Header-based Metadata Extension

Version 1.0e

"Publication of this Working Draft for review and comment has been approved by the Cloud Storage Technical Working Group. This draft represents a "best effort" attempt by the Cloud Storage Technical Working Group to reach preliminary consensus, and it may be updated, replaced, or made obsolete at any time. This document should not be used as reference material or cited as other than a 'work in progress.' Suggestion for revision should be directed to http://snia.org/feedback."

Working Draft
Revision History

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
<th>By</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-11-12</td>
<td>1.0a</td>
<td>TWG</td>
<td>Document created at the Portland Face to Face meeting.</td>
</tr>
<tr>
<td>2012-11-14</td>
<td>1.0b</td>
<td>TWG</td>
<td>Edits at San Diego Face-to-Face meeting.</td>
</tr>
<tr>
<td>2013-03-20</td>
<td>1.0c</td>
<td>TWG</td>
<td>Edits at Austin Face-to-Face meeting.</td>
</tr>
<tr>
<td>2013-11-12</td>
<td>1.0d</td>
<td>TWG</td>
<td>Edits at Memphis Face-to-Face meeting.</td>
</tr>
<tr>
<td>2014-01-29</td>
<td>1.0e</td>
<td>TWG</td>
<td>Edits at San Jose SNIA Symposium</td>
</tr>
</tbody>
</table>

The SNIA hereby grants permission for individuals to use this document for personal use only, and for corporations and other business entities to use this document for internal use only (including internal copying, distribution, and display) provided that:

- Any text, diagram, chart, table, or definition reproduced shall be reproduced in its entirety with no alteration, and,
- Any document, printed or electronic, in which material from this document (or any portion hereof) is reproduced shall acknowledge the SNIA copyright on that material, and shall credit the SNIA for granting permission for its reuse.

Other than as explicitly provided above, you may not make any commercial use of this document, sell any excerpt or this entire document, or distribute this document to third parties. All rights not explicitly granted are expressly reserved to SNIA.

Permission to use this document for purposes other than those enumerated above may be requested by e-mailing tcmd@snia.org. Please include the identity of the requesting individual and/or company and a brief description of the purpose, nature, and scope of the requested use.

Copyright © 2013 Storage Networking Industry Association.
Header-based Metadata Extension

Overview

The CDMI protocol enables CDMI-aware clients to store and retrieve structured metadata using JSON bodies, but does not permit HTTP-based clients to access this metadata. This extension extends CDMI metadata to permit HTTP header metadata to be stored and retrieved as a subset of CDMI metadata.

Due to limitations associated with HTTP headers, certain restrictions must be placed on metadata that is accessible via headers.

Modifications to the CDMI 1.0.2 spec:

1) In Clause 8.3.3, add a new row at end of table "Table 12 - Request Headers - Create a CDMI Data Object using a Non-CDMI Content Type"

<table>
<thead>
<tr>
<th>Header</th>
<th>Type</th>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>x-<em>-meta-</em></td>
<td>Header String</td>
<td>If the &quot;cdmi_header_metadata&quot; capability is present, for each request header matching the pattern &quot;x-<em>-meta-</em>&quot;, a new user metadata item shall be created, with the metadata name set to the header field-name, and the metadata value set to the header field-value. If the number of headers, the length of any of the headers, or the total size of the headers exceeds the limits specified in RFC 2616, or specified by the cdmi_header_metadata_maxitems, cdmi_header_metadata_maxsize, or the cdmi_header_metadata_maxtotalsize capabilities, a 400 Bad Request shall be returned to the client.</td>
<td>Conditional</td>
</tr>
</tbody>
</table>

2) In Clause 8.3.8 "Examples", insert at end

EXAMPLE 2  PUT to the container URI the data object name, contents, and metadata:

PUT /MyContainer/MyDataObject.txt HTTP/1.1
Host: cloud.example.com
Content-Type: text/plain;charset=utf-8
X-CDMI-Meta-Colour: Yellow
Content-Length: 37

This is the Value of this Data Object

The following shows the response.

HTTP/1.1 201 Created

3) After Clause 8.3, add a clause "8.4 Inspect a Data Object using a Non-CDMI Content Type"

8.4.1 Synopsis
To check for the presence of a data object, the following request shall be performed:

```
HEAD <root URI>/<ContainerName>/<DataObjectName>
```

Where:

- `<root URI>` is the path to the CDMI cloud.
- `<ContainerName>` is zero or more intermediate containers that already exist, with one slash (i.e., `/`) between each pair of container names.
- `<DataObjectName>` is the name specified for the data object to be checked.

