cite-as: A Link Relation to Convey a Preferred URI for Referencing

Abstract

   A web resource is routinely referenced by means of the URI with which
   it is directly accessed. But cases exist where referencing a
   resource by means of a different URI is preferred. This
   specification defines a link relation type that can be used to convey
   such a preference.

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Table of Contents

1. Introduction

   A web resource is routinely referenced (e.g., linked or bookmarked)
   by means of the URI with which it is directly accessed. But cases
   exist where referencing a resource by means of a different URI is
   preferred, for example, because the latter URI is intended to be more
   persistent over time. Currently, there is no link relation type to
   convey such an alternative referencing preference; this specification
   addresses this deficit by introducing a link relation type intended
   for that purpose.

2. Terminology

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and
   "OPTIONAL" in this document are to be interpreted as described in
   BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all
   capitals, as shown here.

   This specification uses the terms "link context" and "link target" as
   defined in [RFC8288]. These terms correspond with "Context IRI" and
   "Target IRI", respectively, as used in [RFC5988]. Although defined
   as IRIs (Internationalized Resource Identifiers), they are also URIs
   in common scenarios.

   Additionally, this specification uses the following terms:

   o "access URI": A URI at which a user agent accesses a web resource.

   o "reference URI": A URI, other than the access URI, that should
      preferentially be used for referencing.

   By interacting with the access URI, the user agent may discover typed
   links. For such links, the access URI is the link context.

3. Scenarios

3.1. Persistent Identifiers

   Despite sound advice regarding the design of Cool URIs [CoolURIs],
   link rot ("HTTP 404 Not Found") is a common phenomena when following
   links on the Web. Certain communities of practice (see examples
   below) have introduced solutions to combat this problem. These
   solutions typically consist of:

   o Accepting the reality that the web location of a resource -- the
      access URI -- may change over time.

o Minting an additional URI for the resource -- the reference URI --
   that is specifically intended to remain persistent over time.

o Redirecting (typically with "HTTP 301 Moved Permanently", "HTTP
   302 Found", or "HTTP 303 See Other") from the reference URI to the
   access URI.

o Committing, as a community of practice, to adjust that redirection
   whenever the access URI changes over time.

This approach is, for example, used by:

o Scholarly publishers that use DOIs (Digital Object Identifiers)
   [DOIs] to identify articles and DOI URLs [DOI-URLs] as a means to
   keep cross-publisher article-to-article links operational, even
   when the journals in which the articles are published change hands
   from one publisher to another, for example, as a result of an
   acquisition.

o Authors of controlled vocabularies that use PURLs (Persistent
   Uniform Resource Locators) [PURLs] for vocabulary terms to ensure
   that the URIs they assign to vocabulary terms remain stable even
   if management of the vocabulary is transferred to a new custodian.

o A variety of organizations (including libraries, archives, and
   museums) that assign ARK (Archival Resource Key) URLs [ARK] to
   information objects in order to support long-term access.

In order for the investments in infrastructure involved in these
approaches to pay off, and hence for links to effectively remain
operational as intended, it is crucial that a resource be referenced
by means of its reference URI. However, the access URI is where a
user agent actually accesses the resource (e.g., it is the URI in the
browser's address bar). As such, there is a considerable risk that
the access URI instead of the reference URI is used for referencing
[PIDs-must-be-used].

The link relation type defined in this document makes it possible for
user agents to differentiate the reference URI from the access URI.

3.2. Version Identifiers

Resource versioning systems often use a naming approach whereby:

o The most recent version of a resource is always available at the
   same, generic URI.

o Each version of the resource -- including the most recent one --
   has a distinct version URI.

For example, Wikipedia uses generic URIs of the form
<https://en.wikipedia.org/wiki/John_Doe> and version URIs of the form
<https://en.wikipedia.org/w/index.php?title=John_Doe&oldid=
776253882>.

While the current version of a resource is accessed at the generic
URI, some versioning systems adhere to a policy that favors linking
and referencing a specific version URI. To express this using the
terminology of Section 2, these policies intend that the generic URI
is the access URI and that the version URI is the reference URI.
These policies are informed by the understanding that the content at
the generic URI is likely to evolve over time and that accurate links
or references should lead to the content as it was at the time of
referencing. To that end, Wikipedia's "Permanent link" and "Cite
this page" functionalities promote the version URI, not the generic
URI.

