OSLC Core Version 3.0. Part 5: Attachments

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Related work:

This specification is related to:

RDF Namespaces:

http://open-services.net/ns/core#

Abstract:

Binary or text documents may be considered attachments to other resources. This specification describes a minimal way to manage attachments related to web resources using LDP-Containers and Non-RDF Source [LDP].

Status:

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1. Introduction

This section is non-normative.

Various tools handle the association and creation of related resources in conceptually similar ways, but often differ in details on how it is accomplished. The Linked Data Platform (LDP) already defines a model by which it is possible to relate resources to another, even if they are not RDF-based. This specification defines the method to create associated attachments to a given resource and understand if that resource supports the attaching of attachments.

As an example of how to create an attachment, simply HTTP POST the attachment content to the attachment container for the resource. The request should have a Content-Type header describing the attachment's media type. The optional Slug header is used to give the attachment a name.

**EXAMPLE 1**

```
POST /bugs/2314/attachments HTTP/1.1
Slug: design
Content-Type: application/vnd.oasis.opendocument.text
Content-Length: 18124
[binary content]
```

The response contains a Link to the new attachment in the Location header. This server has also included a Link to the oslc:AttachmentDescriptor for the attachment in the HTTP response, which contains metadata about the attachment.

**EXAMPLE 2**

```
HTTP/1.1 201 Created
Allow: GET,HEAD,OPTIONS,POST
Location: http://example.com/bugs/2314/attachments/3
Link: <http://example.com/bugs/2314/attachments/meta/3>; rel="describedby";
   anchor="http://example.com/bugs/2314/attachments/3",
```
The following sections detail how to leverage LDP to accomplish the ways in which to discovery, get, create, update or delete attachments and associate with a web resource.

### 1.1 Terminology

Terminology uses and extends the terminology and capabilities of OSLC Core Overview [OSLCCore3], W3C Linked Data Platform [LDP], W3C’s Architecture of the World Wide Web [WEBARCH], Hyper-text Transfer Protocol [HTTP11].

**Attachment**
A LDP-NR whose lifecycle is coupled with the attaching resource.

**Attachment Container**
A LDPC that contains Attachments for a resource.

**Attachment Descriptor**
A LDP-RS that contains additional data about an Attachment.

### 1.2 References

#### 1.2.1 Normative references

- [HTTP11](http://www.w3.org/TR/2011/REC-http-2011-12212011)

- [LDP](http://www.w3.org/TR/ldp/)

- [OSLCCore3](http://docs.oasis-open.org/oslc-core/oslc-core/v3.0/csprd01/part1-overview/oslc-core-v3.0-csprd01-part1-overview.html)

- [OSLCCoreVocab](http://docs.oasis-open.org/oslc-core/oslc-core/v3.0/csprd01/part7-core-vocabulary/oslc-core-v3.0-csprd01-part7-core-vocabulary.html)

- [RFC2119](http://tools.ietf.org/html/rfc2119)

- [RFC2183](http://tools.ietf.org/html/rfc2183)

- [RFC5023](http://tools.ietf.org/html/rfc5023)

- [RFC5988](http://tools.ietf.org/html/rfc5988)

#### 1.2.2 Informative references

- [WEBARCH](http://www.w3.org/TR/webarch/)

- [turtle](http://www.w3.org/TR/turtle/)

### 1.3 Typographical Conventions and Use of RFC Terms

As well as sections marked as non-normative, all authoring guidelines, diagrams, examples, and notes in this specification are non-normative. Everything else in this specification is normative.

The key words **MUST**, **MUST NOT**, **REQUIRED**, **SHOULD**, **SHOULD NOT**, **RECOMMENDED**, **MAY**, and **OPTIONAL** in this specification are to be
interpreted as described in [RFC2119].

The namespace for OSLC Core is http://open-services.net/ns/core#.

Sample resource representations are provided in text/turtle format [turtle].

Commonly used namespace prefixes:

```xml
@prefix dcterms: <http://purl.org/dc/terms/>.
@prefix ldp:     <http://www.w3.org/ns/ldp#>.
@prefix oslc:    <http://open-services.net/ns/core#>.
@prefix oslc_cm: <http://open-services.net/ns/cm#>.
@prefix rdf:     <http://www.w3.org/1999/02/22-rdf-syntax-ns#>.
@prefix wdrs:    <http://www.w3.org/2007/05/powder-s#>.
@prefix xsd:     <http://www.w3.org/2001/XMLSchema#>.
```

2. Motivation

This section is non-normative.

