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Returning Values from Forms: multipart/form-data

Abstract

This specification defines the multipart/form-data media type, which can be used by a wide variety of applications and transported by a wide variety of protocols as a way of returning a set of values as the result of a user filling out a form. This document obsoletes RFC 2388.

Status of this Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741[1].

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc7578[2].

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[1] https://www.rfc-editor.org/rfc/rfc5741.html#section-2
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1. Introduction

In many applications, it is possible for a user to be presented with a form. The user will fill out the form, including information that is typed, generated by user input, or included from files that the user has selected. When the form is filled out, the data from the form is sent from the user to the receiving application.

The definition of multipart/form-data is derived from one of those applications, originally set out in [RFC1867] and subsequently incorporated into HTML 3.2 [W3C.REC-html32-19970114], where forms are expressed in HTML, and the form data is sent via HTTP or electronic mail. This representation is widely implemented in numerous web browsers and web servers.

However, multipart/form-data is also used for forms that are presented using representations other than HTML (spreadsheets, PDF, etc.) and for transport using means other than electronic mail or HTTP; it is used in distributed applications that do not involve forms at all or do not have users filling out the form. For this reason, this document defines a general syntax and semantics independent of the application for which it is used, with specific rules for web applications noted in context.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14, RFC 2119 [RFC2119].

2. Percent-Encoding Option

Within this specification, "percent-encoding" (as defined in [RFC3986]) is offered as a possible way of encoding characters in file names that are otherwise disallowed, including non-ASCII characters, spaces, control characters, and so forth. The encoding is created replacing each non-ASCII or disallowed character with a sequence, where each byte of the UTF-8 encoding of the character is represented by a percent-sign (%) followed by the (case-insensitive) hexadecimal of that byte.

3. Advice for Forms and Form Processing

The representation and interpretation of forms and the nature of form processing is not specified by this document. However, for forms and form processing that result in the generation of multipart/form-data, some suggestions are included.

In a form, there is generally a sequence of fields, where each field is expected to be supplied with a value, e.g., by a user who fills out the form. Each field has a name. After a form has been filled out and the form's data is "submitted", the form processing results in a set of values for each field -- the "form data".

In forms that work with multipart/form-data, field names could be arbitrary Unicode strings; however, restricting field names to ASCII will help avoid some interoperability issues (see Section 5.1).

Within a given form, ensuring field names are unique is also helpful. Some fields may have default values or presupplied values in the form itself. Fields with presupplied values might be hidden or invisible; this allows using generic processing for form data from a variety of actual forms.

4. Definition of multipart/form-data

The media type multipart/form-data follows the model of multipart MIME data streams as specified in Section 5.1 of [RFC2046]; changes are noted in this document.

A multipart/form-data body contains a series of parts separated by a boundary.

4.1. "Boundary" Parameter of multipart/form-data

As with other multipart types, the parts are delimited with a boundary delimiter, constructed using CRLF, "--", and the value of the "boundary" parameter. The boundary is supplied as a "boundary" parameter to the multipart/form-data type. As noted in Section 5.1 of [RFC2046], the boundary delimiter MUST NOT appear inside any of the encapsulated parts, and it is often necessary to enclose the "boundary" parameter values in quotes in the Content-Type header field.

4.2. Content-Disposition Header Field for Each Part

Each part MUST contain a Content-Disposition header field [RFC2183] where the disposition type is `form-data`. The Content-Disposition header field MUST also contain an additional parameter of `name`; the value of the `name` parameter is the original field name from the form (possibly encoded; see Section 5.1). For example, a part might contain a header field such as the following, with the body of the part containing the form data of the "user" field:

```
Content-Disposition: form-data; name="user"
```

For form data that represents the content of a file, a name for the file SHOULD be supplied as well, by using a `filename` parameter of the Content-Disposition header field. The file name isn't mandatory for cases where the file name isn't available or is meaningless or private; this might result, for example, when selection or drag-and- drop is used or when the form data content is streamed directly from a device.

