

**XML Hypertext Application Language**  
**draft-michaud-xml-hal-02**

Abstract

This document proposes a media type for representing resources and their relations with hyperlinks.

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."

Copyright Notice

Copyright (c) 2018 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

<a href="#">1.</a>	Introduction . . . . .	<a href="#">2</a>
<a href="#">2.</a>	Requirements . . . . .	<a href="#">3</a>
<a href="#">3.</a>	HAL Documents . . . . .	<a href="#">3</a>
<a href="#">4.</a>	Resource . . . . .	<a href="#">4</a>
<a href="#">4.1.</a>	Reserved Elements . . . . .	<a href="#">4</a>
<a href="#">4.1.1.</a>	link . . . . .	<a href="#">4</a>
<a href="#">4.1.2.</a>	resource . . . . .	<a href="#">4</a>
<a href="#">5.</a>	Link . . . . .	<a href="#">4</a>
<a href="#">5.1.</a>	rel . . . . .	<a href="#">4</a>
<a href="#">5.1.</a>	href . . . . .	<a href="#">5</a>
<a href="#">5.2.</a>	templated . . . . .	<a href="#">5</a>
<a href="#">5.3.</a>	type . . . . .	<a href="#">5</a>
<a href="#">5.4.</a>	deprecation . . . . .	<a href="#">5</a>
<a href="#">5.5.</a>	name . . . . .	<a href="#">5</a>
<a href="#">5.6.</a>	profile . . . . .	<a href="#">6</a>
<a href="#">5.7.</a>	title . . . . .	<a href="#">6</a>
<a href="#">5.8.</a>	hreflang . . . . .	<a href="#">6</a>
<a href="#">6.</a>	Example . . . . .	<a href="#">7</a>
<a href="#">7.</a>	Media Type Parameters . . . . .	<a href="#">8</a>
<a href="#">7.1.</a>	profile . . . . .	<a href="#">8</a>
<a href="#">8.</a>	Recommendations . . . . .	<a href="#">8</a>
<a href="#">8.1.</a>	Self Link . . . . .	<a href="#">8</a>
<a href="#">8.2.</a>	Link relations . . . . .	<a href="#">8</a>
<a href="#">8.3.</a>	Hypertext Cache Pattern . . . . .	<a href="#">8</a>
<a href="#">8.4.</a>	Namespace and prefix . . . . .	<a href="#">9</a>
<a href="#">9.</a>	Security Considerations . . . . .	<a href="#">9</a>
<a href="#">10.</a>	IANA Considerations . . . . .	<a href="#">9</a>
<a href="#">11.</a>	Normative References . . . . .	<a href="#">9</a>
<a href="#">Appendix A.</a>	Acknowledgements . . . . .	<a href="#">10</a>
<a href="#">Appendix B.</a>	Frequently Asked Questions . . . . .	<a href="#">11</a>
<a href="#">B.1.</a>	How should a client know the meaning/structure/semantics/type of a . . . . .	<a href="#">11</a>
<a href="#">B.2.</a>	Where can I find libraries for working with HAL? . . . . .	<a href="#">11</a>
<a href="#">B.3.</a>	Why does HAL have no forms? . . . . .	<a href="#">11</a>
	Author's Address . . . . .	<a href="#">11</a>

**[1.](#) Introduction**

There is an emergence of non-HTML HTTP applications ("Web APIs") which use hyperlinks to direct clients around their resources.

The XML Hypertext Application Language (HAL) is a standard which establishes conventions for expressing hypermedia controls, such as links, with XML [[W3C.REC-xml-20081126](#)].

Michaud

Expires August 7, 2018

[Page 2]

HAL is a generic media type with which Web APIs can be developed and exposed as series of links. Clients of these APIs can select links by their link relation type and traverse them in order to progress through the application.

HAL's conventions result in a uniform interface for serving and consuming hypermedia, enabling the creation of general-purpose libraries that can be re-used on any API utilizing HAL.

The primary design goals of HAL are generality and simplicity. HAL can be applied to many different domains, and imposes the minimal amount of structure necessary to cover the key requirements of a hypermedia Web API.

## **2. Requirements**

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](#)].

## **3. HAL Documents**

A HAL Document uses the format described in [[W3C.REC-xml-20081126](#)] and has the media type "application/hal+xml".

Its root MUST be a resource element.

For example:

```
GET /orders/523 HTTP/1.1
Host: example.org
Accept: application/hal+xml
```

```
HTTP/1.1 200 OK
Content-Type: application/hal+xml
```

```
<resource rel="self" href="/orders/523">
  <link rel="warehouse" href="/warehouse/56"/>
  <link rel="invoice" href="/invoices/873"/>
  <currency>USD</currency>
  <status>shipped</status>
  <total>10.20</total>
</resource>
```

Here, we have a HAL document representing an order resource with the URI "/orders/523". It has "warehouse" and "invoice" links, and its own state in the form of "currency", "status", and "total" elements.



