GWD-R
OCCI-WG

Ralf Nyrén
Florian Feldhaus, GWDG
February 25, 2011
Updated: May 8, 2012

Open Cloud Computing Interface - JSON Rendering

Status of this Document

This document provides information to the community regarding the specification of the Open Cloud Computing Interface. Distribution is unlimited.

Abstract

This document, part of a document series, produced by the OCCI working group within the Open Grid Forum (OGF), provides a high-level definition of a Protocol and API. The document is based upon previously gathered requirements and focuses on the scope of important capabilities required to support modern service offerings.

Comments

Contents

1 Introduction

2 Notational Conventions

All these parts and the information within are mandatory for implementors (unless otherwise specified). The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [1].

3 OCCI JSON Rendering

TBD: intro, JSON Rendering is RESTful, can happily co-exist with the existing HTTP Rendering, etc

4 Namespace

The JSON Rendering provides a represenation of the OCCI Core model into the URL hierarchy by binding Kind and Mixin instances to unique URL paths. Such an URL path is called the *location* of the Kind or Mixin. A provider is free to choose the *location* as long as it is unique within the service provider's URL namespace. For example, the Kind instance[1] for the Compute type may be bound to `/my/occi/api/compute/`.

A Kind instance whose associated type cannot be instantiated MUST NOT be bound to an URL path. This applies to the Kind instance for OCCI Entity.

4.1 Bound and unbound paths

Since a limited set of URL paths are bound to Kind and Mixin instances the URL hierarchy consists of both *bound* and *unbound* paths. A bound URL path is the *location* of a Kind or Mixin collection.

An unbound URL path MAY represent the union of all Kind and Mixin collection "below" the unbound path. RN: FIXME: Should this be a MUST instead?

5 JSON format

The OCCI JSON Rendering constists of a JSON object holding information on the OCCI core objects kind, mixin, action, link and resource.

The following media-type has been assigned to the OCCI JSON Rendering:

`application/occi+json`

5.1 Resource instance format

A *resource instance* is a sub-type of OCCI Entity which has been instantiated. OCCI Resource and OCCI Link are the top-most sub-types of OCCI Entity. OCCI Entity itself cannot be instantiated.

The resource instance format consists of a JSON object as shown in the following example. Table 1 defines the object members.

[1] `http://schemas.ogf.org/occi/infrastructure#compute`

```
{
    "resources": [
        {
            "kind": "http: //schemas.ogf.org/occi/infrastructure#compute",
            "mixins": [
                "http: //schemas.opennebula.org/occi/infrastructure#my_mixin",
                "http: //schemas.other.org/occi#my_mixin"
            ],
            "attributes": {
                "occi": {
                    "core": {
                        "id": "996ad860-2a9a-504f-8861-aeafd0b2ae29",
                        "summary": "This is a summary"
                    },
                    "compute": {
                        "speed": 2,
                        "memory": 4,
                        "cores": 2
                    }
                },
                "org": {
                    "other": {
                        "occi": {
                            "my_mixin": {
                                "my_attribute": "my_value"
                            }
                        }
                    }
                }
            },
            "actions": [
                {
                    "title": "Start My Server",
                    "href": "/compute/996ad860-2a9a-504f-8861-aeafd0b2ae29?action=start",
                    "category": "http://schemas.ogf.org/occi/infrastructure/compute/action#start"
                }
            ],
    "links": [
        {
            "target": "http://myservice.tld/storage/59e06cf8-f390-5093-af2e-3685be593a25",
            "kind": "http://schemas.ogf.org/occi/infrastructure#storagelink",
            "attributes": {
                "occi": {
                    "core": {
                         "id": 391ada15-580c-5baa-b16f-eeb35d9b1122,
                     "title": "My disk"
                     },
                    "storagelink": {
                        "deviceid": "ide:0:1"
                    }
                }
            }
        }
    ]
        }
    ]
```

}

Table 1. Resource instances are rendered using the `application/occi+json` format which consists of a JSON object with name *resources* containing an array of JSON objects with the following entries.

