OSLC Resource Shape: A Linked Data Constraint Language

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Topics

- About OSLC
- Resource Shape
- Use cases
- Vocabulary
- SPARQL semantics
Open Services for Lifecycle Collaboration

• “An open community building practical specifications for integrating software”
  – Change Management, Quality Management, Requirements Management, ...

• REST APIs based on Linked Data principles

• Ongoing development transitioning to:
  – W3C (Linked Data Platform)
  – OASIS
Resource Shape

• Is a high-level, declarative, programmer-friendly description of the expected contents of an RDF graph
  – RDF terms that appear in a graph typically come from many vocabularies
• Defines constraints on RDF graphs
  – unlike RDFS or OWL which define inference rules
• Does not claim to be a complete RDF constraint language
  – Covers commonly occurring cases
Use cases

• REST APIs
  – Machine-readable constraints on the RDF contained in HTTP request and response bodies
  – Suitable for programmatic validation

• Metadata for tools
  – Query builders
  – Form builders

• Documentation for humans
  – Specifications
  – Online help
Specification example

OSLC Change Management 2.0 Appendix B: Resource Shapes

An appendix of the OSLC Change Management 2.0 Specification

Overview

This defines the definitions of the OSLC CM 2.0 defined resources utilizing the OSLC Core Shape Resource definition. Implementations may use these shapes to as a basis for their work, providing their own property additions and additional constraints on OSLC defined properties.

ChangeRequest

```xml
<rdf:RDF
   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:dc="http://purl.org/dc/elements/1.1/"
   xmlns:foaf="http://xmlns.com/foaf/0.1/"
   xmlns:oslc="http://open-services.net/ns/oslc#"
   xmlns:oslc_cm="http://open-services.net/ns/oslc#">

  <oslc:ResourceShape
    rdf:about="http://example.com/oslc/shapes/ChangeRequest">

    <dc:title>CM V1 Change Request</dc:title>
    <oslc:describes rdf:resource="http://open-services.net/ns/oslc#ChangeRequest" />
    <oslc:via rdf:resource="http://open-services.net/ns/oslc#ResourceShape" />

</oslc:ResourceShape>
```
### Resource ChangeRequest

The Change Request resource is a single definition used to define many kinds of change requests such as defect, enhancement, task, bug, activity, etc. There are a fair number of common properties between these different kinds of change requests and can use some of the properties in the following definition to identify them.

The Change Request resource properties are not limited to the ones defined in this specification, service providers may provide additional properties. It is recommended that any additional properties exist in their own unique namespace and not use the namespaces defined in these specifications.

- **Name**: ChangeRequest
- **Type URI**: http://open-services.net/ns/cm#ChangeRequest

<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>oslc.shortTitle</td>
<td>zero-or-one</td>
<td>unspecified</td>
<td>XMLLiteral</td>
<td>n/a</td>
<td>n/a</td>
<td>Short name identifying a resource, often used as an abbreviated identifier for presentation to end-users. SHOULD include only content that is valid inside an XHTML &lt;span&gt; element.</td>
</tr>
<tr>
<td>dcterms.description</td>
<td>zero-or-one</td>
<td>unspecified</td>
<td>XMLLiteral</td>
<td>n/a</td>
<td>n/a</td>
<td>Descriptive text (reference: Dublin Core) about resource represented as rich text in XHTML content. SHOULD include only content that is valid and suitable inside an XHTML &lt;div&gt; element.</td>
</tr>
<tr>
<td>dcterms.title</td>
<td>exactly-one</td>
<td>unspecified</td>
<td>XMLLiteral</td>
<td>n/a</td>
<td>n/a</td>
<td>Title (reference: Dublin Core) or a single line summary of the resource represented as rich text in XHTML content. SHOULD include only content that is valid and suitable inside an XHTML &lt;div&gt; element.</td>
</tr>
<tr>
<td>dcterms.identifier</td>
<td>exactly-one</td>
<td>True</td>
<td>String</td>
<td>n/a</td>
<td>n/a</td>
<td>A unique identifier for a resource. Assigned by the service provider when a resource is created. Not intended for end-user display.</td>
</tr>
</tbody>
</table>
Vocabulary

• Defined by **OSLC Core V2.0**
Vocabulary

- RDF terms are defined in Appendix A
Example

@prefix dcterms: <http://purl.org/dc/terms/> .
@prefix oslc: <http://open-services.net/ns/core#> .
@prefix oslc_cm: <http://open-services.net/ns/cm#> .

@base <http://example.com/shape/oslc-change-request> .

<> a oslc:ResourceShape ;
   dcterms:title "Creation shape of OSLC Change Request" ;
   oslc:describes oslc_cm:ChangeRequest ;
   oslc:property <#dcterms-title>, <#oslc_cm-status> .

<#dcterms-title> a oslc:Property ;
   oslc:propertyDefinition dcterms:title ;
   oslc:occurs oslc:Exactly-one .

