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## Web Host Metadata

### Abstract

This specification describes a method for locating host metadata as well as information about individual resources controlled by the host.

### Status of This Memo

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## 1. Introduction

Web-based protocols often require the discovery of host policy or metadata, where "host" is not a single resource but the entity controlling the collection of resources identified by Uniform Resource Identifiers (URIs) with a common URI host [RFC3986], which can be served by one or more servers.

While web protocols have a wide range of metadata needs, they often use metadata that is concise, has simple syntax requirements, and can benefit from storing their metadata in a common location used by other related protocols.

Because there is no URI or representation available to describe a host, many of the methods used for associating per-resource metadata (such as HTTP headers) are not available. This often leads to the overloading of the root HTTP resource (e.g., 'http://example.com/') with host metadata that is not specific or relevant to the root resource itself.

This document defines a lightweight metadata document format for describing hosts (thus the name "host-meta"), intended for use by web-based protocols. This document also registers the well-known URI suffix "host-meta" in the Well-Known URI Registry established by [RFC5785].

In addition, there are times when a host-wide scope for policy or metadata is too coarse-grained. host-meta provides two mechanisms for providing resource-specific information:

- o Link Templates - links using a URI template instead of a fixed target URI, providing a way to define generic rules for generating resource-specific links by applying the individual resource URI to the template.
- o Link-based Resource Descriptor Documents (LRDD, pronounced 'lard') - descriptor documents providing resource-specific information, typically information that cannot be expressed using link templates. LRDD documents are linked to resources or host-meta documents using link templates with the "lrdd" relation type.

### 1.1. Example

The following is a simple host-meta document including both host-wide and resource-specific information for the 'example.com' host:

```
<?xml version='1.0' encoding='UTF-8'?>
<XRD xmlns='http://docs.oasis-open.org/ns/xri/xrd-1.0'>

  <!-- Host-Wide Information -->

  <Property type='http://protocol.example.net/version'>1.0</Property>

  <Link rel='copyright'
    href='http://example.com/copyright' />

  <!-- Resource-specific Information -->

  <Link rel='hub'
    template='http://example.com/hub' />

  <Link rel='lrdd'
    type='application/xrd+xml'
    template='http://example.com/lrdd?uri={uri}' />

  <Link rel='author'
    template='http://example.com/author?q={uri}' />

</XRD>
```

The host-wide information that applies to the host in its entirety provided by the document includes:

- o An "http://protocol.example.net/version" host property with a value of "1.0".
- o A link to the host's copyright policy ("copyright").

The resource-specific information provided by the document includes:

- o A link template for receiving real-time updates ("hub") about individual resources. Since the template does not include a template variable, the target URI is identical for all resources.
- o A LRDD document link template ("lrdd") for obtaining additional resource-specific information contained in a separate document for each individual resource.
- o A link template for finding information about the author of individual resources ("author").

#### 1.1.1.1. Processing Resource-Specific Information

When looking for information about an individual resource -- for example, the resource identified by 'http://example.com/xy' -- the resource URI is applied to the templates found, producing the following links:

```
<Link rel='hub'
  href='http://example.com/hub' />

<Link rel='lrdd'
  type='application/xrd+xml'
  href='http://example.com/lrdd?uri=http%3A%2F%2Fexample.com%2Fxy' />

<Link rel='author'
  href='http://example.com/author?q=http%3A%2F%2Fexample.com%2Fxy' />
```

The LRDD document for 'http://example.com/xy' (obtained via an HTTP "GET" request):

```
<?xml version='1.0' encoding='UTF-8'?>
<XRD xmlns='http://docs.oasis-open.org/ns/xri/xrd-1.0'>

  <Subject>http://example.com/xy</Subject>

  <Property type='http://spec.example.net/color'>red</Property>
```

```

<Link rel='hub'
  href='http://example.com/another/hub' />

<Link rel='author'
  href='http://example.com/john' />
</XRD>