The link relation type defined in this document makes it possible for
user agents to differentiate the version URI from the generic URI.

3.3. Preferred Social Identifier

A web user commonly has multiple profiles on the Web, for example,
one per social network, a personal homepage, a professional homepage,
a FOAF (Friend Of A Friend) profile [FOAF], etc. Each of these
profiles is accessible at a distinct URI. But the user may have a
preference for one of those profiles, for example, because it is most
complete, kept up to date, or expected to be long lived. As an
example, the first author of this document has, among others, the
following profile URIs:

o <https://hvdsomp.info>

o <https://twitter.com/hvdsomp>

o <https://www.linkedin.com/in/herbertvandesompel/>

o <https://orcid.org/0000-0002-0715-6126>

Of these, from the perspective of the person described by these
profiles, the first URI may be the preferred profile URI for the
purpose of referencing because the domain is not under the
custodianship of a third party. When an agent accesses another
profile URI, such as <https://orcid.org/0000-0002-0715-6126>, this
preference for referencing by means of the first URI could be
expressed.

The link relation type defined in this specification makes it
possible for user agents to differentiate the preferred profile URI
from the accessed profile URI.

3.4. Multi-resource Publications

When publishing on the Web, it is not uncommon to make distinct
components of a publication available as different web resources,
each with their own URI. For example:

o Contemporary scholarly publications routinely consists of a
   traditional article as well as additional materials that are
   considered an integral part of the publication such as
   supplementary information, high-resolution images, or a video
   recording of an experiment.

o Scientific or governmental open data sets frequently consist of
   multiple files.

o Online books typically consist of multiple chapters.

While each of these components is accessible at its distinct URI --
the access URI -- they often also share a URI assigned to the
intellectual publication of which they are components -- the
reference URI.

The link relation type defined in this document makes it possible for
user agents to differentiate the URI of the intellectual publication
from the access URI of a component of the publication.

4. The "cite-as" Link Relation Type for Expressing a Preferred URI for the Purpose of Referencing

A link with the "cite-as" relation type indicates that, for
referencing the link context, use of the URI of the link target is
preferred over use of the URI of the link context. It allows the
resource identified by the access URI (link context) to unambiguously
link to its corresponding reference URI (link target), thereby
expressing that the link target is preferred over the link context
for the purpose of permanent citation.

The link target of a "cite-as" link SHOULD support protocol-based access as a means to ensure that applications that store them can effectively reuse them for access.

The link target of a "cite-as" link SHOULD provide the ability for a user agent to follow its nose back to the context of the link, e.g., by following redirects and/or links. This helps a user agent to establish trust in the target URI.

Because a link with the "cite-as" relation type expresses a preferred URI for the purpose of referencing, the access URI SHOULD only provide one link with that relation type. If more than one "cite-as" link is provided, the user agent may decide to select one (e.g., an HTTP URI over a mailto URI) based on the purpose that the reference URI will serve.

Providing a link with the "cite-as" relation type does not prevent using the access URI for the purpose of referencing if such specificity is needed for the application at hand. For example, in the case of the scenario in Section 3.4, the access URI is likely required for the purpose of annotating a specific component of an intellectual publication. Yet, the annotation application may also want to appropriately include the reference URI in the annotation.

Applications can leverage the information provided by a "cite-as" link in a variety of ways, for example:

o Bookmarking tools and citation managers can take this preference into account when recording a URI.

o Webometrics applications that trace URIs can trace both the access URI and the reference URI.

o Discovery tools can support lookup by means of both the access and the reference URI. This includes web archives that typically make archived versions of web resources discoverable by means of the original access URI of the archived resource; they can additionally make these archived resources discoverable by means of the associated reference URI.

