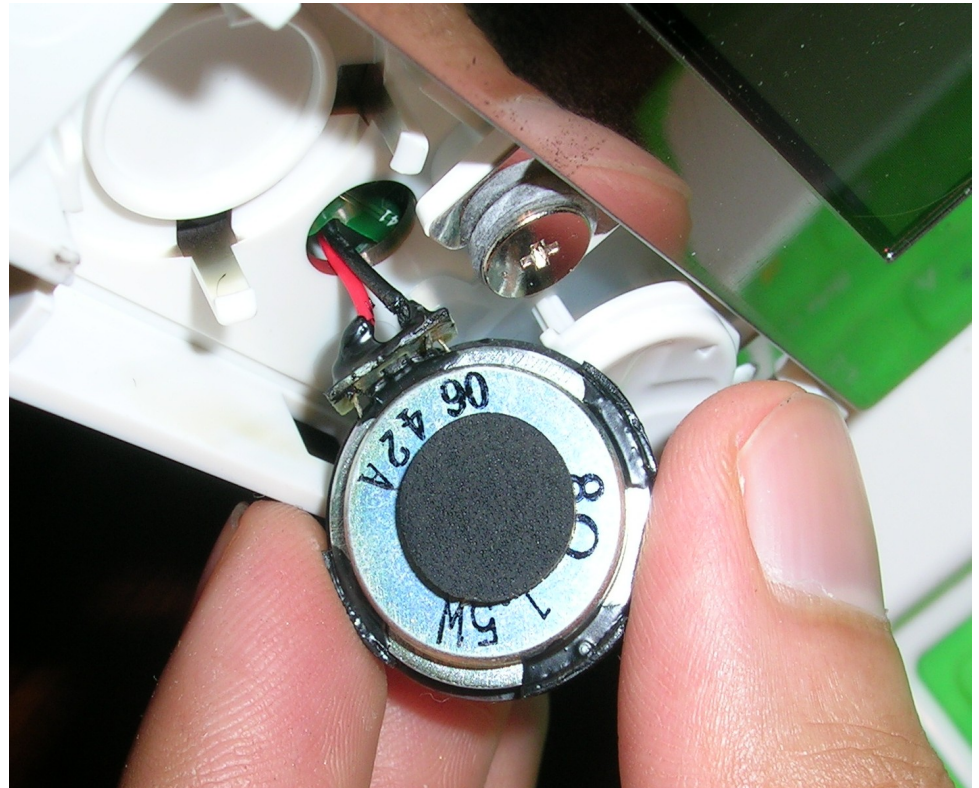


The Mic, Speaker connectors



The Speakers

- Standard speakers
- Standard Amps



Intro to OLPC sw environment

- Linux 2.6.19 as of build 239, continuously moving target.
- glibc, Xorg, standard embedded X86 stuff
- redhat/olpc build team uses Pilgrim to pull selected rpm-s to build the OS. like fedora.
- Audio driver development done by using boot from usb and then reflash

More OLPC sw environment

- custom BIOS using LinuxBIOS + OpenFirmware
- important because of VSA (will revisit this)
- audio server on OLPC is csound
- most apps talk to csound and csound talks to ALSA

What apps run on OLPC

- anything that runs on x86 Linux in a tight 128MB environment with ALSA should work just fine
- currently, TamTam, Squeak eToys, mplayer, quake, etc

Review of ALSA OLPC

- standard ALSA `snd_seq*`, `_pcm`, `soundcore`, etc)
- `snd_cs5535audio` is the ACC (handling DMA, buffering, etc)
- AD1888 is the AC97 codec (handling rates, channels, amps, mix)

OLPC Quirk 1

- actually, quirk on all Geode/CS553x arch
- no PCI config read which means it is faked by BIOS (VSA on traditional Insyde BIOS)
- currently OLPC uses OpenFirmware with a faked config read using an internal device tree
- previously uses VSA built into LinuxBIOS which then used SMI mode to support this

OLPC Driver Work

- Step 1: Added Power Management support
- Fairly straight forward
- Step 2: Test on board
- Problem 1: AC97 read errors (solution: ignore)
- Problem 2: AD1888 duplicate controls (trivial fix)

OLPC Driver Work

- Problem 3: Suspend/Resume bug
- Solution: Touch the magic register on AD1888
- Problem 4: Quirk handling
- All Geode/CS5536 share common PCI ID because hardcoded in VSA
- Can't identify board
- OLPC specific solution: CONFIG_OLPC

OLPC Driver Work

- cs5535audio has CONFIG_OLPC specific _olpc.c to handle quirk
- analog input support
- used to perform ADC work on analog input
- to use as oscilloscope
- eg: Walter Bender photodiode on spoon conductor demo

OLPC Driver Work

- cs5535audio uses x86 port IO to talk to embedded controller to switch input source from standard RC trace to raw trace
- also uses AC97 to tell AD1888 to disable V_ref and high pass filter
- newer OLPC doesn't use EC anymore. Uses CS5536 gpio directly
- exposed via mixer control (“analog input”)

OLPC Driver Work

- Right hand speaker is close to microphone
- Feedback effects when in duplex (eg: telephony)
- Possible solution? default dmix could disable RHS speaker if detect capture and no jack
- Transparent to applications

OLPC Driver Work

- Takashi added aggressive power management code
- Useful to further drop power consumption while transparent to applications

Driver Future

- ASOC/DAPM driver work in progress
- Gotten as far as starting on soc/codecs/ad1888
- Working on machine and platform code
- ASOC/DAPM should help even more with power and also possibly the RHS speaker situation

Applications

- Not exactly happy. TamTam people mention performance is not ideal
- xruns due to scheduling issues
- Managing Xorg needs for TamTam draw, csound needs for audio
- Possible cache size issues
- Renicing TamTam seems to help but not a good solution

Applications

- Still early in development. Tickless kernel, pre-empt may help things
- Will be interesting once video/telephony apps start running using wireless mesh
- May need significant optimization
- ALSA can probably help too. Code size reduction

Thanks!

- Thanks for listening. Any and all feedback is always welcome.
- Email is jayakumar.alsa@gmail.com