The object shall also also be able to be checked at `<root URI>/cdmi_objectid/<objectID>`.

### 8.4.2 Capabilities

The following capabilities describe the supported operations that may be performed when reading an existing data object:

- Support for the ability to read the metadata of an existing data object is indicated by the presence of the `cdmi_read_metadata` capability in the specified object.

### 8.4.3 Request Headers

Request headers may be provided as per RFC 2616.

### 8.4.4 Request Message Body

A request message body shall not be provided.

### 8.4.5 Response Headers

The HTTP response headers for checking for the presence of a CDMI data object using a Non-CDMI content type are shown in Table 14.

#### Table 14 - Response Headers - Check a Data Object using a Non-CDMI Content Type

<table>
<thead>
<tr>
<th>Header</th>
<th>Type</th>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content-Type</td>
<td>Header String</td>
<td>The content type returned shall be the mimetype field in the data object.</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Location</td>
<td>Header String</td>
<td>The server shall respond with the URI that the reference redirects to if the object is a reference.</td>
<td>Conditional</td>
</tr>
<tr>
<td>x-<em>-meta-</em></td>
<td>Header String</td>
<td>If the &quot;cdmi_header_metadata&quot; capability is present, for each user metadata item in the &quot;metadata&quot; field with a metadata name that is a case-insensitive match to the pattern &quot;x-<em>-meta-</em>&quot;, a corresponding response header shall be returned to the client where the header field-name shall be the metadata item name, and the header field-value shall be the metadata item value. If a header value to be return is not conformant with RFC 2616, the server may omit the field from the response headers.</td>
<td>Conditional</td>
</tr>
</tbody>
</table>

### 8.4.6 Response Message Body
No response body shall be provided, as per RFC 2616.

8.4.7 Response Status

Table 15 describes the HTTP status codes that occur when checking the presence of a data object using a Non-CDMI content type.

Table 15 - HTTP Status Codes – Check a Data Object using a Non-CDMI Content Type

<table>
<thead>
<tr>
<th>HTTP Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 OK</td>
<td>The data object exists.</td>
</tr>
<tr>
<td>302 Found</td>
<td>The URI is a reference to another URI.</td>
</tr>
<tr>
<td>400 Bad Request</td>
<td>The request contains invalid parameters or field names.</td>
</tr>
<tr>
<td>401 Unauthorized</td>
<td>The authentication credentials are missing or invalid.</td>
</tr>
<tr>
<td>403 Forbidden</td>
<td>The client lacks the proper authorization to perform this request.</td>
</tr>
<tr>
<td>404 Not Found</td>
<td>The resource was not found at the specified URI, or a requested field within the resource was not found.</td>
</tr>
</tbody>
</table>

8.4.8 Examples

EXAMPLE 1  HEAD to the data object URI to check for the presence of a data object with header metadata:

HEAD /MyContainer/MyDataObject.txt HTTP/1.1
Host: cloud.example.com

The following shows the response.

HTTP/1.1 200 OK
Content-Type: text/plain
Content-Length: 37
X-CDMI-Meta-Colour: Yellow

4) In Clause 8.5.5, add a new row at end of table "Table 19 - Response Headers - Read a CDMI Data Object using a Non-CDMI Content Type"

<table>
<thead>
<tr>
<th>Header</th>
<th>Type</th>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>x-<em>-meta-</em></td>
<td>Header String</td>
<td>If the &quot;cdmi_header_metadata&quot; capability is present, for each user metadata item in the &quot;metadata&quot; field with a metadata name that is a case-insensitive match to the pattern &quot;x-<em>-meta-</em>&quot;, a corresponding response header shall be returned to the client where the header field-name shall be the metadata item name, and the header field-value shall be the metadata item value. If a header value to be return is not conformant with RFC 2616, the server may omit the field from the response headers.</td>
<td>Conditional</td>
</tr>
</tbody>
</table>
5) In Clause 8.5.8 "Examples", insert at end

EXAMPLE 3  GET to the data object URI to read the value of the data object with header metadata:

GET /MyContainer/MyDataObject.txt HTTP/1.1
Host: cloud.example.com

The following shows the response.