## **4. Resource**

The resource element represents a Resource and SHOULD also host the set of attributes that describe a Link (as defined by [[RFC5988](#)]). See [Section 5.](#) and [Section 8.1.](#) for details.

It has two reserved elements:

- (1) "link": a link to another resource.
- (2) "resource": an embedded resource.

Everything else MUST be valid XML and represents the current state of the Resource.

### **4.1. Reserved Elements**

#### **4.1.1. link**

The reserved "link" element is OPTIONAL.

This element MAY be used to host the set of attributes that describe a Link (as defined by [[RFC5988](#)]). See [Section 5.](#) for details.

#### **4.1.2. resource**

The reserved "resource" element is OPTIONAL

If present, this element MUST observe the same constraints defined for the root resource but MUST additionally host a Link so that embedded resources can more easily be identified when processed.

Embedded resources MAY be a full, partial, or inconsistent version of the representation served from the target URI.

## **5. Link**

A Link is defined as a set of attributes that represent a hyperlink from the containing resource to a URI. The attributes are as follows:

### **5.1. rel**

The "rel" attribute is REQUIRED.

It is an attribute whose relation values are link relation types (as defined by [[RFC5988](#)]).



### **5.1. href**

The "href" attribute is REQUIRED.

Its value is either a URI [[RFC3986](#)] or a URI Template [[RFC6570](#)].

If the value is a URI Template then the Link SHOULD have a "templated" attribute whose value is true.

### **5.2. templated**

The "templated" attribute is OPTIONAL.

Its value is boolean (as defined by [[W3C.REC-xmlschema-2-20041028](#)]) and SHOULD be true when the Link's "href" attribute is a URI Template.

Its value SHOULD be considered false if the attribute is absent.

### **5.3. type**

The "type" attribute is OPTIONAL.

Its value is a string used as a hint to indicate the media type expected when dereferencing the target resource.

### **5.4. deprecation**

The "deprecation" attribute is OPTIONAL.

Its presence indicates that the link is to be deprecated (i.e. removed) at a future date. Its value is a URL that SHOULD provide further information about the deprecation.

A client SHOULD provide some notification (e.g. by logging a warning message) whenever it traverses over a link that has this attribute. The notification SHOULD include the deprecation attribute's value so that a client maintainer can easily find information about the deprecation.

### **5.5. name**

The "name" attribute is OPTIONAL.

Its value MAY be used as a secondary key for selecting Links which share the same relation type.





#### **5.6.   profile**

The "profile" attribute is OPTIONAL.

Its value is a string which is a URI that hints about the profile (as defined by [[RFC6906](#)]) of the target resource.

#### **5.7.   title**

The "title" attribute is OPTIONAL.

Its value is a string and is intended for labeling the link with a human-readable identifier (as defined by [[RFC5988](#)]).

#### **5.8.   hreflang**

The "hreflang" attribute is OPTIONAL.

Its value is a string and is intended for indicating the language of the target resource (as defined by [[RFC5988](#)]).



## 6. Example

The following is an example representing a list of orders

```

GET /orders HTTP/1.1
Host: example.org
Accept: application/hal+xml

HTTP/1.1 200 OK
Content-Type: application/hal+xml

<resource rel="self" href="/orders">
  <link rel="next" href="/orders?page=2"/>
  <link rel="find" href="/orderse{/id}" templated="true"/>
  <resource rel="order" href="/orders/123">
    <link rel="basket" href="/baskets/98712"/>
    <link rel="customer" href="/customers/7809"/>
    <total>30.00</total>
    <currency>USD</currency>
    <status>shipped</status>
  </resource>
  <resource rel="order" href="/orders/124">
    <link rel="basket" href="/baskets/97213"/>
    <link rel="customer" href="/customers/12369"/>
    <total>20.00</total>
    <currency>USD</currency>
    <status>processing</status>
  </resource>
  <currentlyProcessing>14</currentlyProcessing>
  <shippedToday>20</shippedToday>
</resource>

```

Here, the order list document provides a "next" link directing to the next page, and a "find" link containing a URI Template which can be expanded with an 'id' variable to go directly to a specific order.

It also has two embedded resources, "order". Each of these has its own links to the associated "basket" and "customer" resources, and properties showing their "total", "currency" and "status".

Additionally, the order list resource has its own properties "currentlyProcessing" and "shippedToday".



## **7. Media Type Parameters**

### **7.1. profile**

The media type identifier application/hal+xml MAY also include an additional "profile" parameter (as defined by [[RFC6906](#)])

HAL documents that are served with the "profile" parameter still SHOULD include a "profile" link belonging to the root resource.

## **8. Recommendations**

### **8.1. Self Link**

Each Resource SHOULD have a 'self' link that corresponds with the IANA registered 'self' relation (as defined by [[RFC5988](#)]) and whose target is the resource's URI.

