

Network Working Group  
Reschke  
Internet-Draft  
greenbytes  
Intended status: Standards Track  
2015  
Expires: April 7, 2016

J.

October 5,

## A JSON Encoding for HTTP Header Field Values draft-reschke-http-jfv-02

### Abstract

This document establishes a convention for use of JSON-encoded field values in HTTP header fields.

Editorial Note (To be removed by RFC Editor before publication)

Distribution of this document is unlimited. Although this is not a work item of the HTTPbis Working Group, comments should be sent to the Hypertext Transfer Protocol (HTTP) mailing list at [ietf-http-wg@w3.org](mailto:ietf-http-wg@w3.org) [1], which may be joined by sending a message with subject "subscribe" to [ietf-http-wg-request@w3.org](mailto:ietf-http-wg-request@w3.org) [2].

Discussions of the HTTPbis Working Group are archived at <http://lists.w3.org/Archives/Public/ietf-http-wg/>.

XML versions and latest edits for this document are available from <http://greenbytes.de/tech/webdav/#draft-reschke-http-jfv>.

The changes in this draft are summarized in [Appendix A.2](#).

### Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on April 7, 2016.

### Copyright Notice



Copyright (c) 2015 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with

respect

to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

- 1 1. Introduction . . . . .
- 3 2. Data Model and Format . . . . .
- 3 3. Sender Requirements . . . . .
- 4 4. Recipient Requirements . . . . .
- 5 5. Using this Format in Header Field Definitions . . . . .
- 5 6. Examples . . . . .
  - 5 6.1. Content-Length . . . . .
  - 6 6.2. Content-Disposition . . . . .
  - 7 6.3. WWW-Authenticate . . . . .
- 7 7. Discussion . . . . .
- 8 8. Deployment Considerations . . . . .
- 8 9. Internationalization Considerations . . . . .
- 8 10. Security Considerations . . . . .
- 8 11. References . . . . .
  - 8 11.1. Normative References . . . . .
  - 9 11.2. Informative References . . . . .
- 10 [Appendix A](#). Change Log (to be removed by RFC Editor before publication) . . . . .
  - 10 [A.1](#). Since [draft-reschke-http-jfv-00](#) . . . . .

10

A.2. Since [draft-reschke-http-jfv-01](#) . . . . .

10

## **1. Introduction**

Defining syntax for new HTTP header fields ([\[RFC7230\]](#), [Section 3.2](#)) is non-trivial. Among the commonly encountered problems are:

- o There is no common syntax for complex field values. Several well-known header fields do use a similarly looking syntax, but it is hard to write generic parsing code that will both correctly handle valid field values but also reject invalid ones.
- o The HTTP message format allows header fields to repeat, so field syntax needs to be designed in a way that these cases are either meaningful, or can be unambiguously detected and rejected.
- o HTTP/1.1 does not define a character encoding scheme ([\[RFC6365\]](#), [Section 2](#)), so header fields are either stuck with US-ASCII ([\[RFC0020\]](#)), or need out-of-band information to decide what encoding scheme is used. Furthermore, APIs usually assume a default encoding scheme in order to map from octet sequences to strings (for instance, [\[XMLHttpRequest\]](#) uses the IDL type "ByteString", effectively resulting in the ISO-8859-1 character encoding scheme [\[ISO-8859-1\]](#) being used).

(See [Section 8.3.1 of \[RFC7231\]](#) for a summary of considerations for new header fields.)

This specification addresses the issues listed above by defining both a generic JSON-based ([\[RFC7159\]](#)) data model and a concrete wire format that can be used in definitions of new header fields.

## **2. Data Model and Format**

In HTTP, header fields with the same field name can occur multiple times within a single message ([Section 3.2.2 of \[RFC7230\]](#)). When this happens, recipients are allowed to combine the field values using commas as delimiter. This rule matches nicely JSON's array format ([Section 5 of \[RFC7159\]](#)). Thus, the basic data model used here is the JSON array.

Header field definitions that need only a single value can restrict themselves to arrays of length 1, and are encouraged to define error handling in case more values are received (such as "first wins", "last wins", or "abort with fatal error message").

JSON arrays are mapped to field values by creating a sequence of serialized member elements, separated by commas and optionally whitespace. This is equivalent to using the full JSON array format, while leaving out the "begin-array" ('[') and "end-array" (']')

Reschke  
3]

Expires April 7, 2016

[Page

delimiters.

The ABNF character names and classes below are used (copied from [\[RFC5234\], Appendix B.1](#)):

```
CR           = %x0D      ; carriage return
HTAB        = %x09      ; horizontal tab
LF          = %x0A      ; line feed
SP          = %x20      ; space
VCHAR       = %x21-7E   ; visible (printing) characters
```

Characters in JSON strings that are not allowed or discouraged in HTTP header field values -- that is, not in the "VCHAR" definition

--

need to be represented using JSON's "backslash" escaping mechanism ([\[RFC7159\], Section 7](#)).

