The Forensic Playground File Format

1.0

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February 28, 2018

1 Meta-Overview

The Forensic Playground File Format (FPFF) is an open format designed to serve as a sandbox for forensics education and competition. It has three main goals:

1. **Resemblance**. FPFF is similar to many common binary formats, making it a good tool for familiarizing students with binary layouts and parsing.
2. **Uniqueness**. FPFF is different enough from real formats, preventing automatic analysis with tools like `binwalk`.
3. **Flexibility**. FPFF's specification is simple, making extension and modification straightforward.

FPFF was developed by UMD-CSEC for CMSC389R: Ethical Hacking.

The specification and a reference implementation are available on GitHub under the MIT license.

Everything below this is fictional.

2 Overview

Developed internally at Briong by lead developer Mark Thompson, the Forensic Playground File Format (FPFF) is a standards-compliant container format. This document contains the official specification for FPFF 1.0.

3 Terminology

- *File* and *stream* are used interchangeably, to denote a source of data.
- A *word* is 32 bits, or 4 bytes.
- A *dword* is 64 bits, or 8 bytes.
- A *double* is a 64 bit IEEE754 floating-point number.
- The use of **must** in any condition indicates that an FPFF parser should fail immediately if the condition is not met.
- The use of **should** indicates a user expectation that an FPFF parser may choose not to enforce.

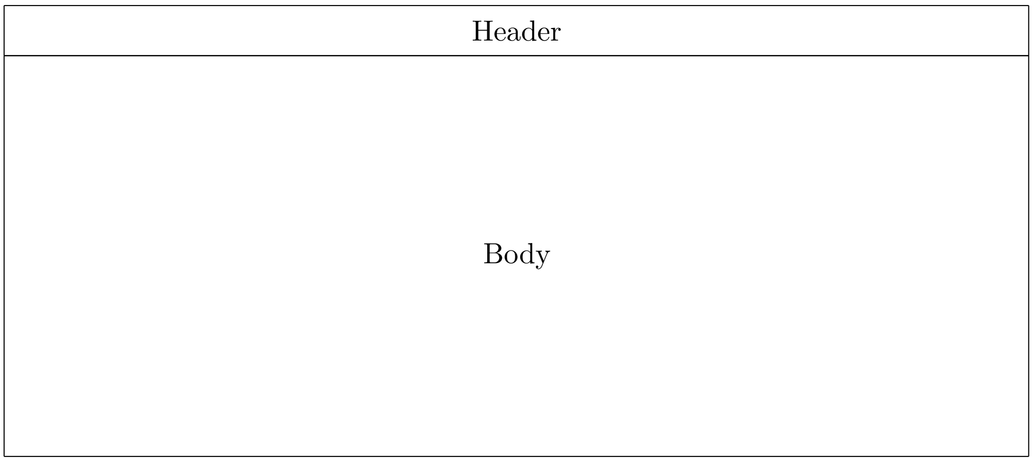
4 Specification

If FPFF data is read from a file, then that file **should** have a `.fpff` suffix.

All FPFF data is little-endian.

Unless otherwise specified, all integer fields are **unsigned**.

An FPFF file has two parts: a **header** and a **body**.

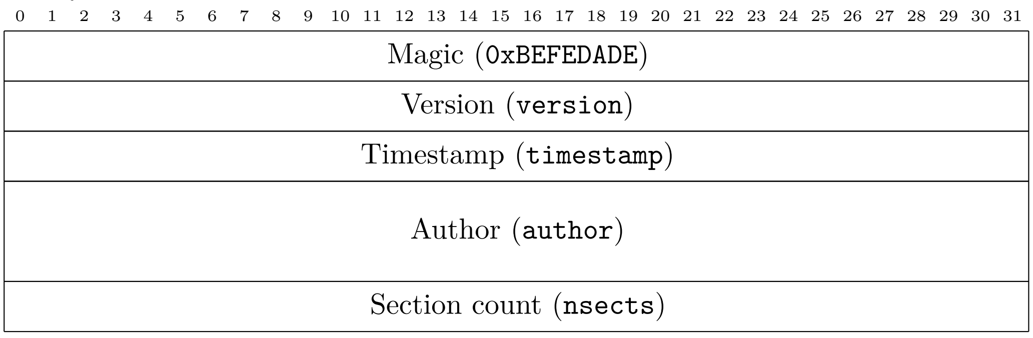


Each part is specified in detail below.

4.1 Header

The FPFF header begins at offset 0.

Its layout is as follows:



Each field is described below.

4.1.1 Magic

The magic field is one word.

A valid FPFF stream **must** begin with the FPFF magic bytes: `0xBEFEDADE`. Any stream that does not begin with `0xBEFEDADE` is not a valid FPFF stream.

4.1.2 Version

The version field is one word.

The stream's version **must** be 1, i.e. `0x1`. Other versions are reserved for future FPFF specifications.

4.1.3 Timestamp

The timestamp field is one word.

The stream's timestamp **must** be a valid UNIX timestamp.[1]

4.1.4 Author

The author field is a dword (8 bytes).

[1] https://en.wikipedia.org/wiki/Unix_time

The stream's author **must** be ASCII-encoded[2]. If the author is shorter than 8 bytes, then the field **must** be padded with null (`0x0`) bytes.

4.1.5 Section count

The section count field is one word.