If a "filename" parameter is supplied, the requirements of Section 2.3 of [RFC2183] for the "receiving MUA" (i.e., the receiving Mail User Agent) apply to receivers of multipart/form-data as well: do not use the file name blindly, check and possibly change to match local file system conventions if applicable, and do not use directory path information that may be present.

In most multipart types, the MIME header fields in each part are restricted to US-ASCII; for compatibility with those systems, file names normally visible to users MAY be encoded using the percent-encoding method in Section 2, following how a "file:" URI [URI-SCHEME] might be encoded.

NOTE: The encoding method described in [RFC5987], which would add a "filename*" parameter to the Content-Disposition header field, MUST NOT be used.

Some commonly deployed systems use multipart/form-data with file names directly encoded including octets outside the US-ASCII range. The encoding used for the file names is typically UTF-8, although HTML forms will use the charset associated with the form.

4.3. Multiple Files for One Form Field

The form data for a form field might include multiple files.

[RFC2388] suggested that multiple files for a single form field be transmitted using a nested "multipart/mixed" part. This usage is deprecated.

To match widely deployed implementations, multiple files MUST be sent by supplying each file in a separate part but all with the same `name` parameter.

Receiving applications intended for wide applicability (e.g., multipart/form-data parsing libraries) SHOULD also support the older method of supplying multiple files.

4.4. Content-Type Header Field for Each Part

Each part MAY have an (optional) `Content-Type` header field, which defaults to "text/plain". If the contents of a file are to be sent, the file data SHOULD be labeled with an appropriate media type, if known, or "application/octet-stream".

4.5. The Charset Parameter for "text/plain" Form Data

In the case where the form data is text, the charset parameter for the "text/plain" Content-Type MAY be used to indicate the character encoding used in that part. For example, a form with a text field in which a user typed "Joe owes <eu>100", where <eu> is the Euro symbol, might have form data returned as:

```
    --AaB03x
    content-disposition: form-data; name="field1"
    content-type: text/plain;charset=UTF-8
    content-transfer-encoding: quoted-printable

    Joe owes =E2=82=AC100.
    --AaB03x
```

In practice, many widely deployed implementations do not supply a charset parameter in each part, but rather, they rely on the notion of a "default charset" for a multipart/form-data instance. Subsequent sections will explain how the default charset is established.

4.6. The _charset_ Field for Default Charset

Some form-processing applications (including HTML) have the convention that the value of a form entry with entry name `_charset_` and type `hidden` is automatically set when the form is opened; the value is used as the default charset of text field values (see form-charset in Section 5.1.2). In such cases, the value of the default charset for each "text/plain" part without a charset parameter is the supplied value. For example:

```
    --AaB03x
    content-disposition: form-data; name="_charset_"

    iso-8859-1
    --AaB03x--
    content-disposition: form-data; name="field1"

    ...text encoded in iso-8859-1 ...
    AaB03x--
```

4.7. Content-Transfer-Encoding Deprecated

Previously, it was recommended that senders use a Content-Transfer-Encoding encoding (such as `quoted-printable`) for each non-ASCII part of a multipart/form-data body because that would allow use in transports that only support a `7bit` encoding. This use is deprecated for use in contexts that support binary data such as HTTP. Senders SHOULD NOT generate any parts with a Content-Transfer-Encoding header field.

Currently, no deployed implementations that send such bodies have been discovered.

4.8. Other "Content-" Header Fields

The multipart/form-data media type does not support any MIME header fields in parts other than Content-Type, Content-Disposition, and (in limited circumstances) Content-Transfer-Encoding. Other header fields MUST NOT be included and MUST be ignored.

5. Operability Considerations

5.1. Non-ASCII Field Names and Values

Normally, MIME header fields in multipart bodies are required to consist only of 7-bit data in the US-ASCII character set. While [RFC2388] suggested that non-ASCII field names be encoded according to the method in [RFC2047], this practice doesn't seem to have been followed widely.