```

Together, the information available about the individual resource (presented as an Extensible Resource Descriptor (XRD) document for illustration purposes) is:

```

<?xml version='1.0' encoding='UTF-8'?>
<XRD xmlns='http://docs.oasis-open.org/ns/xri/xrd-1.0'>

  <Subject>http://example.com/xy</Subject>

  <Property type='http://spec.example.net/color'>red</Property>

  <Link rel='hub'
    href='http://example.com/hub' />

  <Link rel='hub'
    href='http://example.com/another/hub' />

  <Link rel='author'
    href='http://example.com/john' />

  <Link rel='author'
    href='http://example.com/author?q=http%3A%2F%2Fexample.com%2Fxy' />

</XRD>

```

Note that the order of links matters and is based on their original order in the host-meta and LRDD documents. For example, the "hub" link obtained from the host-meta link template has a higher priority than the link found in the LRDD document because the host-meta link appears before the "lrdd" link.

On the other hand, the "author" link found in the LRDD document has a higher priority than the link found in the host-meta document because it appears after the "lrdd" link.

## 1.2. Notational Conventions

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 [RFC2119].

This document uses the Augmented Backus-Naur Form (ABNF) notation of [RFC5234]. Additionally, the following rules are included from [RFC3986]: reserved, unreserved, and pct-encoded.

## 2. Obtaining host-meta Documents

The client obtains the host-meta document for a given host by sending an HTTP [RFC2616] or an HTTPS [RFC2818] GET request to the host for the `"/.well-known/host-meta"` path, using the default ports defined for each protocol (e.g., port 80 for HTTP and port 443 for HTTPS). The scope and meaning of host-meta documents obtained via other protocols or ports is undefined.

The server **MUST** support at least one protocol but **MAY** support both. If both protocols are supported, they **MUST** produce the same document.

The decision as to which protocol is used to obtain the host-meta document has significant security ramifications, as described in Section 5.

For example, the following request is used to obtain the host-meta document for the `'example.com'` host:

```
GET /.well-known/host-meta HTTP/1.1
Host: example.com
```

If the server response indicates that the host-meta resource is located elsewhere (a 301, 302, or 307 response status code), the client **SHOULD** try to obtain the resource from the location provided in the response. This means that the host-meta document for one host **MAY** be retrieved from another host. Likewise, if the resource is not available or does not exist (e.g., a 404 or 410 response status code), the client **SHOULD** infer that metadata is not available via this mechanism.

The host-meta document **SHOULD** be served with the `"application/xrd+xml"` media type.

## 3. The host-meta Document

The host-meta document uses the XRD 1.0 document format as defined by [OASIS.XRD-1.0], which provides a simple and extensible XML-based schema for describing resources. This specification defines additional processing rules needed to describe hosts. Documents **MAY** include any elements included in the XRD 1.0 schema that are not explicitly excluded by this specification.

The server MAY offer alternative representations of any XRD document it serves (host-meta, LRDD, or other XRD-based documents). The client MAY request a particular representation using the HTTP "Accept" request header field. If no "Accept" request header field is included with the request, or if the client requests an "application/xrd+xml" representation, the server MUST respond using the REQUIRED XRD 1.0 XML representation described in Section 3.1.

Applications using the host-meta document MAY require the server to provide a specific alternative representation in addition to the XRD 1.0 XML representation when explicitly requested by the client.

A JavaScript Object Notation (JSON) Resource Descriptor, known as JRD, is described in Appendix A. It is RECOMMENDED that servers offer the JRD representation in addition to the XRD representation.

### 3.1. XML Document Format

The host-meta document root MUST be an "XRD" element. The document SHOULD NOT include a "Subject" element, as at this time no URI is available to identify hosts. The use of the "Alias" element in host-meta is undefined and NOT RECOMMENDED.

The subject (or "context IRI", as defined by [RFC5988]) of the XRD "Property" and "Link" elements is the host described by the host-meta document. However, the subject of "Link" elements with a "template" attribute is the individual resource whose URI is applied to the link template, as described in Section 3.1.1.

