

## Firmware development using Ez-USB Evaluation board

Development of firmware for a series of Audio demo projects for a Japanese customer using the Ez-USB evaluation board

### 1) Demo version 1

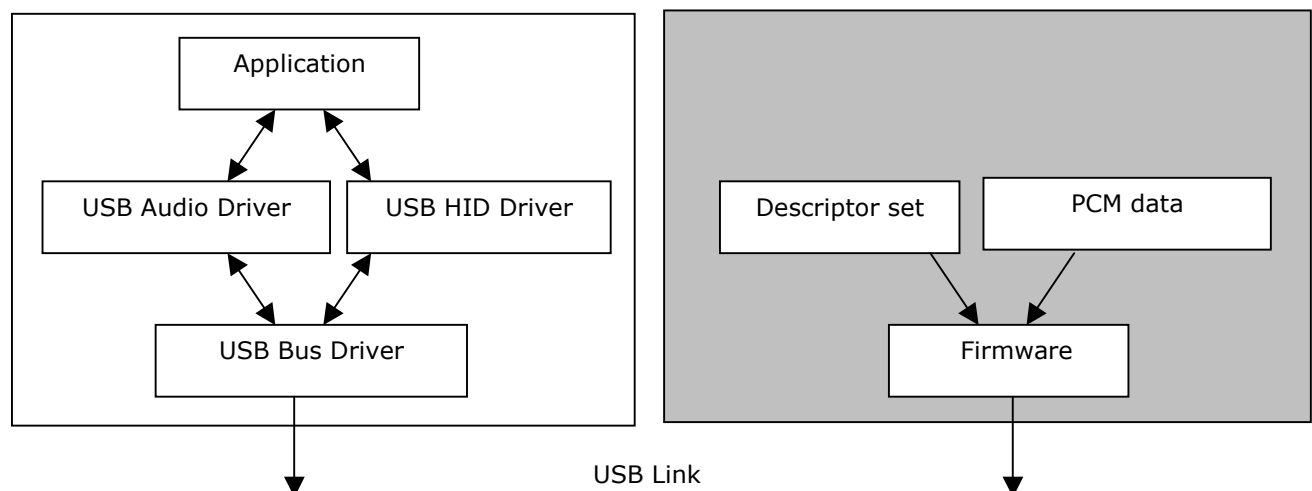
The board on connecting with the computer is enumerated as an audio class device with Mike and Speaker functionality.

There were two modes for the demo:

- A. On using the firmware 1, the board's functionality is as a Mike alone. Hard coded PCM samples stored in the RAM are continuously pumped out as soon as the enumeration of the device is over. So we can either save the data from the board as if it is from a Mike, and play it back later, or play them simultaneously, as they get streamed. Both the files used to generate the PCM samples and the received files are verified to be correct.
- B. The second mode consists of enumerating the device as a speaker and Mike together, i.e., a composite audio class device. A loop back mechanism is applied here. We play CD quality wav file from the PC after selecting the USB device as the default composite audio device. The incoming samples are then looped back through the IN endpoint, i.e. the Mike device. Here also, we can save the file using an application like CoolEdit, or sndrec32.exe. Both the files played and recorded are found the same.

### 2) Demo version 2

With Demo Version 2, HID (Human Interface Device) interface was added. This USB HID class is another set of specification in USB to deal with human interface devices like monitor, keyboard, mouse etc. As a result the demo device appears as a composite device with Audio as well as HID functionalities. Another set of descriptors were added to the firmware and attached them with the evaluation board pushbutton keys for frequency and volume change. This firmware change works for the hard coded Wavetable to induce a transformation of the tone with the push button presses. The scope of the work is given in shaded portion in the diagram below:



### 3) Dolby 5.1 speaker system

Now as the next step of the demo, the feasibility of adding a real codec with the USB chip for a 6-speaker system was done. Two possibilities were presented.

- A. To inflate the compressed data from the DVD player using a software decoder, i.e. a driver which comes on top of the Usbaudio.sys, this can be passed through the USB pipes to the USB audio device and then played, using PCM audio codecs. Here the bandwidth requirement is enormously high, just on the verge of the theoretical possible values, but is a low cost solution with no hardware decoder.
- B. The second option, which is an elegant one, is to pass the compressed data as such through the USB pipes to the device. The descriptor set from the device, which reports the functionality, can report the device as Dolby. This one requires a Dolby 5.1 decoder chip. Also proposed I2S interface as the glue logic between the USB chip and the Decoder chip. Also did a study on the Dolby decoder chips available in the market and their comparative study.

### 4) Ez-USB FX to parallel port Bridge Firmware

This assignment was to write the GPIF (General Purpose Interface) descriptors for Ez-USB FX chip that will emulate the standard PC EPP interface. So the 8051 firmware necessary to generate EPP type signaling over the EPP bus was written. The scope of the work included subroutines to initialize the EPP interface and perform each of the 4 signaling transactions

1. Write Data
2. Read Data
3. Write Address
4. Read Address

The shaded portion in the diagram below denotes the scope of the work

