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JSON Patch
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Abstract

JSON Patch defines the media type "application/json-patch", a JSON document structure for expressing a sequence of operations to apply to a JSON document.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on March 21, 2013.

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1. Introduction

JavaScript Object Notation (JSON) [RFC4627] is a common format for the exchange and storage of structured data. HTTP PATCH [RFC5789] extends the Hypertext Transfer Protocol (HTTP) [RFC2616] with a method to perform partial modifications to resources.

The JSON Patch media type "application/json-patch" is a JSON document structure for expressing a sequence of operations to apply to a target JSON document, suitable for use with the HTTP PATCH method.

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 RFC 2119 [RFC2119].

3. Document Structure

A JSON Patch document contains a JSON array of objects. Each object contains a single operation to apply to the target JSON document.

An example JSON Patch document:

```
[
    { "test": "/a/b/c", "value": "foo" },
    { "remove": "/a/b/c" },
    { "add": "/a/b/c", "value": [ "foo", "bar" ] },
    { "replace": "/a/b/c", "value": 42 },
    { "move": "/a/b/c", "to": "/a/b/d" },
    { "copy": "/a/b/c", "to": "/a/b/e" }
]
```

Evaluation of a JSON Patch document begins with a target JSON document. Operations are applied sequentially in the order they appear in the array. Each operation in the sequence is applied to the target document; the resulting document becomes the target of the next operation. Evaluation continues until all operations are successfully applied or an error condition is encountered.

4. Operations

The operation to perform is expressed in a member of the operation object. The name of the operation member is one of: "add", "remove", "replace", "move", "copy" or "test".

The member value is a string containing a [JSON-Pointer] value that references the location within the target document to perform the operation. It is an error condition if an operation object contains no recognized operation member or more than one operation member.

4.1. add

The "add" operation adds a new value at the specified location in the target document. The location must reference one of: the root of the target document, a member to add to an existing object, or an element to add to an existing array. The operation object contains a "value" member that specifies the value to be added.

Example:

```
{ "add": "/a/b/c", "value": [ "foo", "bar" ] }
```

If the location references the root of the target document or a member of an existing object, it is an error condition if a value at the specified location already exists.

If the location references an element of an existing array, any elements at or above the specified index are shifted one position to the right. It is an error condition if the specified index is greater than the number of elements in the array.

Note that this operation will, in common use, contain a JSON Pointer that does not resolve to an existing value in the target document. As such, the pointer's error handling algorithm is invoked. This specification defines the error handling algorithm for "add" pointers to explicitly ignore the error and perform the operation as specified.

It is an error condition if the "value" member is not present.

4.2. remove

The "remove" operation removes the value at the specified location in the target document.

Example:

```
{ "remove": "/a/b/c" }
```

If removing an element from an array, any elements above the specified index are shifted one position to the left.

It is an error condition if a value at the specified location does

not exist.

4.3. replace

The "replace" operation replaces the value at the specified location in the target document with a new value. The operation object contains a "value" member that specifies the replacement value.

Example:

```
{ "replace": "/a/b/c", "value": 42 }
```

This operation is functionally identical to expressing a "remove" operation for a value, followed immediately by an "add" operation at the same location with the replacement value.

It is an error condition if a value at the specified location does not exist.

It is an error condition if the "value" member is not present.

4.4. move

The "move" operation removes the value at one location and adds it to another location in the target document.

The operation object contains a "to" member, a string containing a JSON Pointer value that references the location in the target document to add the value to. This location must reference one of: the member to add to an existing object, or an element to add to an existing array.

Example:

```
{ "move": "/a/b/c", "to": "/a/b/d" }
```

This operation is functionally identical to expressing a "remove" operation, followed immediately by an "add" operation at the new location with the value that was just removed. Moving a value to its current location can be safely ignored.

If the location in the "to" member references a member of an existing object in the target document, it is an error condition if a value at the specified location already exists (unless "move" and "to" specify the same object, which has no effect).