#### 3.1.1. The "Link" Element

The XRD "Link" element, when used with the "href" attribute, conveys a link relation between the host described by the document and a common target URI.

For example, the following link declares a common copyright license for the entire scope:

```
<Link rel='copyright' href='http://example.com/copyright' />
```

However, a "Link" element with a "template" attribute conveys a relation whose context is an individual resource within the host-meta document scope, and whose target is constructed by applying the context resource URI to the template. The template string MAY contain a URI string without any variables to represent a resource-level relation that is identical for every individual resource.

For example, a blog with multiple authors can provide information about each article's author by providing an endpoint with a parameter set to the URI of each article. Each article has a unique author, but all share the same pattern of where that information is located:

```
<Link rel='author'
  template='http://example.com/author?article={uri}' />
```

#### 3.1.1.1. Template Syntax

This specification defines a simple template syntax for URI transformation. A template is a string containing brace-enclosed ("{}") variable names marking the parts of the string that are to be substituted by the corresponding variable values.

Before substituting template variables, values **MUST** be encoded using UTF-8, and any character other than unreserved (as defined by [RFC3986]) **MUST** be percent-encoded per [RFC3986].

This specification defines a single variable -- "uri" -- as the entire context resource URI. Protocols **MAY** define additional relation-specific variables and syntax rules, but **SHOULD** only do so for protocol-specific relation types, and **MUST NOT** change the meaning of the "uri" variable. If a client is unable to successfully process a template (e.g., unknown variable names, unknown or incompatible syntax), the parent "Link" element **SHOULD** be ignored.

The template syntax ABNF follows:

```
URI-Template = *( uri-char / variable )
variable     = "{" var-name "}"
uri-char     = ( reserved / unreserved / pct-encoded )
var-name     = %x75.72.69 / ( 1*var-char ) ; "uri" or other names
var-char     = ALPHA / DIGIT / "." / "_"
```

For example:

```
Input:      http://example.com/r?f=1
Template:   http://example.org/?q={uri}
Output:    http://example.org/?q=http%3A%2F%2Fexample.com%2Fr%3Ff%3D1
```

## 4. Processing host-meta Documents

Once the host-meta document has been obtained, the client processes its content based on the type of information desired: host-wide or resource-specific.



Clients usually look for a link with a specific relation type or other attributes. In such cases, the client does not need to process the entire host-meta document and all linked LRDD documents, but instead process the various documents in their prescribed order until the desired information is found.

Protocols using host-meta must indicate whether the information they seek is host-wide or resource-specific -- for example, "obtain the first host-meta resource-specific link using the 'author' relation type". If both types are used for the same purpose (e.g., first look for resource-specific, then look for host-wide), the protocol must specify the processing order.

#### 4.1. Host-Wide Information

When looking for host-wide information, the client **MUST** ignore any "Link" elements with a "template" attribute, as well as any link using the "lrdd" relation type. All other elements are scoped as host-wide.

#### 4.2. Resource-Specific Information

Unlike host-wide information, which is contained solely within the host-meta document, resource-specific information is obtained from host-meta link templates, as well as from linked LRDD documents.

When looking for resource-specific information, the client constructs a resource descriptor by collecting and processing all the host-meta link templates. For each link template:

1. The client applies the URI of the desired resource to the template, producing a resource-specific link.
2. If the link's relation type is other than "lrdd", the client adds the link to the resource descriptor in order.
3. If the link's relation type is "lrdd":
  - 3.1. The client obtains the LRDD document by following the scheme-specific rules for the LRDD document URI. If the document URI scheme is "http" or "https", the document is obtained via an HTTP "GET" request to the identified URI. If the HTTP response status code is 301, 302, or 307, the client **MUST** follow the redirection response and repeat the request with the provided location.

