                 Character Set and Language Encoding for
         Hypertext Transfer Protocol (HTTP) Header Field Parameters

Abstract

   By default, message header field parameters in Hypertext Transfer
   Protocol (HTTP) messages cannot carry characters outside the ISO-
   8859-1 character set. RFC 2231 defines an encoding mechanism for use
   in Multipurpose Internet Mail Extensions (MIME) headers. This
   document specifies an encoding suitable for use in HTTP header fields
   that is compatible with a profile of the encoding defined in RFC
   2231.

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.

   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/rfc5987.

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1. Introduction

   By default, message header field parameters in HTTP ([RFC2616])
   messages cannot carry characters outside the ISO-8859-1 character set
   ([ISO-8859-1]). RFC 2231 ([RFC2231]) defines an encoding mechanism
   for use in MIME headers. This document specifies an encoding
   suitable for use in HTTP header fields that is compatible with a
   profile of the encoding defined in RFC 2231.

      Note: in the remainder of this document, RFC 2231 is only
      referenced for the purpose of explaining the choice of features
      that were adopted; they are therefore purely informative.

      Note: this encoding does not apply to message payloads transmitted
      over HTTP, such as when using the media type "multipart/form-data"
      ([RFC2388]).

2. Notational Conventions

   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 [RFC2119].

   This specification uses the ABNF (Augmented Backus-Naur Form)
   notation defined in [RFC5234]. The following core rules are included
   by reference, as defined in [RFC5234], Appendix B.1: ALPHA (letters),
   DIGIT (decimal 0-9), HEXDIG (hexadecimal 0-9/A-F/a-f), and LWSP
   (linear whitespace).

   Note that this specification uses the term "character set" for
   consistency with other IETF specifications such as RFC 2277 (see
   [RFC2277], Section 3). A more accurate term would be "character
   encoding" (a mapping of code points to octet sequences).

3. Comparison to RFC 2231 and Definition of the Encoding

   RFC 2231 defines several extensions to MIME. The sections below
   discuss if and how they apply to HTTP header fields.

   In short:

   o Parameter Continuations aren't needed (Section 3.1),

   o Character Set and Language Information are useful, therefore a
      simple subset is specified (Section 3.2), and

   o Language Specifications in Encoded Words aren't needed
      (Section 3.3).

3.1. Parameter Continuations

   Section 3 of [RFC2231] defines a mechanism that deals with the length
   limitations that apply to MIME headers. These limitations do not
   apply to HTTP ([RFC2616], Section 19.4.7).

   Thus, parameter continuations are not part of the encoding defined by
   this specification.

3.2. Parameter Value Character Set and Language Information

   Section 4 of [RFC2231] specifies how to embed language information
   into parameter values, and also how to encode non-ASCII characters,
   dealing with restrictions both in MIME and HTTP header parameters.

   However, RFC 2231 does not specify a mandatory-to-implement character
   set, making it hard for senders to decide which character set to use.
   Thus, recipients implementing this specification MUST support the
   character sets "ISO-8859-1" [ISO-8859-1] and "UTF-8" [RFC3629].

   Furthermore, RFC 2231 allows the character set information to be left
   out. The encoding defined by this specification does not allow that.

3.2.1. Definition

   The syntax for parameters is defined in Section 3.6 of [RFC2616]
   (with RFC 2616 implied LWS translated to RFC 5234 LWSP):

```
   parameter     = attribute LWSP "=" LWSP value

   attribute     = token
   value         = token / quoted-string

   quoted-string = <quoted-string, defined in [RFC2616], Section 2.2>
   token         = <token, defined in [RFC2616], Section 2.2>
```

   In order to include character set and language information, this
   specification modifies the RFC 2616 grammar to be:

```
   parameter     = reg-parameter / ext-parameter

   reg-parameter = parmname LWSP "=" LWSP value

   ext-parameter = parmname "*" LWSP "=" LWSP ext-value

   parmname      = 1*attr-char

   ext-value     = charset  "'" [ language ] "'" value-chars
                 ; like RFC 2231's <extended-initial-value>
                 ; (see [RFC2231], Section 7)

   charset       = "UTF-8" / "ISO-8859-1" / mime-charset

   mime-charset  = 1*mime-charsetc
   mime-charsetc = ALPHA / DIGIT
                 / "!" / "#" / "$" / "%" / "&"
                 / "+" / "-" / "^" / "_" / "`"
                 / "{" / "}" / "~"
                 ; as <mime-charset> in Section 2.3 of [RFC2978]
                 ; except that the single quote is not included
                 ; SHOULD be registered in the IANA charset registry

   language      = <Language-Tag, defined in [RFC5646], Section 2.1>

   value-chars   = *( pct-encoded / attr-char )

   pct-encoded   = "%" HEXDIG HEXDIG
                 ; see [RFC3986], Section 2.1

   attr-char     = ALPHA / DIGIT
                 / "!" / "#" / "$" / "&" / "+" / "-" / "."
                 / "^" / "_" / "`" / "|" / "~"
                 ; token except ( "*" / "'" / "%" )
```

Thus, a parameter is either a regular parameter (reg-parameter), as
previously defined in Section 3.6 of [RFC2616], or an extended
parameter (ext-parameter).

Extended parameters are those where the left-hand side of the
assignment ends with an asterisk character.

The value part of an extended parameter (ext-value) is a token that
consists of three parts: the REQUIRED character set name (charset),
the OPTIONAL language information (language), and a character
sequence representing the actual value (value-chars), separated by
single quote characters. Note that both character set names and
language tags are restricted to the US-ASCII character set, and are
matched case-insensitively (see [RFC2978], Section 2.3 and [RFC5646],
Section 2.1.1).