If the location in the "to" member references an element of an existing array, any elements at or above the specified index are

shifted one position to the right. It is an error condition if the specified index is greater than the number of elements in the array.

It is an error condition if the "to" member is not present.

4.5. copy

The "copy" operation copies the value at one location to another location in the target document.

The operation object contains a "to" member, a string containing a JSON Pointer value that references the location in the target document to add the value to. This location must reference one of: the member to add to an existing object, or an element to add to an existing array.

Example:

{ "copy": "/a/b/c", "to": "/a/b/e" }

If the location in the "to" member references a member of an existing object in the target document, it is an error condition if a value at the specified location already exists.

If the location in the "to" member references an element of an existing array, any elements at or above the specified index are shifted one position to the right. It is an error condition if the specified index is greater than the number of elements in the array.

It is an error condition if the "to" member is not present.

4.6. test

The "test" operation tests that a value at the specified location in the target document is equal to a specified value. The operation object contains a "value" member that specifies the value to test for.

Here, "equal" means that the target and specified values are of the same JSON type, and considered equal by the following rules for that type:

- strings: are considered equal if, after unescaping any sequence(s) in both strings starting with a reverse solidus, they contain the same number of Unicode characters and their code points are position-wise equal.

- numbers: are considered equal if subtracting one from the other results in 0.

- arrays: are considered equal if they contain the same number of values, and each value can be considered equal to the value at the corresponding position in the other array.

- objects: are considered equal if they contain the same number of members, and each member can be considered equal to a member in the other object, by comparing their keys as strings, and values using this list of type-specific rules.

- literals (false, true and null): are considered equal if they are the same.

Note that this is a logical comparison; e.g., whitespace between the member values of an array is not significant.

Also, note that ordering of the serialisation of object members is not significant.

Example:

```
{ "test": "/a/b/c", "value": "foo" }
```

It is an error condition if the value at the specified location is not equal to the specified value.

If the value is not specified, the test is only for presence, not value.

For example:

```
{ "test": "/a/b/c" }
```

merely tests that the indicated structure is present in the target document.

5. Error Handling

If an error condition occurs, evaluation of the JSON Patch document SHOULD terminate and application of the entire patch document SHALL NOT be deemed successful. Note that as per [RFC5789], when used with the PATCH HTTP method, it is atomic.

Therefore, the following patch would result in no changes being made to the document at all (because the "test" operation results in an

error).

```
[
 {"replace": "/a/b/c", "value": 42},
 {"test": "/a/b/c", "value": "C"}
]
```

6. IANA Considerations

The Internet media type for a JSON Patch document is application/json-patch.

Type name: application

Subtype name: json-patch

Required parameters: none

Optional parameters: none

Encoding considerations: binary

Security considerations:
See Security Considerations in section 7.

Interoperability considerations: N/A

Published specification:
[this memo]

Applications that use this media type:
Applications that manipulate JSON documents.

Additional information:

Magic number(s): N/A

File extension(s): .json-patch

Macintosh file type code(s): TEXT

Person & email address to contact for further information:
Paul C. Bryan <pbryan@anode.ca>

Intended usage: COMMON

Restrictions on usage: none

Author: Paul C. Bryan <pbryan@anode.ca>

Change controller: IETF

7. Security Considerations

This specification has the same security considerations as JSON [RFC4627] and [JSON-Pointer].

8. Acknowledgements

The following individuals contributed ideas, feedback and wording to this specification:

Mike Acar, Mike Amundsen, Paul Davis, Murray S. Kucherawy, Dean Landolt, Randall Leeds, Julian Reschke, James Snell, Eli Stevens.

The structure of a JSON Patch document was influenced by the XML Patch document [RFC5261] specification.