Most users of lifecycle tools have the need to easily create attachments across a variety of integrated tools and associate them to some lifecycle resource in context to some scenario. Some specific scenarios where this touches cross tool integration:

- **Running application scanning**: automatically creating a defect or task to track a problem, attaching a log file that outlines the details of the problem.
- **Publishing build results**: as part of an automated software build, publishing successful build artifacts to an asset management repository.
- **Mockups of app design**: share screenshots and designs to a given user story (requirement)

3. Basic Concepts

This section is non-normative.

Attachments are added to a resource via a simple POST request to the appropriate LDP-Container resource. The entity body becomes the content of the attachment resource. The attachment may automatically be associated with the resource via some membership relationship, which may use the `oslc:attachment` membership predicate. Statements are also automatically added to the `oslc:AttachmentDescriptor` resource. The property values are assigned by the server or can be determined from standard headers of the POST. The following table maps the HTTP request headers from the POST request to create the attachment resource, to what can be used to derive the initial values in the indicated `oslc:AttachmentDescriptor` resource:

<table>
<thead>
<tr>
<th>HTTP Request Header</th>
<th>Prefixed Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slug</td>
<td>dcterms:title</td>
</tr>
<tr>
<td>Content-Type</td>
<td>dcterms:format</td>
</tr>
<tr>
<td>Content-Length</td>
<td>oslc:attachmentSize</td>
</tr>
</tbody>
</table>

4. Working with Attachments

This section is non-normative.

The following examples illustrate how a client can work with attachments.

4.1 Find the Attachments for a Resource

Clients get the attachments for a resource by:

1. Finding the attachment container for a resource using an HTTP OPTIONS method and Link header
2. Getting the container for the list of attachments

Each resource that supports attachments has an attachment container, which is an LDP container. Clients discover the attachment container through an HTTP Link header. A client can use GET or HEAD to get the Link header, but OPTIONS is often more efficient because the server does not have to calculate the ETag or content length of the response. LDP resources must support HTTP OPTIONS, and responses to all HTTP requests for resources that support attachments must have the Link header.

```http
OPTIONS /bugs/2314 HTTP/1.1
Host: example.com
```
The response contains a Link to the attachment container with Link relation `http://open-services.net/ns/core#AttachmentContainer`. Note that other Link headers are in the response. In fact, LDP requires additional Link headers, which is why the response has a Link with relation `type` and target URI `http://www.w3.org/ns/ldp#Resource`.

Now the client requests the attachment container to see the attachments for this resource. It's a good practice to include an HTTP `Prefer` header to explicitly ask the server for the LDP containment triples.

The response is an LDP container for the attachments. It can be any LDP container such as an `ldp:BasicContainer` or an `ldp:DirectContainer`. This example uses an `ldp:BasicContainer`. The attachment container only contains attachments for a single resource.

Clients can look at the `ldp:contains` property on the container for the attachments.

4.2 Get the Attachment Content

Once clients have the attachment URI, they can get the attachment by simply making an HTTP GET request to the attachment URI.

A `Slug` header can be included by a server in the response to a `GET` on an attachment resource. If a client wishes to store the content as a file, this value provides a hint as to the file name to use (subject, of course, to any file system restrictions). In the absence of an `Slug` header, the client may use the last segment of the resource's URI as a hint, or just choose an arbitrary file name.

The response body is the attachment content. Servers should set the response `Content-Type` to describe the media type of the attachment. The response may have a `Content-Disposition` header with a filename parameter, although this isn't required. This example also contains a Link with relation `describedby`, which links to the `oslc:AttachmentDescriptor` for the attachment.
4.3 Create an Attachment

To create an attachment, POST the attachment content to the attachment container for the resource. The request should have a Content-Type header describing the attachment's media type and subtype as specified in Media Types. The optional Slug header is used to give the attachment a name. The Content-Length header is used to initialize the attachment size.