The control characters CR, LF, and HTAB do not appear inside JSON strings, but can be used outside (line breaks, indentation etc). These characters need to be either stripped or replaced by space characters (ABNF "SP").

Formally, using the HTTP specification's ABNF extensions defined in [Section 7 of \[RFC7230\]](#):

```
json-field-value = #json-field-item
json-field-item  = JSON-Text
                  ; see \[RFC7159\], Section 2,
                  ; post-processed so that only VCHAR characters
                  ; are used
```

### **3. Sender Requirements**

To map a JSON array to an HTTP header field value, process each array element separately by:

1. generating the JSON representation,
2. stripping all JSON control characters (CR, HTAB, LF), or replacing them by space ("SP") characters,
3. replacing all remaining non-VSPACE characters by the equivalent backslash-escape sequence ([\[RFC7159\], Section 7](#)).

The resulting list of strings is transformed into an HTTP field value

by combining them using comma (%x2C) plus optional SP as delimiter, and encoding the resulting string into an octet sequence using the US-ASCII character encoding scheme ([\[RFC0020\]](#)).

Reschke  
4]

Expires April 7, 2016

[Page



#### **4. Recipient Requirements**

To map a set of HTTP header field instances to a JSON array:

1. combine all header field instances into a single field as per [Section 3.2.2 of \[RFC7230\]](#),
2. add a leading begin-array ("[" octet and a trailing end-array ("]") octet, then
3. run the resulting octet sequence through a JSON parser.

The result of the parsing operation is either an error (in which case the header field values needs to be considered invalid), or a JSON array.

#### **5. Using this Format in Header Field Definitions**

[[anchor5: Explain what a definition of a new header field needs to do precisely to use this format, mention must-ignore extensibiliy]]

#### **6. Examples**

This section shows how some of the existing HTTP header fields would look like if they would use the format defined by this specification.

##### **6.1. Content-Length**

"Content-Length" is defined in [Section 3.3.2 of \[RFC7230\]](#), with the field value's ABNF being:

```
Content-Length = 1*DIGIT
```

So the field value is similar to a JSON number ([\[RFC7230\]](#), [Section 6](#)).

Content-Length is restricted to a single field instance, as it doesn't use the list production (as per [Section 3.2.2 of \[RFC7230\]](#)). However, in practice multiple instances do occur, and the definition of the header field does indeed discuss how to handle these cases.

If Content-Length was defined using the JSON format discussed here, the ABNF would be something like:

```
Content-Length = #number  
                ; number: \[RFC7159\], Section 6
```

...and the prose definition would:



- o restrict all numbers to be non-negative integers without fractions, and
- o require that the array of values is of length 1 (but allow the case where the array is longer, but all members represent the same value)

## **6.2. Content-Disposition**

Content-Disposition field values, defined in [\[RFC6266\]](#), consist of a "disposition type" (a string), plus multiple parameters, of which at least one ("filename") sometime needs to carry non-ASCII characters.

For instance, the first example in [Section 5 of \[RFC6266\]](#):

```
Attachment; filename=example.html
```

has a disposition type of "Attachment", with filename parameter value

"example.html". A JSON representation of this information might be:

```
{
  "Attachment": {
    "filename" : "example.html"
  }
}
```

which would translate to a header field value of:

```
{ "Attachment": { "filename" : "example.html" } }
```

The third example in [Section 5 of \[RFC6266\]](#) uses a filename parameter containing non-US-ASCII characters:

```
attachment; filename*=UTF-8''%e2%82%ac%20rates
```

Note that in this case, the "filename\*" parameter uses the encoding defined in [\[RFC5987\]](#), representing a filename starting with the Unicode character U+20AC (EURO SIGN), followed by " rates". If the definition of Content-Disposition would have used the format proposed

here, the workaround involving the "parameter\*" syntax would not have been needed at all.

The JSON representation of this value could then be:

```
{ "attachment": { "filename" : "\u20AC rates" } }
```

Reschke  
6]

Expires April 7, 2016

[Page

### **6.3. WWW-Authenticate**

The WWW-Authenticate header field value is defined in [Section 4.1 of \[RFC7235\]](#) as a list of "challenges":

```
WWW-Authenticate = 1#challenge
```

...where a challenge consists of a scheme with optional parameters:

```
challenge = auth-scheme [ 1*SP ( token68 / #auth-param ) ]
```

An example for a complex header field value given in the definition of the header field is:

```
Newauth realm="apps", type=1, title="Login to \"apps\"",  
Basic realm="simple"
```

(line break added for readability)

A possible JSON representation of this field value would be the array below:

```
[  
  {  
    "Newauth" : {  
      "realm": "apps",  
      "type" : 1,  
      "title" : "Login to \"apps\""  
    }  
  },  
  {  
    "Basic" : {  
      "realm": "simple"  
    }  
  }  
]
```

...which would translate to a header field value of:

```
{ "Newauth" : { "realm": "apps", "type" : 1,  
                "title": "Login to \"apps\" } },  
{ "Basic" : { "realm": "simple"}}
```

## **7. Discussion**

This approach uses a default of "JSON array", using implicit array markers. An alternative would be a default of "JSON object". This would simplify the syntax for non-list-typed header fields, but all



the benefits of having the same data model for both types of header fields would be gone. A hybrid approach might make sense, as long as it doesn't require any heuristics on the recipient's side.