9. References

9.1. Normative References

[JSON-Pointer] Bryan, P. and K. Zyp, "JSON Pointer", draft-ietf-appsawg-json-pointer-04 (work in progress), March 2012.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4627] Crockford, D., "The application/json Media Type for JavaScript Object Notation (JSON)", RFC 4627, July 2006.

9.2. Informative References

[RFC2616] Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, "Hypertext Transfer Protocol -- HTTP/1.1", RFC 2616, June 1999.

[RFC5261] Urpalainen, J., "An Extensible Markup Language (XML) Patch Operations Framework Utilizing XML Path Language (XPath) Selectors", RFC 5261, September 2008.

[RFC5789] Dusseault, L. and J. Snell, "PATCH Method for HTTP", RFC 5789, March 2010.

Appendix A. Examples

A.1. Adding an Object Member

An example target JSON document:

```
{
    "foo": "bar"
}
```

A JSON Patch document:

```
[
    { "add": "/baz", "value": "qux" }
]
```

The resulting JSON document:

```
{
    "baz": "qux",
    "foo": "bar"
}
```

A.2. Adding an Array Element

An example target JSON document:

```
{
    "foo": [ "bar", "baz" ]
}
```

A JSON Patch document:

```
[
    { "add": "/foo/1", "value": "qux" }
]
```

The resulting JSON document:

```
{
    "foo": [ "bar", "qux", "baz" ]
}
```

A.3. Removing an Object Member

An example target JSON document:

```
{
    "baz": "qux",
    "foo": "bar"
}
```

A JSON Patch document:

```
[
    { "remove": "/baz" }
]
```

The resulting JSON document:

```
{
    "foo": "bar"
}
```

A.4. Removing an Array Element

An example target JSON document:

```
{
    "foo": [ "bar", "qux", "baz" ]
}
```

A JSON Patch document:

```
[
    { "remove": "/foo/1" }
]
```

The resulting JSON document:

```
{
    "foo": [ "bar", "baz" ]
}
```

A.5. Replacing a Value

An example target JSON document:

```
{
    "baz": "qux",
    "foo": "bar"
}
```

A JSON Patch document:

```
[
      { "replace": "/baz", "value": "boo" }
]
```

The resulting JSON document:

```
{
    "baz": "boo",
    "foo": "bar"
}
```

A.6. Moving a Value

An example target JSON document:

```
{
    "foo": {
        "bar": "baz",
        "waldo": "fred"
    }
    "qux": {
        "corge": "grault"
    }
}
```

A JSON Patch document:

```
[
    { "move": "/foo/waldo", to: "/qux/thud" }
]
```

The resulting JSON document:

```
{
    "foo": {
        "bar": "baz"
    }
    "qux": {
        "corge": "grault",
        "thud": "fred"
    }
}
```

A.7. Moving an Array Element

An example target JSON document:

```
{
    "foo": [ "all", "grass", "cows", "eat" ]
}
```

A JSON Patch document:

```
[
    { "move": "/foo/1", "to": "/foo/3" }
]
```

The resulting JSON document:

```
{
    "foo": [ "all", "cows", "eat", "grass" ]
}
```

A.8. Testing a Value: Success

An example target JSON document:

```
{
    "baz": "qux",
    "foo": [ "a", 2, "c" ]
}
```

A JSON Patch document that will result in successful evaluation:

```
[
    { "test": "/baz", "value": "qux" },
    { "test": "/foo/1", "value": 2 }
]
```

A.9. Testing a Value: Error

An example target JSON document:

```
{
    "baz": "qux"
}
```

A JSON Patch document that will result in an error condition:

```
[
    { "test": "/baz", "value": "bar" }
]
```

A.10. Adding a nested Member Object

An example target JSON document:

```
{
   "foo": "bar"
}
```

A JSON Patch document:

```
[
  { "add": "/child", "value": { "grandchild": { } } }
]
```

The resulting JSON document:

```
{
  "foo": "bar",
  "child": {
    "grandchild": {
    }
  }
}
```

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