Object member	JSON type	Description	Necessity
kind	string	Kind identifier	Mandatory
mixins	array of URIs	List of Mixin identifiers	Mandatory if resource has mixins
attributes	object	Instance attributes	Mandatory if resource has attributes
actions	array of objects	Actions applicable to the resource instance as defined in **??**	Mandatory if resource has applicable actions
links	array of objects	Associated OCCI Links as defined in 2	Mandatory if resource has links

5.2 Link instance format

The link instance format consists of a JSON object as shown in the following example. Table 2 defines the object members.

```
{
    "links": [
        {
            "kind": "http://schemas.ogf.org/occi/infrastructure#networkinterface",
            "mixins": [
                "http://schemas.ogf.org/occi/infrastructure/networkinterface#ipnetworkinterface"
            ],
            "attributes": {
                "occi": {
                    "core": {
                        "id": "22fe83ae-a20f-54fc-b436-cec85c94c5e8",
                    "title": "My network interface"
                        },
                        "infrastructure": {
                            "networkinterface": {
                                "interface": "eth0",
                                "mac": "00:80:41:ae:fd:7e",
                                "address": "192.168.0.100",
                                "gateway": "192.168.0.1",
                                "allocation": "dynamic"
                            }
                        }
                    }
            },
            "actions": [
                {
                    "title": "Disable networkinterface",
                    "href": "/networkinterface/22fe83ae-a20f-54fc-b436-cec85c94c5e8?action=up",
                    "category": "http: //schemas.ogf.org/occi/infrastructure/networkinterface/action
                }
            ],
            "target": "http://myservice.tld/network/b7d55bf4-7057-5113-85c8-141871bf7635",
            "source": "http://myservice.tld/compute/996ad860-2a9a-504f-8861-aeafd0b2ae29"
        }
```

```
    ]
}
```

Table 2. Link instances are rendered using the `application/occi+json` format which consists of a JSON object with name *links* containing an array of JSON objects with the following entries.

Object member	JSON type	Description	Necessity
kind	string	Kind identifier	Mandatory
mixins	array of URIs	List of Mixin identifiers	Mandatory if resource has mixins
attributes	object	Instance attributes	Mandatory if resource has attributes
actions	array of objects	Actions applicable to the resource instance as defined in **??**	Mandatory if resource has applicable actions
target	URI	Location of target resource	Mandatory
source	URI	Location of source resource	Mandatory unless rendered within the source resource

5.3 Kind format

An OCCI kind is used to describe a OCCI entity and cannot itself be instantiated. OCCI kinds can only be queried through the discovery interface of an OCCI server to get a complete description of a specific OCCI entity sub type.

The kind format consists of a JSON object as shown in the following example. Table 3 defines the top-level object members.

Table 3. Kinds are rendered using the `application/occi+json` format which consists of a JSON object with name *kinds* containing an array of JSON objects with the following entries.

Object member	JSON type	Description
term	string	Unique identifier within the categorisation scheme
scheme	string	Categorisation scheme
related	array of URIs	List containing the related "parent" Kind instance
attributes	object	Attribute description, see 6
actions	array of URIs	List of action identifiers
location	string	URL bound to the Kind instance

```
{
    "kinds": [
        {
            "term": "compute",
            "scheme": "http://schemas.ogf.org/occi/infrastructure#",
            "title": "Compute Resource",
            "related": [
                "http://schemas.ogf.org/occi/core#resource"
            ],
            "attributes": {
                "occi": {
                    "compute": {
                        "hostname": {
                            "mutable": true,
                            "required": false,
                            "type": "string",
                            "pattern": "(([a-zA-Z0-9]|[a-zA-Z0-9][a-zA-Z0-9\\-]*[a-zA-Z0-9])\\.)*"
```

```
                        },
                        "state": {
                            "mutable": false,
                            "required": false,
                            "type": "string",
                            "pattern": "inactive|active|suspended|failed",
                            "default": "inactive"
                        }
                    }
                }
            },
            "actions": [
                "http://schemas.ogf.org/occi/infrastructure/compute/action#start",
                "http://schemas.ogf.org/occi/infrastructure/compute/action#stop",
                "http://schemas.ogf.org/occi/infrastructure/compute/action#restart",
                "http://schemas.ogf.org/occi/infrastructure/compute/action#suspend"
            ],
            "location": "/compute/"
        }
    ]
}
```

5.4 Mixin format

An OCCI mixin can be used to extend the description of OCCI entities and cannot itself be instantiated. OCCI mixins can be queried through the discovery interface of an OCCI server and also be created by a user.

The mixin format consists of a JSON object as shown in the following example. Table 5 defines the top-level object members.

Table 4. Mixins are rendered using the `application/occi+json` format which consists of a JSON object with name *mixins* containing an array of JSON objects with the following entries.

