VS1003B WMA Webcast / Rewind Patch

VSMPG "VLSI Solution Audio Decoder"

Project Code:
Project Name: VSMPG

Revision History			
Rev.	**Date**	**Author**	**Description**
0.9	2008-04-22	PO	Initial version

1 WMA Webcast / Rewind

VS1003B supports WMA v2-v9: 5kbps - 320kbps files. Because of the file-format nature of WMA and data-stream nature of VS1003B, random-access for rewind and fast-format features must be done in the controller. The VS1003B firmware allows you to delete and insert ASF packets, but it is hard to determine the ASF packet boundaries on a low-MHz CPU.

This WMA Webcast / Rewind Patch replaces parts of the original WMA decoding routines and **the WMA file contents does not need to be modified anymore.**

- Reads Audio Media information also inside a Header Extension Object.
- Selects the stream that has the highest bitrate.
- If Data Object size is zero, enters broadcast mode that ignores file size.
- Broadcast mode can be entered by writing 0xbca5 to SCI_AICTRL1 before sending the WMA header.
- Resyncronizes to ASF frames automatically. Enters broadcast mode if resynchronization was needed.
- Indicates when it is safer to perform rewind / fast-forward. Because of automatic broadcast mode, no file size fix is needed.
- Fixes the VS1003B ASF parser problem with frames that have Explicit Packet Length < Minimum Data Packet Length by setting the padding variable automatically to the right value.
- Replaces the DAC interrupt: underflows no longer play the audio buffer again, the output is faded to zero.
- Decreases the required data transfer speed of constant bitrate files that have a lot of padding or unused areas.

The patch takes over the whole system, so you can't use other patches at the same time.

Select the right C file for your setup. When you upload the code, it will be activated automatically. A hardware or software reset de-activates the patch.

Chip	File	IRAM Location	Features
VS1003B	wmarew4.c	0x030 .. 0x323	Broadcast and resync patch

2 Usage

In addition to normal usage of SCI registers, two communication registers are used:

Register	**Usage**
SCI_AICTRL1 (0x0D)	Broadcast mode indication
SCI_AICTRL2 (0x0E)	Synchronization

When you want to make a seek in the WMA file, use the following algorithm:

1. Write 0x1234 to SCI_AICTRL2.
2. Continue sending linear data until SCI_AICTRL2 becomes 0x2345.
3. Start sending data from a new location.
4. SCI_AICTRL2 becomes 0 when a frame has been correctly decoded.
5. When file ends, send 2050 zeros, then set OUT_OF_WAV to end decoding or use a software reset.

You can take advantage of the WMA bytes per second information in SCI_HDAT0 to determine a good skip amount.

The mode register bit SCIMB_OUT_OF_WAV can be used to end decoding in the middle, just like without the patch.

If you use software or hardware reset, remember to reload all patch codes.

Note: the resynchronization is not 100% reliable. It is very robust with high bitrates, but the reliability decreases with lower bitrates.

3 Broadcast, WMA Streaming

If you are streaming WMA, you need to generate an appropriate ASF/WMA header that VS1003b understands. If the header comes as part of the data connection, you can just send the full data stream.

The following shows the minimum requirements for a WMA header.

- ASFHeader
  - 16 bytes: ASFHeader GUID
  - 4 bytes: header size
  - 4 bytes of header size high part skipped
  - 2 bytes: object count
  - 2 bytes: object count hi word, must be 0
  - 2 bytes: reserved 2 field must be 0x02
  - ASFFileProperties:
    - 16 bytes: ASFFileProperties GUID
    - 4 bytes: object size
    - 4 bytes of object size high part skipped
    - 64 bytes skipped
    - 4 bytes = file properties, not used in VS1003b
    - 4 bytes = minimum data packet length, must be > 0
    - rest skipped, if any
  - ASFStreamProperties:
    - 16 bytes: ASFStreamProperties GUID
    - 4 bytes: object size
    - 4 bytes of object size high part skipped
    - 16 bytes: ASFAudioMedia GUID
    - 24 bytes skipped
    - 4 bytes: size of audio media (must be >= 24)
    - 4 bytes skipped
    - 2 bytes: stream number
    - 4 bytes skipped
    - 2 bytes: 0x61 0x01 WMA 7 codec
    - 2 bytes: channels
    - 4 bytes: frequency
    - 4 bytes: bytes per seconds
    - 2 bytes: block align
    - 4 bytes skipped
    - 2 bytes: encode options
    - rest skipped
  - rest skipped
- ASFDataObject:
  - 16 bytes: ASFDataObject GUID
  - 4 bytes: data size
  - 4 bytes of data size high part skipped

– 26 bytes skipped
– Data packets follow...

The WMA Broadcast flag is not supported in VS1003B firmware and is not read by the patch either, but if the data object size is 0, broadcast mode is assumed. You can also set broadcast mode by setting SCI_AICTRL1 to 0xbca5 before sending the file.

3.1 Explicit Packet Length < Minimum Data Packet Length

In some files the explicit ASF packet length is smaller than the minimum data packet length defined in the ASF header (for example header minimum data packet length 1567, explicit packet length 1564) and unfortunately the ASF parser in VS1003b does not handle this case correctly.

This patch handles this case by updating the padding size field automatically.