A client can set a Slug header in the attachment-creating POST to specify a hint for a name for the resource as part of that single request. This can be important as some systems require a name at the time the attachment is created. Different systems may have different requirements for valid attachment names, so the value of the Slug header should be interpreted as a hint in this context. If the given name can not be used as specified, it is transformed into a valid name. If that is not possible or the header is not specified, an arbitrary value is assigned. Failure due to an invalid name is undesirable because of the potentially large size of an attachment resource.

The client can provide the attachment size in the Content-Length header and this can be used to initialize the oslc:AttachmentDescriptor oslc:attachmentSize property. The server may compute a different attachment size than that provided by the client if the client specified value is incorrect or not provided.

**EXAMPLE 9**

```
POST /bugs/2314/attachments HTTP/1.1
Slug: design
Content-Type: application/vnd.oasis.opendocument.text
Content-Length: 18124
[binary content]
```

The response contains a Link to the new attachment in the Location header. This server has also included a Link to the oslc:AttachmentDescriptor for the attachment in the HTTP response, which contains metadata about the attachment.

When a server successfully creates an attachment resource, it responds with an HTTP status code of 201 (created) with the URI of the newly created attachment resource in the HTTP response Location header. Additionally, if the server created an associated oslc:AttachmentDescriptor resource, the URI for this resource should be listed in the HTTP response Link header [RFC5988] with rel="describedby" [LDP].

Properties for the AttachmentDescriptor that are not readOnly, such as its title and description, can be updated using the usual HTTP PUT method.

**EXAMPLE 10**

```
HTTP/1.1 201 Created
Allow: GET,HEAD,OPTIONS,POST
Location: http://example.com/bugs/2314/attachments/3
Link: <http://example.com/bugs/2314/attachments/meta/3>; rel="describedby";
     anchor="http://example.com/bugs/2314/attachments/3",
     <http://www.w3.org/ns/ldp#Resource>; rel="type"
Content-Length: 0
```

4.4 Update an Attachment

To update an attachment, PUT the attachment content to the attachment resource.

**EXAMPLE 11**

```
PUT /bugs/2314/attachments/3 HTTP/1.1
Content-Type: application/vnd.oasis.opendocument.text
Content-Length: 19377
[binary content]
```

The server typically responds with a 204 No Content status if the request succeeds. It also updates an associated attachment metadata in the oslc:AttachmentDescriptor in the describedby link. For example, the client could have included a Slug header on the update request in order to rename the attachment.

**EXAMPLE 12**

```
HTTP/1.1 204 No Content
Link: <http://example.com/bugs/2314/attachments/meta/3>; rel="describedby";
     anchor="http://example.com/bugs/2314/attachments/3",
     <http://www.w3.org/ns/ldp#Resource>; rel="type"
Content-Length: 0
```

4.5 Remove an Attachment

To remove an attachment, make a DELETE request on the attachment URI. This removes the attachment from the container and deletes the content and attachment metadata from the server.
The server typically responds with 204 No Content status if the request was successful.

4.6 Include Attachment Information Inline with a Resource

Servers can choose to include the attachment information directly in the HTTP response for a resource although this isn't required. Here is an example defect resource that contains attachments. The attachment container is an ldp:DirectContainer where the membership resource is the defect itself. The membership predicate is oslc:attachment, although this predicate is not required. The following example shows the results of an HTTP GET on http://example.com/bugs/2314.

```
EXAMPLE 15

@prefix oslc: <http://open-services.net/ns/core#> .
@prefix oslc_cm: <http://open-services.net/ns/cm#> .
@prefix ldp: <http://w3.org/ns/ldp#> .
@prefix wdrs: <http://www.w3.org/2007/05/powder-s#> .

<http://example.com/bugs/2314> a oslc_cm:Defect ;
  oslc:attachment <http://example.com/bugs/2314/attachments/2> ,
  <http://example.com/bugs/2314/attachments/1> ;
  dcterms:title "A serious bug!" ;
  dcterms:identifier "2314" .

<http://example.com/bugs/2314/attachments> a ldp:DirectContainer , oslc:AttachmentContainer ;
  ldp:contains <http://example.com/bugs/2314/attachments/2> ,
  <http://example.com/bugs/2314/attachments/1> ;
  ldp:hasMemberRelation oslc:attachment ;

<http://example.com/bugs/2314/attachments/1>
  wdrs:describedBy <http://example.com/bugs/2314/attachments/meta/1> .

<http://example.com/bugs/2314/attachments/meta/1> a oslc:AttachmentDescriptor ;
  oslc:attachmentSize "53622"^^<http://www.w3.org/2001/XMLSchema#integer> ;
  dcterms:creator <http://example.com/users/steve> ;
  dcterms:format <http://purl.org/NET/mediatypes/image/png> ;
  dcterms:identifier "1" ;
  dcterms:title "screenshot.png" .

<http://example.com/bugs/2314/attachments/2>
  wdrs:describedBy <http://example.com/bugs/2314/attachments/meta/2> .

<http://example.com/bugs/2314/attachments/meta/2> a oslc:AttachmentDescriptor ;
  oslc:attachmentSize "9196"^^<http://www.w3.org/2001/XMLSchema#int> ;
  dcterms:created "2011-07-19T15:03:54.00-05:00"^^<http://www.w3.org/2001/XMLSchema#dateTime> ;
  dcterms:creator <http://example.com/users/dave> ;
  dcterms:format <http://purl.org/NET/mediatypes/text/x-diff> ;
  dcterms:identifier "2" ;
  dcterms:title "fix.patch" .
```