5. Distinction with Other Link Relation Types

   Some existing IANA-registered relationships intuitively resemble the
   relationship that "cite-as" is intended to convey. But a closer
   inspection of these candidates provided in the blog posts
   [identifier-blog], [canonical-blog], and [bookmark-blog] shows that
   they are not appropriate for various reasons and that a new link
   relation type is required. The remainder of this section provides a
   summary of the detailed explanations provided in the referenced blog
   posts.

   It can readily be seen that the following link relation types do not
   address the requirements described in Section 3:

   o "alternate" [RFC4287]: The link target provides an alternate
      version of the content at the link context. These are typically
      variants according to dimensions that are subject to content
      negotiation, for example, the same content with varying Content-
      Type (e.g., application/pdf vs. text/html) and/or Content-Language
      (e.g., en vs. fr). The representations provided by the context
      URIs and target URIs in the scenarios in Sections 3.1 through 3.4
      are not variants in the sense intended by [RFC4287], and, as such,
      the use of "alternate" is not appropriate.

   o "duplicate" [RFC6249]: The link target is a resource whose
      available representations are byte-for-byte identical with the
      corresponding representations of the link context, for example, an
      identical file on a mirror site. In none of the scenarios
      described in Sections 3.1 through 3.4 do the link context and the
      link target provide identical content. As such, the use of
      "duplicate" is not appropriate.

   o "related" [RFC4287]: The link target is a resource that is related
      to the link context. While "related" could be used in all of the
      scenarios described in Sections 3.1 through 3.4, its semantics are
      too vague to convey the specific semantics intended by "cite-as".

   Two existing IANA-registered relationships deserve closer attention
   and are discussed in the remainder of this section.

5.1. The "bookmark" Link Relation Type

"bookmark" [W3C.REC-html52-20171214]: The link target provides a URI
for the purpose of bookmarking the link context.

The intent of "bookmark" is closest to that of "cite-as" in that the
link target is intended to be a permalink for the link context, for
bookmarking purposes. The link relation type dates back to the
earliest days of news syndication, before blogs and news feeds had
permalinks to identify individual resources that were aggregated into
a single page. As such, its intent is to provide permalinks for
different sections of an HTML document. It was originally used with
HTML elements such as <div>, <h1>, <h2>, etc.; more recently, HTML5
revised it to be exclusively used with the <article> element.
Moreover, it is explicitly excluded from use in the <link> element in
HTML <head> and, as a consequence, in the HTTP Link header that is
semantically equivalent. For these technical and semantic reasons,
the use of "bookmark" to convey the relationship intended by "cite-
as" is not appropriate.

A more detailed justification regarding the inappropriateness of
"bookmark", including a thorough overview of its turbulent history,
is provided in [bookmark-blog].

5.2. The "canonical" Link Relation Type

"canonical" [RFC6596]: The meaning of "canonical" is commonly
misunderstood on the basis of its brief definition as being "the
preferred version of a resource." The description in the abstract of
[RFC6596] is more helpful and states that "canonical" is intended to
link to a resource that is preferred over resources with duplicative
content. A more detailed reading of [RFC6596] clarifies that the
intended meaning is that "canonical" is preferred for the purpose of
content indexing. A typical use case is linking from each page in a
multi-page magazine article to a single page version of the article
provided for indexing by search engines: the former pages provide
content that is duplicative to the superset content that is available
at the latter page.

The semantics intended by "canonical" as preferred for the purpose of
content indexing differ from the semantics intended by "cite-as" as
preferred for the purpose of referencing. A further exploration of
the various scenarios shows that the use of "canonical" is not
appropriate to convey the semantics intended by "cite-as":

o Scenario of Section 3.1: The reference URI that is intended to be
   persistent over time does not serve content that needs to be
   indexed; it merely redirects to the access URI. Since the meaning
   intended by "canonical" is that it is preferred for the purpose of
   content indexing, it is not appropriate to point at the reference
   URI (persistent identifier) using the "canonical" link relation
   type. Moreover, Section 6.1 shows that scholarly publishers that
   assign persistent identifiers already use the "canonical" link
   relation type for search engine optimization; it also shows how
   that use contrasts with the intended use of "cite-as".