This specification makes three sets of recommendations for three different states of workflow.

5.1.1. Avoid Non-ASCII Field Names

For broadest interoperability with existing deployed software, those creating forms SHOULD avoid non-ASCII field names. This should not be a burden because, in general, the field names are not visible to users. The field names in the underlying need not match what the user sees on the screen.

If non-ASCII field names are unavoidable, form or application creators SHOULD use UTF-8 uniformly. This will minimize interoperability problems.

5.1.2. Interpreting Forms and Creating multipart/form-data Data

Some applications of this specification will supply a character encoding to be used for interpretation of the multipart/form-data body. In particular, HTML 5 [W3C.REC-html5-20141028] uses

- the content of a "_charset_" field, if there is one;
- the value of an accept-charset attribute of the <form> element, if there is one;
- the character encoding of the document containing the form, if it is US-ASCII compatible;
- otherwise, UTF-8.

Call this value the form-charset. Any text, whether field name, field value, or ("text/plain") form data that uses characters outside the ASCII range MAY be represented directly encoded in the form-charset.

5.1.3. Parsing and Interpreting Form Data

While this specification provides guidance for the creation of multipart/form-data, parsers and interpreters should be aware of the variety of implementations. File systems differ as to whether and how they normalize Unicode names, for example. The matching of form elements to form-data parts may rely on a fuzzier match. In particular, some multipart/form-data generators might have followed the previous advice of [RFC2388] and used the "encoded-word" method of encoding non-ASCII values, as described in [RFC2047]:

```
encoded-word = "=?" charset "?" encoding "?" encoded-text "?="
```

Others have been known to follow [RFC2231], to send unencoded UTF-8, or even to send strings encoded in the form-charset.

For this reason, interpreting multipart/form-data (even from conforming generators) may require knowing the charset used in form encoding in cases where the _charset_ field value or a charset parameter of a "text/plain" Content-Type header field is not supplied.

5.2. Ordered Fields and Duplicated Field Names

Form processors given forms with a well-defined ordering SHOULD send back results in order. (Note that there are some forms that do not define a natural order.) Intermediaries MUST NOT reorder the results. Form parts with identical field names MUST NOT be coalesced.

5.3. Interoperability with Web Applications

Many web applications use the "application/x-www-form-urlencoded" method for returning data from forms. This format is quite compact, for example:

```
name=Xavier+Xantico&verdict=Yes&colour=Blue&happy=sad&Utf%F6r=Send
```

However, there is no opportunity to label the enclosed data with a content type, apply a charset, or use other encoding mechanisms.

Many form-interpreting programs (primarily web browsers) now implement and generate multipart/form-data, but a receiving application might also need to support the "application/x-www-form-urlencoded" format.

5.4. Correlating Form Data with the Original Form

This specification provides no specific mechanism by which multipart/form-data can be associated with the form that caused it to be transmitted. This separation is intentional; many different forms might be used for transmitting the same data. In practice, applications may supply a specific form processing resource (in HTML, the ACTION attribute in a FORM tag) for each different form. Alternatively, data about the form might be encoded in a "hidden field" (a field that is part of the form but that has a fixed value to be transmitted back to the form-data processor).

6. IANA Considerations

The media type registration of multipart/form-data has been updated to point to this document, using the template in Section 8. In addition, the registrations of the "name" parameter and the "form-data" value in the "Content Disposition Values and Parameters" registry have been updated to both point to this document.

7. Security Considerations

All form-processing software should treat user supplied form-data with sensitivity, as it often contains confidential or personally identifying information. There is widespread use of form "auto-fill" features in web browsers; these might be used to trick users to unknowingly send confidential information when completing otherwise innocuous tasks. multipart/form-data does not supply any features for checking integrity, ensuring confidentiality, avoiding user confusion, or other security features; those concerns must be addressed by the form-filling and form-data-interpreting applications.