5. Implementation Conformance

5.1 General

5.1.1 Servers that support OSLC attachments must be Linked Data Platform 1.0 conformant servers [LDP].

5.2 Resources with Attachments

5.2.1 Each resource that supports attachments must have at least one oslc:AttachmentContainer that holds attachments for that resource.

5.2.2 Responses to HTTP requests for resources that support attachments must contain at least one Link header [RFC5988] where the context URI is the resource URI, the Link relation is http://open-services.net/ns/core#AttachmentContainer, and the target URI is the URI of an oslc:AttachmentContainer resource.
5.3 Attachments

5.3.1 An attachment **MUST** be a conformance Linked Data Platform Non-RDF Source (LDP-NR).

5.3.2 Successful responses to HTTP GET requests for an attachment URI **SHOULD** include a Content-Disposition header [RFC2183] with disposition type attachment and a filename parameter. The filename is often the Slug header value used to create the attachment with an appropriate file extension added for the attachment's media type.

5.3.3 If an attachment has an associated oslc:AttachmentDescriptor, responses to HTTP requests for the attachment URI **MUST** include a Link header [RFC5988] where the context URI is the attachment URI, the Link relation is describedby, and the target URI is the URI of the oslc:AttachmentDescriptor.

5.3.4 When servers update an attachment, they **MUST** also update any affected oslc:AttachmentDescriptor properties of the associated attachment descriptor.

5.3.5 When deleting attachments, servers **MUST** also delete any associated oslc:AttachmentDescriptor resources.

5.4 Attachment Containers

5.4.1 Each oslc:AttachmentContainer **MUST** be a conformance Linked Data Platform Container (LDPC).

5.4.2 Clients **MAY** use the HTTP Slug request header [RFC5023] to suggest a name when creating an attachment. If present, the Slug header **SHOULD NOT** include a file extension.

5.4.3 Servers **SHOULD NOT** reject an HTTP POST request to an oslc:AttachmentContainer solely because it does not contain a Slug header.

5.4.4 Servers **SHOULD NOT** reject an an HTTP POST request to an oslc:AttachmentContainer solely because they cannot use the Slug value unchanged. Servers **SHOULD** instead modify the Slug value as needed or assign a different name.

5.4.5 In response to a successful HTTP POST request that creates an attachment with an associated oslc:AttachmentDescriptor, the server **MUST** include an HTTP Link header in the response where the context URI is the newly-created attachment URI, the link relation is describedby, and the link target is the oslc:AttachmentDescriptor URI.

5.4.6 Clients **MAY** specify an LDP-NR interaction model when POSTing RDF content to an oslc:AttachmentContainer by including an HTTP Link header where the target URI is http://www.w3.org/ns/ldp#NonRDFSource and the link relation is type. In this case, Servers **MUST** honor the client's requested interaction model and treat the resource as an LDP-NR.

5.4.7 Servers **MUST** reject an HTTP DELETE request to an oslc:AttachmentContainer.

5.5 Attachment Descriptors

5.5.1 Servers **MAY** create an associated oslc:AttachmentDescriptor to describe properties of the attachment such as its name, media type, and size.