o Scenario of Section 3.2: In most common cases, custodians of
   resource versioning systems want search engines to index the most
   recent version of a page and hence would use a "canonical" link to
   point from version URIs of a resource to the associated generic
   URI. Wikipedia effectively does this. However, for some resource
   versioning systems, including Wikipedia, version URIs are
   preferred for the purpose of referencing. As such, a "cite-as"
   link would point from the generic URI to the most recent version
   URI (that is, in the opposite direction of the "canonical" link).

o Scenario of Section 3.3: The content at the link target and the
   link context are different profiles for a same person. Each
   profile, not just a preferred one, should be indexed. But a
   single one could be preferred for referencing.

o Scenario of Section 3.4: The content at the link target, if any,
   would typically be a landing page that includes descriptive
   metadata pertaining to the multi-resource publication and links to
   its component resources. Each component resource provides content
   that is different, not duplicative, to the landing page.

A more detailed justification regarding how the use of "canonical" is
inappropriate to address the requirements described in this document,
including examples, is provided in [canonical-blog].

6. Examples

Sections 6.1 through 6.4 show examples of the use of links with the
"cite-as" relation type. They illustrate how the typed links can be
used in a response header and/or response body.

6.1. Persistent HTTP URI

   PLOS ONE is one of many scholarly publishers that assigns DOIs to the
   articles it publishes. For example, <https://doi.org/10.1371/
   journal.pone.0171057> is the persistent identifier for such an
   article. Via the DOI resolver, this persistent identifier redirects
   to <https://journals.plos.org/plosone/doi?id=10.1371/
   journal.pone.0171057> in the plos.org domain. This URI itself
   redirects to <https://journals.plos.org/plosone/article?id=10.1371/
   journal.pone.0171057>, which delivers the actual article in HTML.

   The HTML article contains a <link> element with the "canonical" link
   relation type pointing at itself, <https://journals.plos.org/plosone/
   article?id=10.1371/journal.pone.0167475>. As per Section 5.2, this
   indicates that the article content at that URI should be indexed by
   search engines.

   PLOS ONE can additionally provide a link with the "cite-as" relation
   type pointing at the persistent identifier to indicate it is the
   preferred URI for permanent citation of the article. Figure 1 shows
   the addition of the "cite-as" link in both the HTTP header and the
   HTML that results from an HTTP GET on the article URI
   <https://journals.plos.org/plosone/article?id=10.1371/
   journal.pone.0167475>.

```
HTTP/1.1 200 OK
Link: <https://doi.org/10.1371/journal.pone.0171057> ; rel="cite-as"
Content-Type: text/html;charset=utf-8

<html>
  <head>
   ...
    <link rel="cite-as"
          href="https://doi.org/10.1371/journal.pone.0171057" />
    <link rel="canonical"
          href="https://journals.plos.org/plosone/article?
                         id=10.1371/journal.pone.0167475" />
   ...
  </head>
  <body>
   ...
  </body>
</html>
```

      Figure 1: Response to HTTP GET on the URI of a Scholarly Article

6.2. Version URIs

   The preprint server arXiv.org has a versioning approach like the one
   described in Section 3.2:

   o The most recent version of a preprint is always available at the
      same, generic URI. Consider the preprint with generic URI
      <https://arxiv.org/abs/1711.03787>.

   o Each version of the preprint -- including the most recent one --
      has a distinct version URI. The considered preprint has two
      versions with respective version URIs: <https://arxiv.org/
      abs/1711.03787v1> (published 10 November 2017) and
      <https://arxiv.org/abs/1711.03787v2> (published 24 January 2018).

   A reader who accessed <https://arxiv.org/abs/1711.03787> between 10
   November 2017 and 23 January 2018, obtained the first version of the
   preprint. Starting 24 January 2018, the second version was served at
   that URI. In order to support accurate referencing, arXiv.org could
   implement the "cite-as" link to point from the generic URI to the
   most recent version URI. In doing so, assuming the existence of
   reference manager tools that consume "cite-as" links:

   o The reader who accesses <https://arxiv.org/abs/1711.03787> between
      10 November 2017 and 23 January 2018 would reference
      <https://arxiv.org/abs/1711.03787v1>.

   o The reader who accesses <https://arxiv.org/abs/1711.03787>
      starting 24 January 2018 would reference <https://arxiv.org/
      abs/1711.03787v2>.