<#oslc_cm-status> a oslc:Property ;
   oslc:propertyDefinition oslc_cm:status ;
   oslc:occurs oslc:Zero-or-one .
## Value-type: Property

A Property resource describes one allowed or required property of a resource.

- **Resource**: `oslc:Property`
- **Namespace URI**: `http://open-services.net/ns/core#`
- **Suggested Namespace Prefix**: `oslc`

<table>
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<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>dotsr:location</td>
<td>zero-or-one</td>
<td>True</td>
<td>XMLLiteral</td>
<td>n/a</td>
<td>n/a</td>
<td>Description of the property. <strong>SHOULD</strong> include only content that is valid and suitable inside an XHTML <code>&lt;div&gt;</code> element.</td>
</tr>
<tr>
<td>dotsr:location</td>
<td>zero-or-one</td>
<td>True</td>
<td>XMLLiteral</td>
<td>n/a</td>
<td>n/a</td>
<td>Title of the property. <strong>SHOULD</strong> include only content that is valid and suitable inside an XHTML <code>&lt;span&gt;</code> element.</td>
</tr>
<tr>
<td>oslc:allowedValues</td>
<td>zero-or-one</td>
<td>True</td>
<td>Reference</td>
<td>Reference</td>
<td>oslc:AllowedValues</td>
<td>Resource with allowed values for the property being defined.</td>
</tr>
<tr>
<td>oslc:allowedValue</td>
<td>zero-or-many</td>
<td>True</td>
<td>Same value-type as the property being defined</td>
<td>n/a</td>
<td>n/a</td>
<td>A value allowed for property, included into property definition. If there are both oslc:allowedValue elements and an oslc:allowedValue resource, then the full-set of allowed values is the union of both.</td>
</tr>
<tr>
<td>oslc:defaultValue</td>
<td>zero-or-one</td>
<td>True</td>
<td>Same as</td>
<td>n/a</td>
<td>n/a</td>
<td>A default value for the property.</td>
</tr>
<tr>
<td>oslc:maxSize</td>
<td>zero-or-one</td>
<td>True</td>
<td>Integer</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
<td>----------</td>
<td>---------</td>
<td>-----</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td>oslc:occurs</td>
<td>exactly-one</td>
<td>True</td>
<td>Resource</td>
<td>Reference</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>oslc:propertyDefinition</td>
<td>exactly-one</td>
<td>True</td>
<td>Resource</td>
<td>Reference</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>oslc:range</td>
<td>zero-or-many</td>
<td>True</td>
<td>Resource</td>
<td>Reference</td>
<td>n/a</td>
<td></td>
</tr>
</tbody>
</table>

For String properties only, specifies maximum characters allowed. If not set, then there is no maximum or maximum is specified elsewhere.

**oslc:occurs**

- **exactly-one**: True
- **Resource**: Reference

**oslc:propertyDefinition**

- **exactly-one**: True
- **Resource**: Reference

**oslc:range**

- **zero-or-many**: True
- **Resource**: Reference

For properties with a resource value-type. Providers MAY also specify the range of possible resource types allowed, each specified by URI. The default range is [http://open-services.net/ns/core#One-or-many](http://open-services.net/ns/core#One-or-many) (property is required). For String properties only, specifies maximum characters allowed. If not set, then there is no maximum or maximum is specified elsewhere.
<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
<th>Data Type</th>
<th>Reference</th>
<th>Value Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>example 1</td>
<td>This is a description of example 1</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>example 2</td>
<td>This is a description of example 2</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
SPARQL semantics

• It is natural to define the semantics of Resource Shape constraints using SPARQL ASK
  – Assertions should return TRUE
  – Exceptions should return FALSE
  – If a constraint is violated, it is also useful to have a SPARQL query that returns the reason

• Some constraints implicitly refer to other graphs
  – Operation post-conditions refer to the “after” graph
  – Range constraints may refer to remote resources, e.g. asserting their type
SPARQL assertion for:
olsc:occurs oslc:Zero-or-one

prefix oslc_cm: <http://open-services.net/ns/cm#>

ASK
{
    {
        {
            select ?resource
            where {
                ?resource a oslc_cm:ChangeRequest.
                ?resource oslc_cm:status ?status
            }
            group by ?resource
            having (count(?status) <= 1)
        }
    }
}
SPARQL exception for:
olsc:occurs oslc:Exactly-one

prefix oslc_cm: <http://open-services.net/ns/cm#>

ASK
{
    ?resource a oslc_cm:ChangeRequest.
    FILTER (?status1 != ?status2)
}
Summary

• OSLC Resource Shape is a high-level RDF vocabulary for describing commonly occurring constraints on RDF graphs
  – NOT a full constraint language
• Motivated by REST API documentation and tool metadata use cases (query, creation)
• Expressible as SPARQL Ask queries
• In production use at OSLC