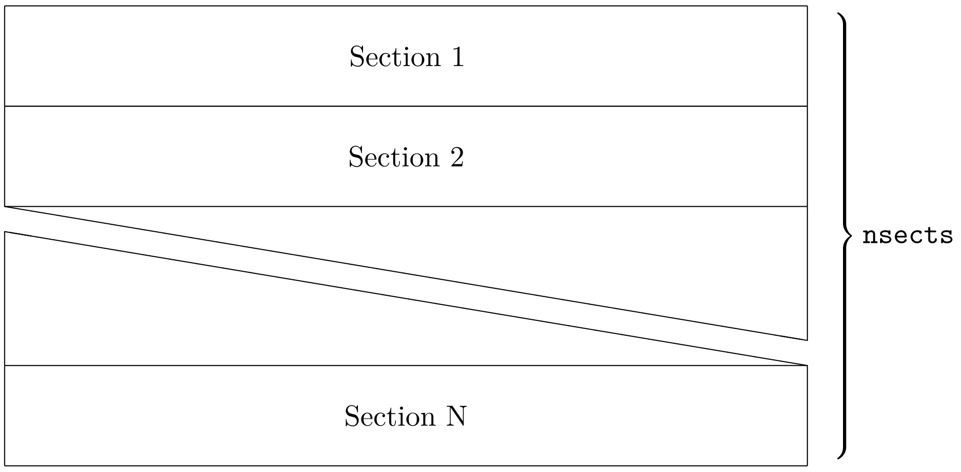
The stream's section count **must** be greater than 0.

[2] https://en.wikipedia.org/wiki/ASCII

4.2 Body

The FPFF body begins immediately after the header (offset `sizeof(header)`).

The body is a list of `nsects` *sections*:

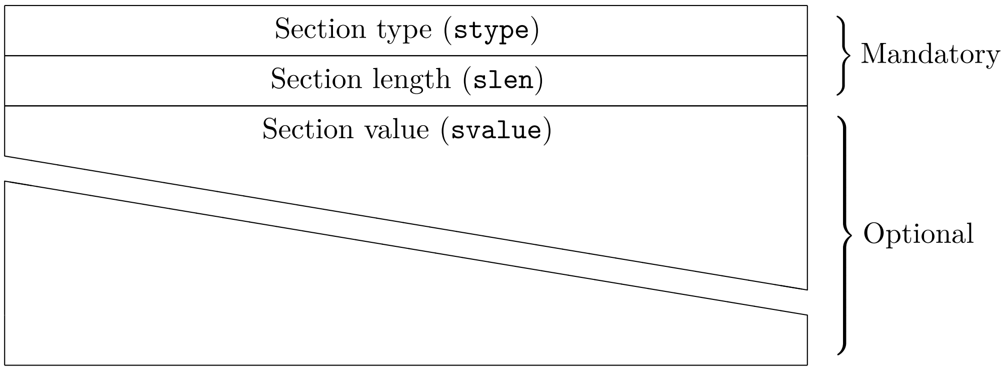


The layout of sections is described below.

4.2.1 Sections

Every section has *at least* two words: the section type (`stype`) and length (`slen`).

If `slen` is 0, then `svalue` **must** not exist. Thus, `slen` refers to the **value only** – the *total* length of the section in bytes is `slen + sizeof(stype) + sizeof(slen)`.



4.2.1.1 Section types

The `stype` field of a section indicates how to handle the section's value.

There are currently a fixed set of valid types:

- `SECTION_ASCII` (`0x1`)
- `SECTION_UTF8` (`0x2`) – UTF-8-encoded text[3].
- `SECTION_WORDS` (`0x3`) – Array of words.
- `SECTION_DWORDS` (`0x4`) – Array of dwords.
- `SECTION_DOUBLES` (`0x5`) – Array of doubles.
- `SECTION_COORD` (`0x6`) – (Latitude, longitude) tuple of doubles.
- `SECTION_REFERENCE` (`0x7`) – The index of another section.
- `SECTION_PNG` (`0x8`) – Embedded PNG image.

A section's type **must** be one of the above.

4.2.1.1.1 `SECTION_ASCII`

Sections of type `SECTION_ASCII` **must** contain `slen` bytes of ASCII-encoded text.

4.2.1.1.2 `SECTION_UTF8`

Sections of type `SECTION_UTF8` **must** contain `slen` bytes of UTF-8-encoded text.

4.2.1.1.3 `SECTION_WORDS`

Sections of type `SECTION_WORDS` **must** contain `slen / 4` words.

4.2.1.1.4 `SECTION_DWORDS`

Sections of type `SECTION_DWORDS` **must** contain `slen / 8` dwords.

4.2.1.1.5 `SECTION_DOUBLES`

Sections of type `SECTION_DOUBLES` **must** contain `slen / 8` doubles.

4.2.1.1.6 `SECTION_COORD`

Sections of type `SECTION_COORD` **must** contain two doubles.

`SECTION_COORD` sections **must** have an `slen` of exactly 16.

The coordinates inside of a `SECTION_COORD` **should** be a valid (latitude, longitude) tuple.

[3]https://en.wikipedia.org/wiki/UTF-8

4.2.1.1.7 `SECTION_REFERENCE`

Sections of type `SECTION_REFERENCE` **must** contain one word.

`SECTION_REFERENCE` sections **must** have an `slen` of exactly 4.

The `svalue` of a `SECTION_REFERENCE` section **must** be a valid index in the range `[0, nsects - 1]`.

4.2.1.1.8 `SECTION_PNG`

Sections of type `SECTION_PNG` **must** contain `slen` bytes of PNG-encoded data[4].

As a space-saving measure, a proper RFCC emitter **must** remove the PNG's file signature[5]. Thus, a proper RFCC parser **must** re-add the signature to produce the actual PNG.

4.2.1.2 Section length

As mentioned in 4.2.1, a section's length (`slen`) is the length of the section's value (`svalue`), **not** including the length of `stype` and `slen` themselves.

[4] https://en.wikipedia.org/wiki/Portable_Network_Graphics
[5] http://www.libpng.org/pub/png/spec/1.2/PNG-Rationale.html#R.PNG-file-signature