   Figure 2 shows the header that arXiv.org would have returned in the
   first case, in response to a HTTP HEAD on the generic URI
   <https://arxiv.org/abs/1711.03787>.

   HTTP/1.1 200 OK
   Date: Sun, 24 Dec 2017 16:12:43 GMT
   Content-Type: text/html; charset=utf-8
   Link: <https://arxiv.org/abs/1711.03787v1> ; rel="cite-as"
   Vary: Accept-Encoding,User-Agent

      Figure 2: Response to HTTP HEAD on the Generic URI of the Landing
                     Page of an arXiv.org Preprint

6.3. Preferred Profile URI

   If the access URI is the home page of John Doe, John can add a link
   with the "cite-as" relation type to it, in order to convey that he
   would prefer to be referenced by means of the URI of his FOAF
   profile. Figure 3 shows the response to an HTTP GET on the URI of
   John's home page.

   HTTP/1.1 200 OK
   Content-Type: text/html;charset=utf-8

   <html>
    <head>
    ...
     <link rel="cite-as" href="http://johndoe.example.com/foaf"
           type="text/ttl"/>
    ...
    </head>
    <body>
     ...
    </body>
   </html>

      Figure 3: Response to HTTP GET on the URI of John Doe's Home Page

6.4. Multi-resource Publication

   The Dryad Digital Repository at datadryad.org specializes in hosting
   and preserving scientific datasets. Each dataset typically consists
   of multiple resources. For example, the dataset "Data from: Climate,
   demography, and lek stability in an Amazonian bird" consists of an
   Excel spreadsheet, a csv file, and a zip file. Each of these
   resources have different content and are accessible at their
   respective URIs. In addition, the dataset has a landing page at
   <https://datadryad.org/resource/doi:10.5061/dryad.5d23f>.

   Each of these resources should be permanently cited by means of the
   persistent identifier that was assigned to the entire dataset as an
   intellectual publication, i.e., <https://doi.org/10.5061/
   dryad.5d23f>. To that end, the Dryad Digital Repository can add
   "cite-as" links pointing from the URIs of each of these resources to
   <https://doi.org/10.5061/dryad.5d23f>. This is shown in Figure 4 for
   the csv file that is a component resource of the dataset, through use
   of the HTTP Link header.

```
HTTP/1.1 200 OK
Date: Tue, 12 Jun 2018 19:19:22 GMT
Last-Modified: Wed, 17 Feb 2016 18:37:02 GMT
Content-Type: text/csv;charset=ISO-8859-1
Content-Length: 25414
Link: <https://doi.org/10.5061/dryad.5d23f> ; rel="cite-as"

DATE,Year,PLOT/TRAIL,LOCATION,SPECIES CODE,BAND NUM,COLOR,SEX,AGE,
 TAIL,WING,TARSUS,NARES,DEPTH,WIDTH,WEIGHT
6/26/02,2002,DANTA,325,PIPFIL,969,B/O,M,AHY,80,63,16,7.3,3.9,4.1,
 14.4
...
2/3/13,2013,LAGO,,PIPFIL,BR-5095,O/YPI,M,SCB,78,65.5,14.2,7.5,3.8,
 3.7,14.3
```

       Figure 4: Response to HTTP GET on the URI of a csv File That Is a
                   Component of a Scientific Dataset

7. IANA Considerations

   The link relation type has been registered by IANA per Section 2.1.1
   of [RFC8288] as follows:

      Relation Name: cite-as

      Description: Indicates that the link target is preferred over the
      link context for the purpose of permanent citation.

      Reference: RFC 8574

8. Security Considerations

   In cases where there is no way for the agent to automatically verify
   the correctness of the reference URI (cf. Section 4), out-of-band
   mechanisms might be required to establish trust.

   If a trusted site is compromised, the "cite-as" link relation could
   be used with malicious intent to supply misleading URIs for
   referencing. Use of these links might direct user agents to an
   attacker's site, break the referencing record they are intended to
   support, or corrupt algorithmic interpretation of referencing data.

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