HTTP/1.1 200 OK
Content-Type: text/plain
Content-Length: 37
X-CDMI-Meta-Colour: Yellow

This is the Value of this Data Object

6) In Clause 8.7.3, add a new row at end of table "Table 25 - Request Headers - Update a CDMI Data Object using a Non-CDMI Content Type"

<table>
<thead>
<tr>
<th>Header Type Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>x-<em>-meta-</em> Header Type</td>
<td>If the &quot;cdmi_header_metadata&quot; capability is present, for each request header matching the pattern &quot;x-<em>-meta-</em>&quot;, a new user metadata item shall be created, or an existing metadata item shall be updated, with the metadata name set to the header field-name, and the metadata value set to the header field-value. If a metadata item already exists where the metadata name and the header field-name differ only in case, the existing metadata item value shall be updated. If an empty header field-value is specified, the corresponding metadata item shall be removed from the object. If the number of headers, the length of any of the headers, or the total size of the headers exceeds the limits specified in RFC 2616, or specified by the cdmi_header_metadata_maxitems, cdmi_header_metadata_maxsize, or the cdmi_header_metadata_maxtotalsize capabilities, a 400 Bad Request shall be returned to the client.</td>
</tr>
</tbody>
</table>

7) In Clause 8.7.8 "Examples", insert at end

EXAMPLE 3  PUT to the data object URI to update the value and metadata of the data object:

PUT /MyContainer/MyDataObject.txt HTTP/1.1
Host: cloud.example.com
Content-Type: text/plain;charset=utf-8
X-CDMI-Meta-Colour: Green
Content-Length: 41

This is the new Value of this Data Object

The following shows the response.
8) In Clause 9.3.3, replace with the below text:

The HTTP request headers for creating a CDMI container object using a non-CDMI content type are shown in Table 37.

<table>
<thead>
<tr>
<th>Header</th>
<th>Type</th>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>x-<em>-meta-</em></td>
<td>Header String</td>
<td>If the &quot;cdmi_header_metadata&quot; capability is present, for each request header matching the pattern &quot;x-*-meta-&quot;, a new user metadata item shall be created, with the metadata name set to the header field-name, and the metadata value set to the header field-value. If the number of headers, the length of any of the headers, or the total size of the headers exceeds the limits specified in RFC 2616, or specified by the cdmi_header_metadata_maxitems, cdmi_header_metadata_maxsize, or the cdmi_header_metadata_maxtotalsize capabilities, a 400 Bad Request shall be returned to the client.</td>
<td>Conditional</td>
</tr>
</tbody>
</table>

9) In Clause 9.3.8 "Examples", insert at end

EXAMPLE 2  PUT to the URI the container object name and metadata:

```
PUT /MyContainer/ HTTP/1.1  
Host: cloud.example.com  
X-CDMI-Meta-Colour: Yellow
```

The following shows the response.

```
HTTP/1.1 201 Created
```

10) After Clause 9.3, add a clause "9.4 Inspect a Container Object using a Non-CDMI Content Type"

9.4.1 Synopsis

To check for the presence of a container object, the following request shall be performed:

```
HEAD <root URI>/<ContainerName>/<TheContainerName>/
```

Where:

- <root URI> is the path to the CDMI cloud.
- <ContainerName> is zero or more intermediate containers that already exist, with one slash (i.e., "/") between each pair of container names.
- <TheContainerName> is the name specified for the container object to be checked.
The container object shall also be able to be checked at <root URI>/cdmi_objectid/<objectID>.

### 9.4.2 Capabilities

The following capabilities describe the supported operations that may be performed when reading an existing container object:

- Support for the ability to read the metadata of an existing container object is indicated by the presence of the cdmi_read_metadata capability in the specified container object.

### 9.4.3 Request Headers

Request headers may be provided as per RFC 2616.

### 9.4.4 Request Message Body

A request message body shall not be provided.

### 9.4.5 Response Headers

The HTTP response headers for checking for the presence of a CDMI container object using a Non-CDMI content type are shown in Table 38.

<table>
<thead>
<tr>
<th>Header</th>
<th>Type</th>
<th>Description</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content-Type</td>
<td>Header</td>
<td>&quot;application/cdmi-container&quot;</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Location</td>
<td>Header</td>
<td>The server shall respond with the URI that the reference redirects to if the object is a reference.</td>
<td>Conditional</td>
</tr>
<tr>
<td>x-<em>-meta-</em></td>
<td>Header</td>
<td>If the &quot;cdmi_header_metadata&quot; capability is present, for each user metadata item in the &quot;metadata&quot; field with a metadata name that is a case-insensitive match to the pattern &quot;x-<em>-meta-</em>&quot;, a corresponding response header shall be returned to the client where the header field-name shall be the metadata item name, and the header field-value shall be the metadata item value. If a header value to be return is not conformant with RFC 2616, the server may omit the field from the response headers.</td>
<td>Conditional</td>
</tr>
</tbody>
</table>

### 9.4.6 Response Message Body

No response body shall be provided, as per RFC 2616.