[[anchor7: Use of generic libs vs compactness of field values..]]

## **8. Deployment Considerations**

This JSON-based syntax will only apply to newly introduced header fields, thus backwards compatibility is not a problem. That being said, it is conceivable that there is existing code that might trip over double quotes not being used for HTTP's quoted-string syntax ([Section 3.2.6 of \[RFC7230\]](#)).

## **9. Internationalization Considerations**

[[anchor10: TBD, mention migration path to message format that is robust wrt UTF-8, or other binary encodings of JSON]]

## **10. Security Considerations**

Using JSON-shaped field values is believed to not introduce any new threads beyond those described in [Section 12 of \[RFC7159\]](#), namely the risk of recipients using the wrong tools to parse them.

Other than that, any syntax that makes extensions easy can be used to smuggle information through field values; however, this concern is shared with other widely used formats, such as those using parameters in the form of name/value pairs.

## **11. References**

### **11.1. Normative References**

- [RFC0020] Cerf, V., "ASCII format for network interchange", STD 80, [RFC 20](#), DOI 10.17487/RFC0020, October 1969, <<http://www.rfc-editor.org/info/rfc20>>.
- [RFC5234] Crocker, D., Ed. and P. Overell, "Augmented BNF Syntax Specifications: ABNF", STD 68, [RFC 5234](#), DOI 10.17487/RFC5234, January 2008, <<http://www.rfc-editor.org/info/rfc5234>>.
- [RFC7159] Bray, T., "The JavaScript Object Notation (JSON) Data Interchange Format", [RFC 7159](#), DOI 10.17487/[RFC7159](#), March 2014,

<http://www.rfc-editor.org/info/rfc7159>>.

Reschke  
8]

Expires April 7, 2016

[Page



[RFC7230] Fielding, R., Ed. and J. Reschke, Ed., "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing", [RFC 7230](#), DOI 10.17487/RFC7230, June 2014, <<http://www.rfc-editor.org/info/rfc7230>>.

[RFC7231] Fielding, R., Ed. and J. Reschke, Ed., "Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content", [RFC 7231](#), DOI 10.17487/RFC7231, June 2014, <<http://www.rfc-editor.org/info/rfc7231>>.

## **11.2. Informative References**

[ISO-8859-1] International Organization for Standardization, "Information technology -- 8-bit single-byte coded graphic character sets -- Part 1: Latin alphabet No. 1", ISO/IEC 8859-1:1998, 1998.

[RFC5987] Reschke, J., "Character Set and Language Encoding for Hypertext Transfer Protocol (HTTP) Header Field Parameters", [RFC 5987](#), DOI 10.17487/RFC5987, August 2010, <<http://www.rfc-editor.org/info/rfc5987>>.

[RFC6266] Reschke, J., "Use of the Content-Disposition Header Field in the Hypertext Transfer Protocol (HTTP)", [RFC 6266](#), DOI 10.17487/RFC6266, June 2011, <<http://www.rfc-editor.org/info/rfc6266>>.

[RFC6365] Hoffman, P. and J. Klensin, "Terminology Used in Internationalization in the IETF", [BCP 166](#), [RFC 6365](#), DOI 10.17487/RFC6365, September 2011, <<http://www.rfc-editor.org/info/rfc6365>>.

[RFC7235] Fielding, R., Ed. and J. Reschke, Ed., "Hypertext Transfer Protocol (HTTP/1.1): Authentication", [RFC 7235](#), DOI 10.17487/RFC7235, June 2014, <<http://www.rfc-editor.org/info/rfc7235>>.

[XMLHttpRequest] van Kesteren, A., Aubourg, J., Song, J., and H. Steen, "XMLHttpRequest Level 1", W3C Working Draft WD-XMLHttpRequest-20140130, January 2014, <<http://www.w3.org/TR/2014/WD-XMLHttpRequest-20140130/>>.

<ht

Latest version available at <<http://www.w3.org/TR/XMLHttpRequest/>>.

Reschke  
9]

Expires April 7, 2016

[Page

## URIs

[1] <<mailto:ietf-http-wg@w3.org>>

[2] <<mailto:ietf-http-wg-request@w3.org?subject=subscribe>>

## **Appendix A. Change Log (to be removed by RFC Editor before publication)**

### **A.1. Since [draft-reschke-http-jfv-00](#)**

Editorial fixes + working on the TODOs.

### **A.2. Since [draft-reschke-http-jfv-01](#)**

Mention slightly increased risk of smuggling information in header field values.

## Author's Address

Julian F. Reschke  
greenbytes GmbH  
Hafenweg 16  
Muenster, NW 48155  
Germany

EMail: [julian.reschke@greenbytes.de](mailto:julian.reschke@greenbytes.de)  
URI: <http://greenbytes.de/tech/webdav/>