- 3.2. The client adds any links found in the LRDD document to the resource descriptor in order, except for any link using the "lrdd" relation type (processing is limited to a single level of inclusion). When adding links, the client SHOULD retain any extension attributes and child elements if present (e.g., <Property> or <Title> elements).
- 3.3. The client adds any resource properties found in the LRDD document to the resource descriptor in order (e.g., <Alias> or <Property> child elements of the LRDD document <XRD> root element).

## 5. Security Considerations

The host-meta document is designed to be used by other applications explicitly "opting-in" to use the facility. Therefore, any such application MUST review the specific security implications of using host-meta documents. By itself, this specification does not provide any protections or guarantees that any given host-meta document is under the control of the appropriate entity as required by each application.

The metadata returned by the host-meta resource is presumed to be under the control of the appropriate authority and representative of all the resources described by it. If this resource is compromised or otherwise under the control of another party, it may represent a risk to the security of the server and data served by it, depending on the applications using it.

Applications utilizing the host-meta document where the authenticity of the information is necessary MUST require the use of the HTTPS protocol and MUST NOT produce a host-meta document using other means. In addition, such applications MUST require that any redirection leading to the retrieval of a host-meta document also utilize the HTTPS protocol.

Since the host-meta document is authoritative for the entire host, not just the authority (combination of scheme, host, and port) of the host-meta document server, applications MUST ensure that using a host-meta document for another URI authority does not represent a potential security exploit.

Protocols using host-meta templates must evaluate the construction of their templates as well as any protocol-specific variables or syntax to ensure that the templates cannot be abused by an attacker. For example, a client can be tricked into following a malicious link due to a poorly constructed template that produces unexpected results when its variable values contain unexpected characters.

## 6. IANA Considerations

### 6.1. The "host-meta" Well-Known URI

This specification registers the "host-meta" well-known URI in the Well-Known URI Registry as defined by [RFC5785].

URI suffix: host-meta

Change controller: IETF

Specification document(s): RFC 6415

Related information: The "host-meta" documents obtained from the same host using the HTTP and HTTPS protocols (using default ports) MUST be identical.

### 6.2. The "host-meta.json" Well-Known URI

This specification registers the "host-meta.json" well-known URI in the Well-Known URI Registry as defined by [RFC5785].

URI suffix: host-meta.json

Change controller: IETF

Specification document(s): RFC 6415

Related information: The "host-meta.json" documents obtained from the same host using the HTTP and HTTPS protocols (using default ports) MUST be identical.

### 6.3. The "lrdd" Relation Type

This specification registers the "lrdd" relation type in the Link Relation Type Registry defined by [RFC5988]:

Relation Name: lrdd

Description: Refers to further information about the link's context, expressed as a LRDD ("Link-based Resource Descriptor Document") resource. See RFC 6415 for information about processing this relation type in host-meta documents. When used elsewhere, it refers to additional links and other metadata. Multiple instances indicate additional LRDD resources. LRDD resources MUST have an "application/xrd+xml" representation, and MAY have others.

Reference: RFC 6415

## Appendix A. JRD Document Format

The JRD document format -- a general-purpose XRD 1.0 representation -- uses the JavaScript Object Notation (JSON) format defined in [RFC4627]. JRD uses the same elements and processing rules described in Section 3.1. The JRD format is designed to include the same base functionality provided by the XML format, with the exception of extensibility, as extensibility is beyond the scope of this specification.

The client MAY request a JRD representation using the HTTP "Accept" request header field with a value of "application/json". The server MUST include the HTTP "Content-Type" response header field with a value of "application/json". Any other "Content-Type" value (or lack thereof) indicates that the server does not support the JRD format.

Alternatively, the client MAY request a JRD representation by requesting the "host-meta.json" well-known document, by making a GET request for "/.well-known/host-meta.json", following the same process used for "/.well-known/host-meta". If the server does not support serving a JRD representation at this location, the server MUST respond with an HTTP 404 (Not Found) status code.

