

Requirements:

The product must be implemented on a low power consuming MCU, namely the Polaris NB-IoT.

The product must be able to play music using a bluetooth connection.

The volume of the speakers must be controlled by the MCU depending on its location.

The product must be able to playback sound files (preferably MP3) stored on a SD card attached to the MCU.

The files stored on the SD card must be replaceable online.

The product must support concurrent location updates while playing audio files.

The solution must be compact with minimal exposure of components. Ideally the final solution fits into the MikroBus on the Polaris and within its casing.

The Polaris NB-IoT has to support software updates for further development.

Current state of project:

We are having trouble making the MP3 decoder play audio files. We have been unable to play the sine test mentioned in the VS1053b documentation on the MP3 Click inserted in the MikroBus of the Polaris and have therefore tried implementing the playback on an Arduino Uno R3 using the Adafruit VS1053b breakout board. On the Arduino we are able to play the sine test from the docs but we are unable to play the MP3 files from our SD card. It seems that the SD card initialization disrupts the communication with the VS1053b chip making the Arduino unable to play the files, as the registers contain 0s (likely due to the communication not getting through) after initialization of the SD card, but contain the expected values before initialization of the SD card. We can perform the sine test before SD card initialization, but not after.

Components:

Polaris NB-IoT:

<https://www.fortebit.tech/polaris/>

Arduino UNO R3:

<https://www.elextra.dk/en-gb/p/arduino-uno-r3/H31941>

Adafruit VS1053b:

https://www.digikey.dk/da/products/detail/adafruit-industries-llc/1381/5011071?gclid=CjwKCAiApY-7BhBjEiwAQMrREWRJSCbDwC_NGBCRhPeH9ihbiiuwpGXIZFToAisapx81H71b2yflxxoCm_cQAvD_BwE&gad_source=1&gclid=CjwKCAiApY-7BhBjEiwAQMrREWRJSCbDwC_NGBCRhPeH9ihbiiuwpGXIZFToAisapx81H71b2yflxxoCm_cQAvD_BwE&gclsrc=aw.ds

MP3 Click:

<https://www.mikroe.com/mp3-click>

BT 5.0 V2.0 Audio Receiver Module:

<https://www.elextra.dk/en-gb/p/bt-50-v20-audio-modtager-modul-35mm-stereo-jack/H14797>

TPA3116 Audio Amplifier:

<https://www.elextra.dk/en-gb/p/stereo-audioforst%c3%a6rker-2-x-120w-tpa3116/H12871>

MCP41100-E/P Digital Potentiometer 100kOhm:

<https://www.elextra.dk/en-gb/p/mcp41100-e-p-digital-potentiometer-100kohm-dip8/H58619>

Sound setup:

For controlling the volume based on location, our Polaris board sends volume commands to our digital potentiometer so it can adjust the volume of the sound coming from the Bluetooth Receiver.

Therefore, the Polaris board is connected to the digipot.

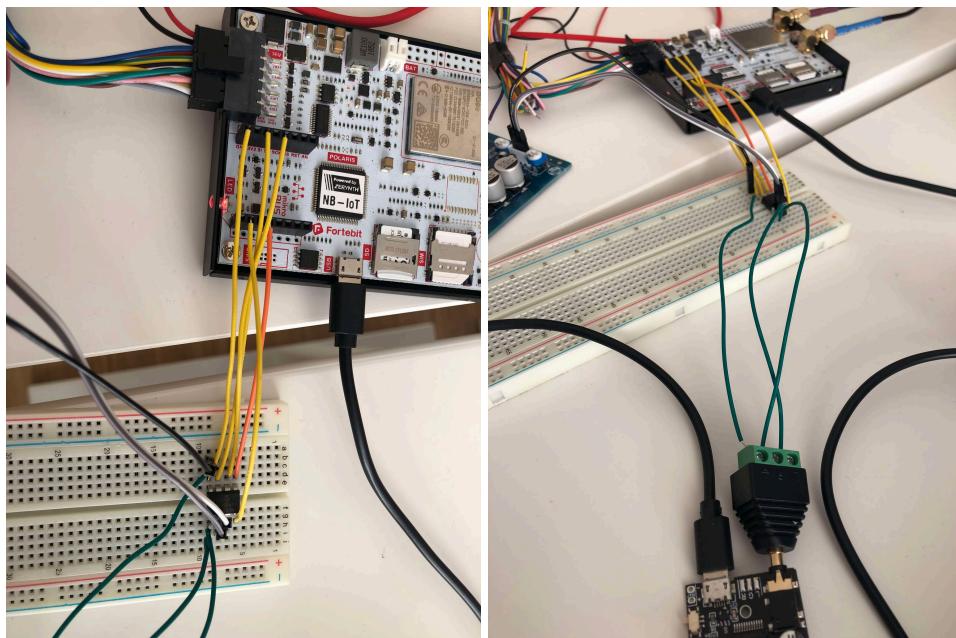
The Bluetooth receiver is connected to the digipot.

The digipot is connected to our TPA3116 amplifier.

The TPA3116 amplifier is connected to a speaker.

For the final product, we would ideally have the MP3 playback module be a part of this setup.

Images:



Arduino + Adafruit VS1053 setup:

<https://learn.adafruit.com/adafruit-vs1053-mp3-aac-ogg-midi-wav-play-and-record-codec-tutorial/simple-audio-player-wiring>

Important: We do not wish for the Arduino board to be a part of the final solution. It is only used for testing.