Inside the value part, characters not contained in attr-char are
encoded into an octet sequence using the specified character set.
That octet sequence is then percent-encoded as specified in Section
2.1 of [RFC3986].

Producers MUST use either the "UTF-8" ([RFC3629]) or the "ISO-8859-1"
([ISO-8859-1]) character set. Extension character sets (mime-
charset) are reserved for future use.

   Note: recipients should be prepared to handle encoding errors,
   such as malformed or incomplete percent escape sequences, or non-
   decodable octet sequences, in a robust manner. This specification
   does not mandate any specific behavior, for instance, the
   following strategies are all acceptable:

   *   ignoring the parameter,

   *   stripping a non-decodable octet sequence,

   *   substituting a non-decodable octet sequence by a replacement
       character, such as the Unicode character U+FFFD (Replacement
       Character).

   Note: the RFC 2616 token production ([RFC2616], Section 2.2)
   differs from the production used in RFC 2231 (imported from
   Section 5.1 of [RFC2045]) in that curly braces ("{" and "}") are
   excluded. Thus, these two characters are excluded from the attr-
   char production as well.

Note: the <mime-charset> ABNF defined here differs from the one in
Section 2.3 of [RFC2978] in that it does not allow the single
quote character (see also RFC Errata ID 1912 [Err1912]). In
practice, no character set names using that character have been
registered at the time of this writing.

3.2.2. Examples

Non-extended notation, using "token":

   foo: bar; title=Economy

Non-extended notation, using "quoted-string":

   foo: bar; title="US-$ rates"

Extended notation, using the Unicode character U+00A3 (POUND SIGN):

   foo: bar; title*=iso-8859-1'en'%A3%20rates

Note: the Unicode pound sign character U+00A3 was encoded into the
single octet A3 using the ISO-8859-1 character encoding, then
percent-encoded. Also, note that the space character was encoded as
%20, as it is not contained in attr-char.

Extended notation, using the Unicode characters U+00A3 (POUND SIGN)
and U+20AC (EURO SIGN):

   foo: bar; title*=UTF-8''%c2%a3%20and%20e2%82%ac%20rates

Note: the Unicode pound sign character U+00A3 was encoded into the
octet sequence C2 A3 using the UTF-8 character encoding, then
percent-encoded. Likewise, the Unicode euro sign character U+20AC
was encoded into the octet sequence E2 82 AC, then percent-encoded.
Also note that HEXDIG allows both lowercase and uppercase characters,
so recipients must understand both, and that the language information
is optional, while the character set is not.

3.3. Language Specification in Encoded Words

Section 5 of [RFC2231] extends the encoding defined in [RFC2047] to
also support language specification in encoded words. Although the
HTTP/1.1 specification does refer to RFC 2047 ([RFC2616], Section
2.2), it's not clear to which header field exactly it applies, and
whether it is implemented in practice (see
<http://tools.ietf.org/wg/httpbis/trac/ticket/111> for details).

Thus, this specification does not include this feature.

4. Guidelines for Usage in HTTP Header Field Definitions

   Specifications of HTTP header fields that use the extensions defined
   in Section 3.2 ought to clearly state that. A simple way to achieve
   this is to normatively reference this specification, and to include
   the ext-value production into the ABNF for that header field.

   For instance:

     foo-header = "foo" LWSP ":" LWSP token ";" LWSP title-param
     title-param = "title" LWSP "=" LWSP value
                 / "title*" LWSP "=" LWSP ext-value
     ext-value   = <see RFC 5987, Section 3.2>

      Note: The Parameter Value Continuation feature defined in Section
      3 of [RFC2231] makes it impossible to have multiple instances of
      extended parameters with identical parmname components, as the
      processing of continuations would become ambiguous. Thus,
      specifications using this extension are advised to disallow this
      case for compatibility with RFC 2231.

4.1. When to Use the Extension

   Section 4.2 of [RFC2277] requires that protocol elements containing
   human-readable text are able to carry language information. Thus,
   the ext-value production ought to be always used when the parameter
   value is of textual nature and its language is known.

   Furthermore, the extension ought to also be used whenever the
   parameter value needs to carry characters not present in the US-ASCII
   ([USASCII]) character set (note that it would be unacceptable to
   define a new parameter that would be restricted to a subset of the
   Unicode character set).

4.2. Error Handling

   Header field specifications need to define whether multiple instances
   of parameters with identical parmname components are allowed, and how
   they should be processed. This specification suggests that a
   parameter using the extended syntax takes precedence. This would
   allow producers to use both formats without breaking recipients that
   do not understand the extended syntax yet.

   Example:

     foo: bar; title="EURO exchange rates";
             title*=utf-8''%e2%82%ac%20exchange%20rates

   In this case, the sender provides an ASCII version of the title for
   legacy recipients, but also includes an internationalized version for
   recipients understanding this specification -- the latter obviously
   ought to prefer the new syntax over the old one.

      Note: at the time of this writing, many implementations failed to
      ignore the form they do not understand, or prioritize the ASCII
      form although the extended syntax was present.

5. Security Considerations

   The format described in this document makes it possible to transport
   non-ASCII characters, and thus enables character "spoofing"
   scenarios, in which a displayed value appears to be something other
   than it is.

   Furthermore, there are known attack scenarios relating to decoding
   UTF-8.

   See Section 10 of [RFC3629] for more information on both topics.

   In addition, the extension specified in this document makes it
   possible to transport multiple language variants for a single
   parameter, and such use might allow spoofing attacks, where different
   language versions of the same parameter are not equivalent. Whether
   this attack is useful as an attack depends on the parameter
   specified.

6. Acknowledgements

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   ABNF details, to Graham Klyne and Alexey Melnikov for general review,
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   Benjamin Carlyle and Roar Lauritzsen for implementer's feedback.

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