Odile Clavier – ohc@creare.com
Chip Audette – wea@creare.com

Daniel Rasetshwane - Daniel.Rasetshwane@boystown.org
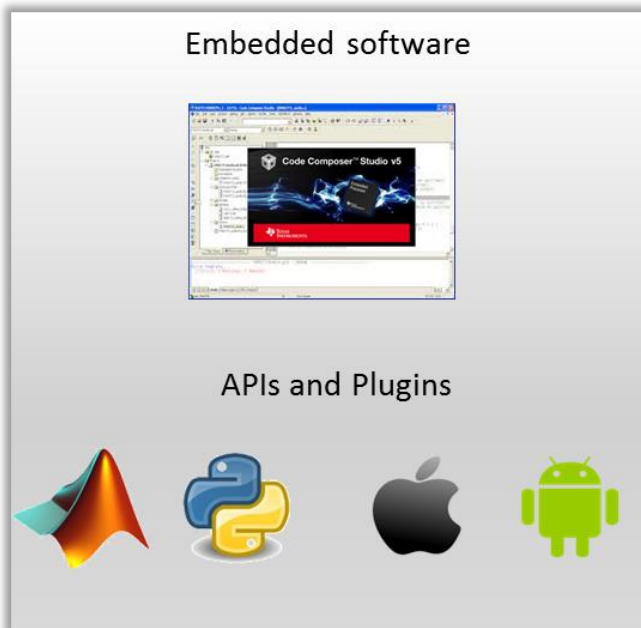Marc Brennan - Marc.Brennan@boystown.org

Open Source System for Audio Processing
Software Tool Chain

Experts and Developers

- **Full access for experts and developers**
  - Completely reprogram the device
  - Add and remove hardware elements
- **Base firmware**
  - Maintained by hardware vendor (Creare)
  - Includes drivers for hardware elements
  - Defines a default audio pathway
- **Extending the code**
  - Use freely available software toolchain
  - Write in C/C++ (optionally: Matlab Coder)
  - End-to-end example code included
  - Transfer to device via USB
- **API for audio signal processing**
  - Includes FIR/IIR filters, dynamic range compression, and FFT/IFFT blocks
  - Adjust parameters via USB or Bluetooth

Researchers and Professionals

- **Adjust algorithms via friendlier interface**
  - No coding necessary!
  - Change processing parameters of existing algorithms via PC or mobile device
  - Calibrate system via software routine
- **Mobile platform**
  - Users manipulate specific configurations through mobile user interface
  - Connect to hardware easily to conduct in-situ experiments
  - Allow hearing aid platform wearer to adjust selected parameters
  - Access additional ecological information through mobile device

https://creare-com.github.io/openear/

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Open Source System for Audio Processing
Hardware Options

Integrated BTE or Head-Worn Platform


Example: Ear Probe (25 x 25 mm)

- **Expected Features:**
  - Fast ARM M4 Processor with FPU
  - High-res AIC (ADC/DAC)
  - Bluetooth LE
  - Two on-board microphones
  - Coin cell battery (CR1632)

- **Access via Fine-Pitch Connectors:**
  - Reprogramming
  - Speakers / Mics

Extensible Body-Worn Platform

Example: FRDM-K66 (55 x 90 mm)
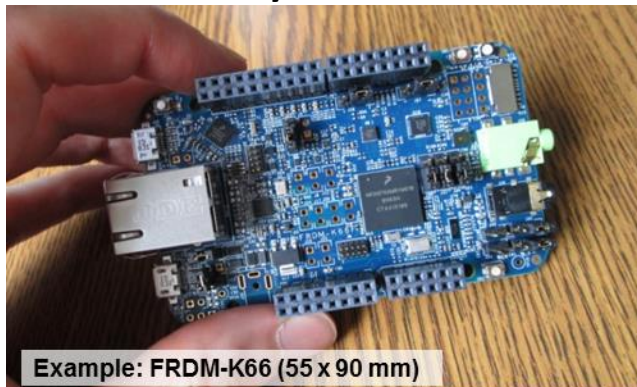
- **Expected Features:**
  - Same Fast Processor
  - Same High-res AIC
  - Same Bluetooth LE
  - Includes SD Card
  - Runs from Li-Po Battery (or USB)

- **Extensibility via Full-size Connectors:**
  - Power, USB communication
  - User's Own Speakers / Mics
  - User's Own Add-On electronics

Preliminary Component Selection

Head-Worn Concept (16 x 19 mm)
Top   Bottom   Battery
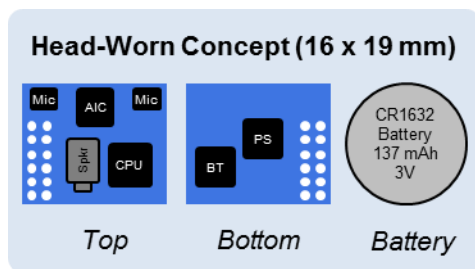
CPU: NXP MK65FX
  ARM M4 Core (32-bit)
  180 MHz w/FPU
  Free IDE and Toolchain

Mic/Spkrs: User Choice
  Targeting Knowles
  Digital Mics: SPH0645
  Speakers: FED-30048

AIC: TI TLV320AIC3212
  24-bit AIC, 192 kHz
  2 channels in/out
  Incl. headphone amp

Bluetooth LE: nRF8001
  Small and low power
  For user controls
  For Audiologist controls

https://creare-com.github.io/openear/