XRD elements are serialized into a JSON object as follows:

- o The XML document declaration and "XRD" element are discarded.
- o The "Subject" element is included as a name/value pair with the name 'subject', and value included as a string.
- o The "Expires" element is included as a name/value pair with the name 'expires', and value included as a string.
- o "Alias" elements are included as a single name/value pair with the name 'aliases', and value a string array containing the values of each element in order.
- o "Property" elements are included as a single name/value pair with the name 'properties', and value an object with each element included as a name/value pair with the value of the "type" attribute as name, and element value included as a string value. The values of properties with empty values (i.e., using the REQUIRED "xsi:nil='true'" attribute) are included as null. If more than one "Property" element is present with the same "type" attribute, only the last instance is included.

- o "Link" elements are included as a single name/value pair with the name 'links', and value an array with each element included as an object. Each attribute is included as a name/value pair with the attribute name as name, and value included as a string.
- o "Link" child "Property" elements are included using the same method as XRD-level "Property" elements using a name/value pair inside the link object.
- o "Link" child "Title" elements are included as a single object with the name 'titles', and value an object with each element included as a name/value pair with the value of the "xml:lang" attribute as name, and element value included as a string value. The names of elements without an "xml:lang" attribute are added with the name 'default'. If more than one "Title" element is present with the same (or no) "xml:lang" attribute, only the last instance is included.
- o The conversion of any other element is left undefined.

For example, the following XRD document...

```
<?xml version='1.0' encoding='UTF-8'?>
<XRD xmlns='http://docs.oasis-open.org/ns/xri/xrd-1.0'
      xmlns:xsi='http://www.w3.org/2001/XMLSchema-instance'>

  <Subject>http://blog.example.com/article/id/314</Subject>
  <Expires>2010-01-30T09:30:00Z</Expires>

  <Alias>http://blog.example.com/cool_new_thing</Alias>
  <Alias>http://blog.example.com/steve/article/7</Alias>

  <Property type='http://blgx.example.net/ns/version'>1.2</Property>
  <Property type='http://blgx.example.net/ns/version'>1.3</Property>
  <Property type='http://blgx.example.net/ns/ext' xsi:nil='true' />

  <Link rel='author' type='text/html'
        href='http://blog.example.com/author/steve'>
    <Title>About the Author</Title>
    <Title xml:lang='en-us'>Author Information</Title>
    <Property type='http://example.com/role'>editor</Property>
  </Link>

  <Link rel='author' href='http://example.com/author/john'>
    <Title>The other guy</Title>
    <Title>The other author</Title>
  </Link>
```

```
<Link rel='copyright'
      template='http://example.com/copyright?id={uri}' />
</XRD>
```

...is represented by the following JRD document:

```
{
  "subject": "http://blog.example.com/article/id/314",
  "expires": "2010-01-30T09:30:00Z",

  "aliases": [
    "http://blog.example.com/cool_new_thing",
    "http://blog.example.com/steve/article/7" ],

  "properties": {
    "http://blgx.example.net/ns/version": "1.3",
    "http://blgx.example.net/ns/ext": null
  },

  "links": [
    {
      "rel": "author",
      "type": "text/html",
      "href": "http://blog.example.com/author/steve",
      "titles": {
        "default": "About the Author",
        "en-us": "Author Information"
      },
      "properties": {
        "http://example.com/role": "editor"
      }
    },
    {
      "rel": "author",
      "href": "http://example.com/author/john",
      "titles": {
        "default": "The other author"
      }
    },
    {
      "rel": "copyright",
      "template": "http://example.com/copyright?id={uri}"
    }
  ]
}
```

Note that the "Subject" and "Alias" elements are NOT RECOMMENDED in the context of host-meta documents, and are included in the example for completeness only.

#### Appendix B. Acknowledgments

The authors would like to acknowledge the contributions of everyone who provided feedback and use cases for this specification -- in particular, Dirk Balfanz, DeWitt Clinton, Eve Maler, Breno de Medeiros, Brad Fitzpatrick, James Manger, Will Norris, Mark Nottingham, John Panzer, Drummond Reed, and Peter Saint-Andre.

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