### 9.4.7 Response Status

Table 39 describes the HTTP status codes that occur when checking the presence of a container object using a Non-CDMI content type.

<table>
<thead>
<tr>
<th>Header</th>
<th>Status Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>200</td>
<td>OK</td>
</tr>
<tr>
<td></td>
<td>204</td>
<td>No Content</td>
</tr>
<tr>
<td></td>
<td>404</td>
<td>Not Found</td>
</tr>
<tr>
<td>HTTP Status</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>200 OK</td>
<td>The container object content exists.</td>
<td></td>
</tr>
<tr>
<td>302 Found</td>
<td>The URI is a reference to another URI.</td>
<td></td>
</tr>
<tr>
<td>400 Bad Request</td>
<td>The request contains invalid parameters or field names.</td>
<td></td>
</tr>
<tr>
<td>401 Unauthorized</td>
<td>The authentication credentials are missing or invalid.</td>
<td></td>
</tr>
<tr>
<td>403 Forbidden</td>
<td>The client lacks the proper authorization to perform this request.</td>
<td></td>
</tr>
<tr>
<td>404 Not Found</td>
<td>The resource was not found at the specified URI, or a requested field within the resource was not found.</td>
<td></td>
</tr>
</tbody>
</table>

9.4.8 Examples

EXAMPLE 1  HEAD to the container object URI to check for the presence of a container object with header metadata:

```
HEAD /MyContainer/ HTTP/1.1
Host: cloud.example.com
```

The following shows the response.

```
HTTP/1.1 200 OK
Content-Type: application/cdmi-container
X-CDMI-Meta-Colour: Yellow
```

11) After Clause 9.5, add a clause "9.6 Read a Container Object using a Non-CDMI Content Type"

9.6.1 Synopsis

Reading a Container Object using a Non-CDMI Content Type is not defined as part of the CDMI standard.

A server implementation is free to respond to Non-CDMI GETs for Container Objects in any way that conforms with RFC 2616.

If container object metadata items matching the pattern "x-*-meta-*" are present, these metadata items shall be returned as response headers as per clause 9.5 Read a Container Object using CDMI Content Type.

12) After Clause 9.7, add a clause "9.8 Update a Container Object using a Non-CDMI Content Type"

9.8.1 Synopsis

Updating a Container Object using a Non-CDMI Content Type is not defined as part of the CDMI standard.

A server implementation is free to respond to Non-CDMI PUTs for existing Container Objects in any way that conforms with RFC 2616.
If header metadata matching the pattern "x-*-meta-*" is present in the request headers, these headers shall be processed as per clause 9.6 Update a Container Object using CDMI Content Type.

13) In Clause 12.1.1, Add new row at end of table "Table 101 - System-Wide Capabilities"

<table>
<thead>
<tr>
<th>Capability Name</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cdmi_header_metadata</td>
<td>JSON</td>
<td>If present and &quot;true&quot;, this capability indicates that the cloud storage system supports header-visible metadata.</td>
</tr>
<tr>
<td>cdmi_header_metadata_maxitems</td>
<td>JSON</td>
<td>If present, this capability indicates the maximum number of user-defined header metadata items supported per object. If absent, there is no additional limit placed on the number of user-defined metadata items.</td>
</tr>
<tr>
<td>cdmi_header_metadata_maxsize</td>
<td>JSON</td>
<td>If present, this capability indicates the maximum size, in bytes, of each user-defined header metadata item. If absent, there is no additional limit placed on the size of user-defined metadata items.</td>
</tr>
<tr>
<td>cdmi_header_metadata_maxtotalsize</td>
<td>JSON</td>
<td>If present, this capability indicates the maximum size, in bytes, of all user-defined header metadata per object. If absent, there is no additional limit placed on the size of user-defined metadata.</td>
</tr>
</tbody>
</table>

14) In Clause 16.2 "Support for User Metadata", Add to end:

If metadata items with a name is a case-insensitive match to the pattern "x-*-meta-*" are created or updated through a CDMI request, the following conditions shall be true, or else a 400 Bad Request result code shall be returned to the client:

- The metadata name shall be a valid HTTP header field-name
- The metadata value that is a valid HTTP header field-value
- The number of matching headers shall not exceed the limits specified by RFC 2616, and shall not exceed the number specified in the cdmi_header_metadata_maxitems capability.
- The size of each matching header shall not exceed the limits specified by RFC 2616, and shall not exceed the number specified in the cdmi_header_metadata_maxsize capability.
- The total size of all of the matching headers shall not exceed the limits specified by RFC 2616, and shall not exceed the number specified in the cdmi_header_metadata_maxtotalsize capability.