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JSON Pointer
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Abstract

JSON Pointer defines a string syntax for identifying a specific value within a JSON document.

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Table of Contents

1.	Introduction	3
2.	Conventions	3
3.	Syntax	3
4.	Evaluation	3
5.	JSON String Representation	4
6.	URI Fragment Identifier Representation	5
7.	Error Handling	6
8.	IANA Considerations	6
9.	Security Considerations	6
10.	Acknowledgements	7
11.	References	7
11.1.	Normative References	7
11.2.	Informative References	7
	Authors' Addresses	7

1. Introduction

This specification defines JSON Pointer, a string syntax for identifying a specific value within a JavaScript Object Notation (JSON) [RFC4627] document. It is intended to be easily expressed in JSON string values as well as Uniform Resource Identifier (URI) [RFC3986] fragment identifiers.

2. 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 expresses normative syntax rules using Augmented Backus-Naur Form (ABNF) [RFC5234] notation.

3. Syntax

A JSON Pointer is a [Unicode] string containing a sequence of zero or more reference tokens, each prefixed by a '/' (%x2F) character.

Since the characters '~' (%x7E) and '/' (%x2F) have a special meaning in JSON Pointer, they need to be encoded as '~0' and '~1' respectively, when appearing in a reference token.

Its ABNF syntax is:

```
json-pointer = *( "/" reference-token )
reference-token = *( unescaped / escaped )
unescaped = %x00-2E / %x30-7D / %x7F-10FFFF
escaped = "~" ( "0" / "1" )
```

It is an error condition if a JSON Pointer value does not conform to this syntax (see [Section 7](#)).

4. Evaluation

Evaluation of a JSON Pointer begins with a reference to the root value of a JSON document and completes with a reference to some value within the document. Each reference token in the JSON Pointer is sequentially evaluated.

Evaluation of each reference token begins by decoding any escaped character sequence; this is performed by first transforming any

occurrence of the sequence '~1' to '/', then transforming any occurrence of the sequence '~0' to '~'.

The reference token then modifies which value is referenced according to the following scheme:

If the currently referenced value is a JSON object, the new referenced value is the object member with the name identified by the reference token. The member name is equal to the token if it has the same number of Unicode characters as token and their code points are position-wise equal. If a referenced member name is not unique in an object, the member that is referenced is undefined, and evaluation fails (see below).

If the currently referenced value is a JSON array, the reference token MUST contain characters that represent an unsigned base-10 integer value (possibly with leading zeros), and the new referenced value is the array element with the zero-based index identified by the token.

If a reference token is being evaluated against a JSON document, implementations will evaluate each token against the document's contents, and terminate evaluation with an error condition if it fails to resolve a concrete value for any of the JSON pointer's reference tokens. See [Section 7](#) for details.

5. JSON String Representation

A JSON Pointer can be represented in a JSON string value. Per [\[RFC4627\], Section 2.5](#), all instances of quotation mark '"' (%x22), reverse solidus '\' (%x5C) and control (%x00-1F) characters MUST be escaped.

Note that before processing a JSON string as a JSON Pointer, backslash escape sequences must be unescaped.

For example, given the JSON document


```
{
  "foo": ["bar", "baz"],
  "": 0,
  "a/b": 1,
  "c%d": 2,
  "e^f": 3,
  "g|h": 4,
  "i\\j": 5,
  "k\"l": 6,
  " ": 7,
  "m~n": 8
}
```

Then the following JSON strings evaluate to the accompanying values:

""	// the whole document
"/foo"	["bar", "baz"]
"/foo/0"	"bar"
"/"	0
"/a~1b"	1
"/c%d"	2
"/e^f"	3
"/g h"	4
"/i\\j"	5
"/k\"l"	6
"/ "	7
"/m~0n"	8

6. URI Fragment Identifier Representation

A JSON Pointer can be represented in a URI fragment identifier by encoding it into octets, using UTF-8 [\[RFC3629\]](#), percent-encoding those characters not allowed by the fragment rule in [\[RFC3986\]](#).

Note that a given media type needs to nominate JSON Pointer as its fragment identifier syntax explicitly (usually, in its registration [\[RFC4288\]](#)); i.e., just because a document is JSON does not imply that JSON Pointer can be used as its fragment identifier syntax. In particular, the fragment identifier syntax for `application/json` is not JSON Pointer.

Given the same example document as above, the following URI fragment identifiers evaluate to the accompanying values:


```
#           // the whole document
#/foo      ["bar", "baz"]
#/foo/0    "bar"
#/         0
#/a~1b     1
#/c%25d    2
#/e%5Ef    3
#/g%7Ch    4
#/i%5Cj    5
#/k%22l    6
#/%20      7
#/m~0n     8
```

7. Error Handling

In the event of an error condition, evaluation of the JSON Pointer fails to complete.

This includes, but is not limited to:

- o Invalid pointer syntax
- o A pointer that references a non-existent value

This specification does not define how errors are handled; an application of JSON Pointer SHOULD specify the impact and handling of each type of error.

For example, some applications might stop pointer processing upon an error; others may attempt to recover from missing values by inserting default ones.

8. IANA Considerations

This document has no impact upon IANA.

9. Security Considerations

A given JSON Pointer is not guaranteed to reference an actual JSON value. Implementations should be aware of this and take appropriate precautions.

Note that JSON pointers can contain the NUL (Unicode U+0000) character, which may not be representable in all programming languages.

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11.1. Normative References

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