

## Appendix D

# E-Chalk's Audio Format

This appendix describes the syntax of E-Chalk's audio format, internally called WWR3. A conceptual explanation can be found in Chapter 6. All integers defined herein are unsigned 32-bit big-endian, all shorts are unsigned 16-bit big-endian, and all bytes contain 8-bit unsigned data. The audio data is sent and stored in the same format. In the case of file storage, the data is written to a file called `content.wwr`. The overall syntax of any E-Chalk Audio stream is:

```
(<event>|(<packetlength><zippacket>))*
```

Archived audio data is accompanied by an *index file*, called `index.wwr` residing at the same location as the `content.wwr` file. The index file is a list of offsets pointing to the beginning of each compressed packet. It is used by the client for an accelerated random seek. The syntax is:

```
(<offset>)*
```

An `<offset>` is an integer defining the absolute position of a compressed packet. The offsets are ordered and thus monotonically increasing. Audio files larger than 4 GB cannot have an index file.

### D.1 Events

Events were introduced in WWR2 to enable transparent broadcaster forwarding and for showing arbitrary URLs. An event has the following syntax:

```
<event> ::= <type><url>
<type> ::= "0" | "1"
```

The entry `<url>` denotes a 1024-byte field containing a valid URL and `<type>` a short value containing either '0' or '1'. If `<type>` is '0', the URL is to be displayed in a new browser window (or as specified by the user). If `<type>` is 1, the URL is to replace the web page that is currently used by the replay Applet. In other words, the page replaces itself and the replay Applet is closed. This is used to enable transparent broadcaster forwarding. Events of type '0' are considered obsolete and are replaced by the slide-show client (see Chapter 5). Events of type '1' are only allowed during live-transmissions.

## D.2 Zipped packets

$\langle\text{packetlength}\rangle$  is a short (greater or equal 2) specifying the length in bytes of the following  $\langle\text{zippacket}\rangle$ .  $\langle\text{zippacket}\rangle$  contains ZIP-encoded compressed or uncompressed audio data. Each packet begins with a ZIP file header [P. Deutsch and J-L. Gailly, 1996] which also contains information about its length. The information should correspond, otherwise the packet is to be considered corrupt and needs repair. WWR3 content is always recorded with 16 kHz mono 16 bit signed linear. The ZIP filename of the packet specifies the content as follows.

String	Content of unzipped packet
rawzip32	16 kHz mono 16 bit signed linear audio data
hr40	40 kbit ADPCM encoded audio data
hr32	32 kbit ADPCM encoded audio data
hr24	24 kbit ADPCM encoded audio data

Please note that the names `rawzip`, `mu4`, `fbus`, `fbus2`, and `fbus3` denote legacy WWR2 codecs that should not be used any more.

## D.3 Codecs

Packets labeled `rawzip32`, as the name implies, contain uncompressed audio data. After unzipping, they contain 50,800 bytes of audio data in source format. Packets labeled `hr40`, `hr32`, `hr24` contain 40 kbit/s, 32 kbit/s, and 24 kbit/s ADPCM encoded audio data, respectively. Each packet is generated using 50,800 bytes of source data. The encoding follows the ADPCM standard as defined by [ITU-T, 1990]. Please refer to this document for details.