1   Notes on WMA Multi-Bitrate (MBR)

WMA v9 supports multiple streams (multi-bitrate, MBR) in the same ASF/WMA file. This can be used for dynamic bitrate selection. The same audio data is encoded with varying bitrates, for example 22 kbit/s, 44 kbit/s, and 192 kbit/s, and the resulting bit-streams are encapsulated into one ASF/WMA file.

When Windows Media Clients connect to Windows Media Server, the server selects the best bitrate that the connection is able to transfer and only sends that. The connection can be through a 28 kbps modem, ISDN modem, or high-bandwidth ADSL modem. No re-encoding of audio is needed, it is enough to select the appropriate stream. Storage space is traded for processing power. **The client only receives one stream.**

Why isn't it a good idea to use MBR files with portable devices and decoders like VS1003B?

The first thing is file size: the same audio is encoded several times to allow dynamic bitrate selection. The feature is not needed, thus the files are larger than necessary. When the redundant streams are removed, more music or the same amount of music with better quality can be fit into the same storage space.

The second thing is that the decoder only plays one audio stream and it has to skip all others. Because of the stream interface also the unneeded data has to be sent to VS1003B so that it can skip it. In addition to whole unused streams, packet padding and unused portions of data packets has to be skipped also.

This has to happen fairly quickly to allow the decoding to continue before audio buffer becomes empty. This sets quite strict requirements for the controller that feeds the data. **Whenever VS1003B requests more data, the controller should be able to provide it.**

What can be done to fully support MBR files with VS1003B?

The right solution would be to demultiplex the ASF/WMA file, select only one audio stream, encapsulate it to ASF/WMA format and send that to VS1003B, just what Windows Media Server does with MBR files. Ideally this would be done before transfer to the portable player or storage media, but it can conceivably also be done on the controller if absolutely necessary.

Because VS1003B does handle MBR files, the second alternative is to make certain the controller can satisfy the data requirements. Depending on the storage media you may need a moderately-sized RAM buffer that is able to provide the required sustained transfer speed when data is being skipped. When the data requirement decreases for the duration of the actual decoding, the controller can keep filling the RAM buffer from the storage media, such as Multi-Media Card.

In VS1003B with $3.0\times$ clock, upto 9 Mbit/s SDI write speeds ($3.0\times12.288/4$) and 6 Mbit/s SCI read speeds ($3.0 \times 12.288/6$) can be used.

WMA Format

The WMA/ASF file format consist of two main parts: header information, which contains several ASF objects, and data object, which contains the actual audio/video data.

The data object consists of data packets that can have one or multiple payloads. Each payload contains a number of frames and a frame can consist of several subframes. A frame can straddle payload boundaries, i.e. a frame can continue from one payload to another.

If the last frame in a payload ends before the end of a payload, the rest of the payload must be skipped. This implicit padding is not known before the last frame of the payload is decoded. In addition to this implicit padding, there may be explicit padding bytes, which is indicated in the packet header.

For more details, see the Advanced Systems Format (ASF) Specification.

Different Data to Skip

There are three different parts that have to be skipped in MBR WMA files:

1. unused streams – only one stream is decoded
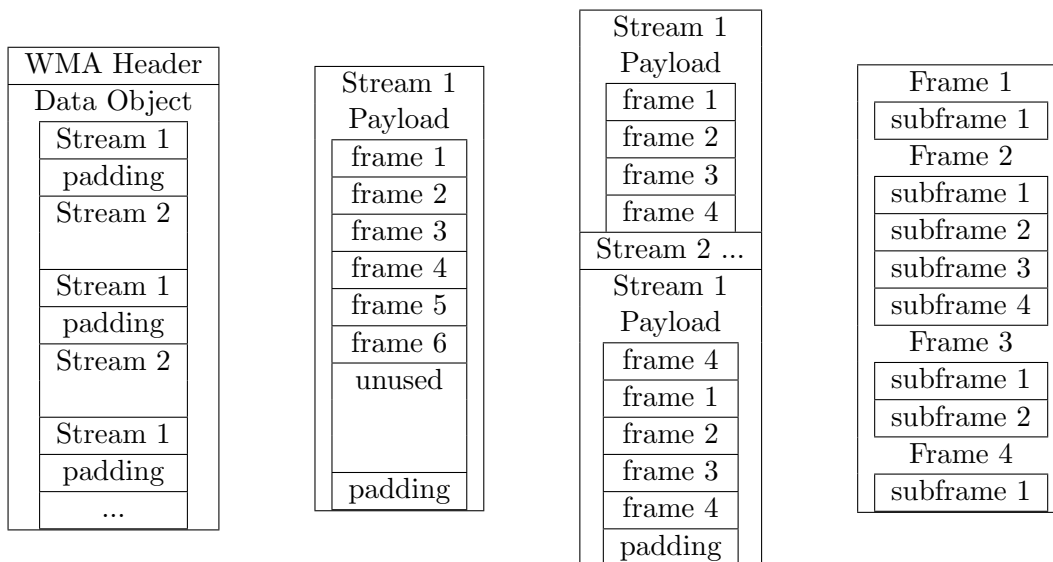2. ASF packet padding
3. unused portions of packets that are not marked as padding.

Figure 1: Multibitrate file example