Object member	JSON type	Description
term	string	Unique identifier within the categorisation scheme
scheme	string	Categorisation scheme
related	array of URIs	List containing the related "parent" mixin instances
attributes	object	Attribute description, see 6
actions	array of URIs	List of action identifiers
location	string	URL bound to the Mixin instance

```
{
    "mixins": [
        {
            "term": "medium",
            "scheme": "http://example.com/template/resource#",
            "title": "Medium VM",
            "related": [
                "http://schemas.ogf.org/occi/infrastructure#resource_tpl",
                "http://schemas.ogf.org/occi/infrastructure#compute"
            ],
            "attributes": {
                "occi": {
                    "compute": {
                        "speed": {
                            "type": "number",
```

```
                            "default": 2.8
                        }
                    }
                }
            },
            "location": "/template/resource/medium/"
        }
    ]
}
```

5.5 Action format

An OCCI action can be used to trigger specific actions on an OCCI entity and cannot itself be instantiated. OCCI actions can only be queried through the discovery interface of an OCCI server.

The action format consists of a JSON object as shown in the following example. Table 5 defines the top-level object members.

Table 5. Mixins are rendered using the `application/occi+json` format which consists of a JSON object with name *actions* containing an array of JSON objects with the following entries.

Object member	JSON type	Description
term	string	Unique identifier within the categorisation scheme
scheme	string	Categorisation scheme
attributes	object	Attribute description, see 6

```
{
    "actions": [
        {
            "term": "stop",
            "scheme": "http://schemas.ogf.org/occi/infrastructure/compute/action#",
            "title": "Stop Compute instance",
            "attributes": {
                "method": {
                    "mutable": true,
                    "required": false,
                    "type": "string",
                    "pattern": "graceful|acpioff|poweroff",
                    "default": "poweroff"
                }
            }
        }
]
}
```

5.6 Attribute description format

Attribute descriptions of OCCI Categories are rendered as JSON objects. The dots of the attribute names define a hierarchy. This hierarchy is reflected by JSON objects within the higher layer JSON object or within the top level JSON object with name *attributes*. The last part of the attribute name hierarchy includes the properties-object pairs of the attribute as defined in table 6

Table 6. The attribute-properties object has the members defined in this table. All attribute properties are optional and the table shows which property default value an OCCI client MUST assume if a particular property is unspecified.

Object member	JSON type	Description
mutable	boolean	Attribute mutability
required	boolean	Whether the attribute MUST be specified at resource instantiation
type	string	Enum {string, number, boolean}
pattern	string	Posix Extended Regular Expression as defined in [2]. For interoperability reasons, POSIX characte
default	string, number or boolean	Attribute default when not specified by client.

6 Glossary

Term	Description
Action	An OCCI base type. Represent an invocable operation on a Entity sub-type instance or collection thereof.
Category	A type in the OCCI model. The parent type of Kind.
Client	An OCCI client.
Collection	A set of Entity sub-type instances all associated to a particular Kind or Mixin instance.
Entity	An OCCI base type. The parent type of Resource and Link.
Kind	A type in the OCCI model. A core component of the OCCI classification system.
Link	An OCCI base type. A Link instance associate one Resource instance with another.
mixin	An instance of the Mixin type associated with a **resource instance**. The "mixin" concept as used by OCCI *only* applies to instances, never to Entity types.
Mixin	A type in the OCCI model. A core component of the OCCI classification system.
OCCI	Open Cloud Computing Interface.
OCCI base type	One of Entity, Resource, Link or Action.
OGF	Open Grid Forum.
Resource	An OCCI base type. The parent type for all domain-specific resource types.
resource instance	An instance of a sub-type of Entity. The OCCI model defines two sub-types of Entity, the Resource type and the Link type. However, the term *resource instance* is defined to include any instance of a *sub-type* of Resource or Link as well.
Tag	A Mixin instance with no attributes or actions defined.
Template	A Mixin instance which if associated at resource instantiation time pre-populate certain attributes.
type	One of the types defined by the OCCI model. The OCCI model types are Category, Kind, Mixin, Action, Entity, Resource and Link.
concrete type/sub-type	A concrete type/sub-type is a type that can be instantiated.
URI	Uniform Resource Identifier.
URL	Uniform Resource Locator.
URN	Uniform Resource Name.

7 Intellectual Property Statement

The OGF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the OGF Secretariat.

The OGF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this recommendation.

Please address the information to the OGF Executive Director.

8 Disclaimer

This document and the information contained herein is provided on an "As Is" basis and the OGF disclaims all warranties, express or implied, including but not limited to any warranty that the use of the information herein will not infringe any rights or any implied warranties of merchantability or fitness for a particular purpose.

9 Full Copyright Notice

References

[1] S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels," RFC 2119 (Best Current Practice), Internet Engineering Task Force, Mar. 1997. [Online]. Available: http://www.ietf.org/rfc/rfc2119.txt

[2] "Information technology – portable operating system interface (posix) base specifications, issue 7," 2009.