5.5.2 An oslc:AttachmentDescriptor **MUST** have an explicit rdf:type Set to http://open-services.net/ns/core#AttachmentDescriptor in its RDF representations. It **MAY** have additional rdf:type values.

5.5.3 An oslc:AttachmentDescriptor **MUST** be a conforming Linked Data Platform RDF Source (LDPR).

5.5.4 The dcterms:title of the oslc:AttachmentDescriptor **SHOULD** be the value of the client-supplied HTTP Slug header.

5.5.5 Servers **SHOULD** use the Content-Type header value from an attachment creation request to determine the dcterms:format property value in the newly-created attachment's oslc:AttachmentDescriptor. The dcterms:format value **SHOULD** be a PURL media-type resource.

5.5.6 An oslc:AttachmentDescriptor **MUST** conform to the shape defined in 6.1 Resource: AttachmentDescriptor.

6. Resource Constraints

6.1 Resource: AttachmentDescriptor

This document applies the following constraints to the [OSLCCoreVocab] vocabulary terms.

The oslc:AttachmentDescriptor resource type is used to describe the binary resource (or non-RDF Resource) associated with a particular resource. When a client POSTs an attachment content to a server, the server stores the attachment content and assigns a URI just like any other type of resource creation but it may also create an oslc:AttachmentDescriptor resource to contain data about the attachment.
There is no restriction on the content of each attachment resource. For example, it could be a photo of a kitten, an installation manual, a log file, or a source code patch. Since the attachment cannot be expected to contain additional client or server supplied data, a typical set of properties for each attachment is included with the oslc:AttachmentDescriptor resource itself. Thus, the object of each oslc:attachment statement is the binary attachment. Issuing an HTTP HEAD or GET operation on that binary attachment resource URL should produce an HTTP response with a header value of Link: rel='describedBy' to indicate the URL of the oslc:AttachmentDescriptor resource. The properties for the oslc:AttachmentDescriptor resource are indicated in the table below.

- **Name:** core#AttachmentDescriptor
- **URI:** http://open-services.net/ns/core#AttachmentDescriptor
- **Summary:** LDP-RS to contain data about a LDP-NR(Attachment)

### core#AttachmentDescriptor Properties

<table>
<thead>
<tr>
<th>Prefixed Name</th>
<th>Occurs</th>
<th>Read-only</th>
<th>Value-type</th>
<th>Representation</th>
<th>Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dcterms:created</td>
<td>Zero-or-one</td>
<td>true</td>
<td>dateTime</td>
<td>N/A</td>
<td>Unspecified</td>
<td>Timestamp of attachment creation.</td>
</tr>
<tr>
<td>dcterms:creator</td>
<td>Zero-or-many</td>
<td>true</td>
<td>AnyResource</td>
<td>Either</td>
<td>Unspecified</td>
<td>Creator or creators of the attachment. Likely a foaf:Person, but not necessarily so.</td>
</tr>
<tr>
<td>dcterms:description</td>
<td>Zero-or-one</td>
<td>false</td>
<td>XMLLiteral</td>
<td>N/A</td>
<td>Unspecified</td>
<td>Descriptive text about the attachment.</td>
</tr>
<tr>
<td>dcterms:format</td>
<td>Zero-or-one</td>
<td>true</td>
<td>string</td>
<td>N/A</td>
<td>Unspecified</td>
<td>MIME type of the attachment content. <em><strong>SHOULD</strong></em> be a PURL media-type resource.</td>
</tr>
<tr>
<td>dcterms:identifier</td>
<td>Zero-or-one</td>
<td>true</td>
<td>string</td>
<td>N/A</td>
<td>Unspecified</td>
<td>System-assigned identifier.</td>
</tr>
<tr>
<td>dcterms:title</td>
<td>Zero-or-one</td>
<td>false</td>
<td>string</td>
<td>N/A</td>
<td>Unspecified</td>
<td>Client-specified file name or title.</td>
</tr>
<tr>
<td>oslc:attachmentSize</td>
<td>Zero-or-one</td>
<td>true</td>
<td>integer</td>
<td>N/A</td>
<td>Unspecified</td>
<td>Size in bytes of the attachment content.</td>
</tr>
</tbody>
</table>

### Appendix A. Change History

*This section is non-normative.*

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Editor</th>
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<td>07/06/2016</td>
<td>Jim Amsden</td>
<td>CSD was approved and published.</td>
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