Atmel AVR32843: AVR UC3 Audio Player
-
AAC Decoder

Features

- **Software AAC decoder implementation**
  - **Player implementation**
  - **Player configuration**
  - **Licensing**

1. Introduction

This application note is an extension of the application note Atmel® AVR32839: AVR® UC3 Audio Player.

The aim is to give the reader all he needs about implementation and configuration of the Fraunhofer AAC decoder in the Atmel AVR UC3 Audio Player.

The current implementation only supports AAC-LC.

HE-AAC decoding is possible and will be ported to 32-bit AVR UC3 upon customer request.

32-bit Atmel Microcontroller

Application Note

32180B–32-bit AVR–02/12

2. Atmel AVR UC3 Audio Player

2.1 Overview

The UC3 audio player is a generic audio player interface and is designed to support multiple audio formats like MP3, WMA, AAC…

This document details the implementation of the Fraunhofer AAC decoder in this player.

2.2 Package

The UC3 audio player package implementing the AAC decoder is the:
audio_player-evk1104-evk1105-aac-<version>.zip file.

It can be requested from the Atmel AAC registration page:
http://www.atmel.com/forms/aac-eval_reg.asp.

2.3 AAC decoder

2.3.1 Overview

MPEG AAC Low Complexity (AAC-LC) is the high performance audio codec for excellent audio quality at low bit rates. Co-invented by Fraunhofer IIS, AAC is widely used in mobile music players and mobile phones.

- Quality up to statistically transparent
- Bitrates up to 256kbit/s per channel
- Sampling rates 8 to 96kHz
- Channels mono, stereo, multi-channel (for example, 5.1, 7.1)

More information can be retrieved from the Fraunhofer AAC-LC audio codec page:
http://www.iis.fraunhofer.de/en/bf/amm/produkte/audiocodec/audiocodecs/aaclc.

2.3.2 Supported devices

The AAC decoder can only be executed on Atmel AVR UC3 Audio devices.

Currently supported Atmel devices include:

- AT32UC3A0512AU-ALUT
- AT32UC3A0512AU-ALTRA
- AT32UC3A0256AU-ALUT
- AT32UC3A0128AU-ALUT
- AT32UC3A1512AU-AUR
- AT32UC3A1256AU-AUR
- AT32UC3A3256AU-ALUT
- AT32UC3B0512AU-Z2UR
- AT32UC3B0128AU-A2UT
- AT32UC3B0128AU-Z2UR
- AT32UC3C0512CAU-ALUT

2.4 Player implementation

2.4.1 Source code

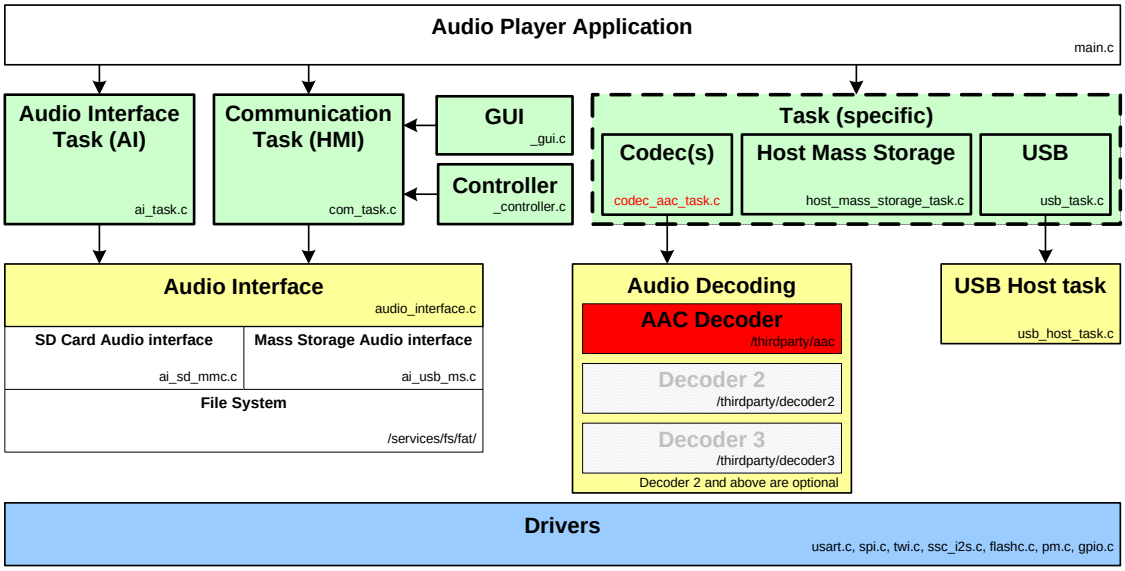
The AAC decoder is delivered in binary form as an UC3 library available in /third-party/fraunhofer_aacdec/libs directory. Three optimized GCC and IAR™ versions are delivered:

- Speed optimization
- Size optimization
- Balanced optimization

2.4.2 Player layer

The AAC player layer is located in /avr32/services/audio/players/aac/aac_player.[c,h].

Figure 2-1. Player software architecture.



2.5 Player configuration

As detailed in the Atmel AVR32839: AVR UC3 Audio Player application note, the task() function is in charge of calling the software “tasks” to perform audio decoding.

The task() is macro based and defined in /config/conf_audio_player.h file where the call to the AAC task is defined:

```
#define task()          \
{                       \
    task_usb();         \
    task_usb_ms();      \
    task_aac();         \
}
```

The AAC support is then enabled by defining the AAC_SUPPORT to true:

```
#define SUPPORT_AAC                 true
```

The AAC file extension filtering is enabled in the following section of the conf_audio_player.h file:

```
// ***** AAC Support ****************************************
#if defined(SUPPORT_AAC) && SUPPORT_AAC == true
    #include "ai_usb_ms_aac_support.h"
    #define task_aac()                          \
    {                                           \
        extern void codec_aac_task(void);       \
        codec_aac_task();                       \
    }
    #define file_format_aac             AAC_FILE_FORMAT,
#else
    #define task_aac()
    #define file_format_aac
#endif
```

2.6 Decoder license

The Fraunhofer AAC decoder implementation is subject to software licence agreement acceptance from the Atmel AAC registration page: http://www.atmel.com/forms/aac-eval_reg.asp.

2.7 Performance

Table 2-1 shows the memory requirement for the AAC decoder implementation.

Table 2-1. AAC decoder performance.

Compiler	Flash [KB] (1)	RAM [KB] (2)
GCC 4.4.3 (3)	125.7 / 99.0	42.6 / 42.8
IAR EWAVR32 3.31.1	105.6 / 83.9	46.7 / 46.8

1. Speed / size optimization
2. Speed / size optimization
3. AVR 32-bit GNU Toolchain 3.3.1 build 285

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