### **8.2. Link relations**

Custom link relation types (Extension Relation Types in [[RFC5988](#)]) SHOULD be URIs that when dereferenced in a web browser provide relevant documentation, in the form of an HTML page, about the meaning and/or behavior of the target Resource. This will improve the discoverability of the API.

The CURIE Syntax [[W3C.NOTE-curie-20101216](#)] MAY be used for brevity for these URIs. CURIEs are established within a HAL document via XML namespace on the root Resource.

```
<resource rel="self" href="/orders" xmlns:acme="http://a.com/rels/">
  <link rel="acme:widgets" href="/widgets"/>
</resource>
```

The above demonstrates the relation "http://a.com/rels/widgets" being abbreviated to "acme:widgets" via CURIE syntax.

### **8.3. Hypertext Cache Pattern**

The "hypertext cache pattern" allows servers to use embedded resources to dynamically reduce the number of requests a client makes, improving the efficiency and performance of the application.

Clients MAY be automated for this purpose so that, for any given link relation, they will read from an embedded resource (if present) in preference to traversing a link.

To activate this client behavior for a given link, servers SHOULD add



an embedded resource into the representation with the same relation.

Servers SHOULD NOT entirely "swap out" a link for an embedded resource (or vice versa) because client support for this technique is OPTIONAL.

The following examples shows the hypertext cache pattern applied to an "author" link:

Before:

```
<resource rel="self" href="/books/the-way-of-zen">
  <link rel="author" href="/people/alan-watts"/>
</resource>
```

After:

```
<resource rel="self" href="/books/the-way-of-zen">
  <link rel="author" href="/people/alan-watts"/>
  <resource rel="author" href="/people/alan-watts">
    <name>Alan Watts</name>
    <born>January 6, 1915</born>
    <died>November 16, 1973</died>
  </resource>
</resource>
```

#### **8.4. Namespace and prefix**

The default namespace of "http://stateless.co/hal/ns" SHOULD be used to allow for mixed, and potentially conflicting, xml vocabularies to coexist in the same xml instance (e.g. embedding an application/hal+xml payload in another xml).

If a namespace prefix is needed, "hal" MAY be used by default.

### **9. Security Considerations**

TBD

### **10. IANA Considerations**

TBD

### **11. Normative References**

[RFC6906] Wilde, E., "The 'profile' Link Relation Type", [RFC 6906](#), March 2013.





- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax", STD 66, [RFC 3986](#), January 2005.
- [W3C.REC-xml-20081126]
- Bray, T., Paoli, J., Sperberg-McQueen, C. M., Maler, E., Yergeau, F., "Extensible Markup Language (XML) 1.0 (Fifth Edition)", World Wide Web Consortium REC REC-xml-20081126, November 2008, <<http://www.w3.org/TR/2008/REC-xml-20081126/>>.
- [RFC5988] Nottingham, M., "Web Linking", [RFC 5988](#), October 2010.
- [RFC6570] Gregorio, J., Fielding, R., Hadley, M., Nottingham, M., and D. Orchard, "URI Template", [RFC 6570](#), March 2012.
- [W3C.NOTE-curie-20101216]
- McCarron, S. and M. Birbeck, "CURIE Syntax 1.0", World Wide Web Consortium NOTE NOTE-curie-20101216, December 2010, <<http://www.w3.org/TR/2010/NOTE-curie-20101216/>>.
- [W3C.REC-xmlschema-2-20041028]
- Biron, P. V., Malhotra, A., "XML Schema Part 2: Datatypes Second Edition", World Wide Web Consortium REC REC-xmlschema-2-20041028, October 2004, <<http://www.w3.org/TR/2004/REC-xmlschema-2-20041028/>>.

## [Appendix A](#). Acknowledgements

Thanks to Mike Kelly for making this specification possible through the creation of HAL and the hal+json specification.

I would also like to thank folks on the Hal Discuss Google group for providing feedback for the draft.

The author takes all responsibility for errors and omissions.



## **Appendix B.    Frequently Asked Questions**

### **B.1.    How should a client know the meaning/structure/semantics/type of a resource?**

There are two main approaches to solving this problem. Both involve exposing additional documentation describing the resource which may be human and/or machine readable (e.g. an HTML page, an XML Schema, an ALPS profile, etc.). The difference between the two approaches is in where that URI is shared with the client, which is either:

- (1) The relation documentation associated to a Link relation type.
- (2) A 'profile' (via a Link's profile attribute or via a Link with a 'profile' relation type).

### **B.2.    Where can I find libraries for working with HAL?**

A list of libraries is maintained here:  
[http://stateless.co/hal\\_specification.html](http://stateless.co/hal_specification.html)

### **B.3.    Why does HAL have no forms?**

Omitting forms from HAL was an intentional design decision that was made to keep it focused on linking for APIs. HAL is therefore a good candidate for use as a base media type on which to build more complex capabilities.

Author's Address

Jeff Michaud

Email: [cometaj2@comcast.net](mailto:cometaj2@comcast.net)

Twitter: [@cometaj2](https://twitter.com/cometaj2)

