

# USB Sound Capture

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## Synopsis

This project will add USB audio to the HDMI2USB firmware. It will allow the FX2 USB module to present itself as an audio device as well as the current video device. USB audio is a much needed addition as it reduces the number of required cables when setting up a presenter's laptops. It also has applications for other sources as many HDMI capable devices send their audio over that HDMI connection. Note that this does not include the HDMI capture side of the audio.

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## Deliverables

1. Working USB Audio device enumeration for 2 PCM streams. This means that HDMI2USB will correctly present as an audio USB capture device as well as a video

device. Linux will correctly bind to both and a new sound device and a new video device will appear.

2. Correct audio transmission over the Cypress FX2 module.
3. Documentation of the USB Audio interface code
4. Updated documentation in the Developer's Guide where it references the USB firmware.

## Implementation Plan

### Timeline

#### March 24 - April 24 (4 Weeks):

1. Read through and understand the USB Audio spec
2. Read through existing documentation on FX2 and HDMI2USB firmware
  - a. Add FX2 documentation to [README.md](#)

#### May 4 - May 29 (4 Weeks):

1. Setup development environment. By the end I will have a fully working development tool chain, preferably portable, that I will be working with.
  - a. Test the FX2 development toolchain. This will be done by flashing a Cypress FX2 with the latest HDMI2USB firmware and verifying it works.
  - b. Test the 2 Cypress FX2 boards in my possession by verifying that both the default firmware and the latest HDMI2USB firmware work.
2. University classes are still on-going

#### May 30 - April 13 (2 Weeks):

1. Build test audio capture device. This will be a separate firmware image to the HDMI2USB FX2 image. It will be hosted on GitHub and be consist of firmware that enumerates as an audio device when connected to USB. Create GitHub repository
  - a. Commit build system using make/CMake.
2. University classes are still on-going

#### April 13 - June 26 (2 Weeks)

1. Build test audio capture device. This will be a separate firmware image to the HDMI2USB FX2 image.
  - a. Commit working firmware to the repository
  - b. Flash the firmware onto the FX2 board in my possession.
  - c. The linux USB driver will bind to the device and a new soundcard will appear.
2. Test device with known audio input samples.
3. University classes are still on-going
4. Phase 1 evaluation opens June 26

## June 27 - July 11 (2 Weeks):

1. Adapt test audio device to HDMI2USB FX2 firmware. By the end of this section I will have a running HDMI2USB FX2 image that includes audio endpoints.
  - a. Code will exist in a GitHub fork of the HDMI2USB firmware and as a pull request against the TimVideos master branch.
  - b. It will be structured similarly to how the current video sections of the firmware is set up - in the firmware directory with a .c file and corresponding header.
  - c. The linux USB driver will bind to the device and a new soundcard will appear.
2. University classes are still on-going

## July 11 - June 24 (2 Weeks)

1. Adapt as pull request reviewers require. By the end of this section it will be ready to be merged into the master branch, just waiting on testing.
2. University vacation starts 14 July
3. Phase 2 evaluation opens 24 July

## July 25 - August 29 (4 Weeks):

1. Final testing
2. Update developer documentation and add new documentation where necessary
3. Debconf runs from 31 July - 13 August. I will use some of this time to test with Opsis hardware, though these tests will largely be testing that the board presents as an audio device as there will be no HDMI audio capture as this is beyond my skill set.
4. University re-opens on 14 August.
5. Final evaluation opens August 29

## Resources:

- Working with USB - [http://janaxelson.com/usb\\_virtual\\_com\\_port.htm](http://janaxelson.com/usb_virtual_com_port.htm)
- USB Audio spec - [www.usb.org/developers/docs/devclass\\_docs/audio10.pdf](http://www.usb.org/developers/docs/devclass_docs/audio10.pdf)
- HDMI2USB FX2 firmware - <https://github.com/timvideos/HDMI2USB-fx2-firmware/>

## Biographical Information

I am a Bachelor of Science student at the University of Cape Town in South Africa. I am currently in second year, majoring in Computer Science and Computer Engineering. I am an experienced programmer, having worked on various projects largely around Linux. I am fluent in C/C++, Java, Javascript and Python and I have worked with Arduino and ARM based processors in C/C++.

My interests lie in the union of embedded programming and audio and/or lighting as these are largely my three main passions. Projects I am involved with and have worked on can be found on my [Gitlab](#) and [Github](#) profiles.