Applications that receive forms and process them must be careful not to supply data back to the requesting form-processing site that was not intended to be sent.

It is important when interpreting the filename of the Content-Disposition header field to not inadvertently overwrite files in the recipient's file space.

User applications that request form information from users must be careful not to cause a user to send information to the requestor or a third party unwillingly or unwittingly. For example, a form might request that spam information be sent to an unintended third party or private information be sent to someone that the user might not actually intend. While this is primarily an issue for the representation and interpretation of forms themselves (rather than the data representation of the form data), the transportation of private information must be done in a way that does not expose it to unwanted prying.

With the introduction of form-data that can reasonably send back the content of files from a user's file space, the possibility arises that a user might be sent an automated script that fills out a form and then sends one of the user's local files to another address. Thus, additional caution is required when executing automated scripting where form-data might include a user's files.

Files sent via multipart/form-data may contain arbitrary executable content, and precautions against malicious content are necessary.

The considerations of Sections 2.3 and 5 of [RFC2183], with respect to the "filename" parameter of the Content-Disposition header field, also apply to its usage here.

8. Media Type Registration for multipart/form-data

This section is the media type registration using the template from [RFC6838].

Type name:	multipart
Subtype name:	form-data
Required parameters:	boundary
Optional parameters:	none
Encoding considerations:	Common use is BINARY. In limited use (or transports that restrict the encoding to 7bit or 8bit), each part is encoded separately using Content-Transfer-Encoding; see Section 4.7.
Security considerations:	See Section 7 of this document.
Interoperability considerations:	This document makes several recommendati for interoperabilit with

deployed implementatic including Section 4.7.

Published specification: This document.

Applications that use this media type: Numerous web browsers, servers, and web applications.

Fragment identifier considerations: None; fragment identifiers are not defined for this type.

Additional information:

Deprecat alias names for this type: N/A

Magic number(s N/A

File extensior N/A

Macintos file type code(s): N/A

Person & email address to contact for further information: Author of this document.

Intended usage: COMMON

Restrictions on usage:	none
Author:	Author of this document.
Change controller:	IETF
Provisional registration:	N/A

9. References

9.1. Normative References

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[W3C.REC-html5-20141028] Hickson, I., Berjon, R., Faulkner, S., Leithead, T., Navara, E., O'Connor, E., and S. Pfeiffer, "HTML5", W3C Recommendation

REC-html5-20141028, October 2014, <http://www.w3.org/TR/2014/REC-html5-20141028>.

Appendix A. Changes from RFC 2388

The handling of non-ASCII field names has changed -- the method described in RFC 2047 is no longer recommended; instead, it is suggested that senders send UTF-8 field names directly and that file names be sent directly in the form-charset.

The handling of multiple files submitted as the result of a single form field (e.g., HTML's <input type=file multiple> element) results in each file having its own top-level part with the same name parameter; the method of using a nested "multipart/mixed" from [RFC2388] is no longer recommended for creators and is not required for receivers as there are no known implementations of senders.

The _charset_ convention and use of an explicit "form-data" charset is documented; also, "boundary" is now a required parameter in Content-Type.

The relationship of the ordering of fields within a form and the ordering of returned values within multipart/form-data was not defined before, nor was the handling of the case where a form has multiple fields with the same name.

Various editorial changes were made; they include removing the obsolete discussion of alternatives from the appendix, updating the references, and moving the outline of form processing into the introduction.

Appendix B. Alternatives

There are numerous alternative ways in which form data can be encoded; many are listed in Section 5.2 of [RFC2388]. The multipart/form-data encoding is verbose, especially if there are many fields with short values. In most use cases, this overhead isn't significant.

More problematic are the differences introduced when implementors opted to not follow [RFC2388] when encoding non-ASCII field names (perhaps because "may" should have been "MUST"). As a result, parsers need to be more complex for matching against the possible outputs of various encoding methods.

Appendix C. Acknowledgements

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