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Open Cloud Computing Interface - JSON Rendering

Status of this Document

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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.

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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. Section 6.1 contains a detailed example. Table 1 defines the object members.

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

```
{
    "resources": [
        {
            "kind": "...",
            "mixins": [ "...", "..." ],
            "attributes": { },
            "actions": [ { }, { } ],
            "id": "...",
            "title": "...",
            "summary": "...",
            "links": [ { }, { } ],
        }
    ]
}
```

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 strings	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 5	Mandatory if resource has applicable actions
id	string	UUID of the resource	Mandatory
title	string	Title of the resource	Optional
summary	string	Summary describing the resource	Optional
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. Section 6.2 contains a detailed example. Table 2 defines the object members.

```
{
    "links": [
        {
            "kind": "...",
            "mixins": [ "...", "..." ],
            "attributes": { },
            "actions": [ { }, { } ],
            "id": "...",
            "title": "...",
            "target": "...",
            "source": "..."
        }
    ]
}
```

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

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 strings	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 5	Mandatory if resource has applicable actions
id	string	UUID of the link	Mandatory
title	string	Title of the link	Optional
target	string	Absolute location of target resource	Mandatory
source	string	Absolute location of source resource	Mandatory unless rendered within the source resource

entity sub type.

The kind format consists of a JSON object as shown in the following example. Section 6.3 contains a detailed 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	Necessity
term	string	Unique identifier within the categorisation scheme	Mandatory
scheme	string	Categorisation scheme	Mandatory
title	string	Title of the kind	Mandatory
attributes	object	Attribute description, see **??**	Mandatory if kind has attributes
related	array of strings	List containing the related "parent" Kind instance	Mandatory if kind is related to another kind
actions	array of strings	List of action identifiers	Mandatory if kind has actions
location	string	Relative URL bound to the Kind instance	Mandatory

```
{
    "kinds": [
        {
            "term": "...",
            "scheme": "...",
            "title": "...",
            "attributes": { },
            "actions": [ "...", "..." ],
            "related": [ "...", "..." ],
            "location": "..."
        }
    ]
}
```

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. Section 6.3 contains a detailed example. Table 4 defines the top-level object members.

```
{
    "mixins": [
```

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	Necessity
term	string	Unique identifier within the categorisation scheme	Mandatory
scheme	string	Categorisation scheme	Mandatory
title	string	Title of the mixin	Mandatory
attributes	object	Attribute description, see **??**	Mandatory if mixin has attributes
related	array of strings	List containing the related "parent" Mixin instance	Mandatory if mixin is related to other mixins
actions	array of strings	List of action identifiers	Mandatory if mixin has actions
location	string	Relative URL bound to the Kind instance	Mandatory

```
        {
            "term": "...",
            "scheme": "...",
            "title": "...",
            "attributes": { },
            "actions": [ "...", "..." ],
            "related": [ "...", "..." ],
            "location": "..."
        }
    ]
}
```

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. Actions 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	Necessity
term	string	Unique identifier within the categorisation scheme	Mandatory
scheme	string	Categorisation scheme	Mandatory
title	string	Title of the mixin	Optional
attributes	object	Attribute description, see **??**	Mandatory if action has attributes

```
{
    "actions": [
        {
            "term": "...",
            "scheme": "...",
            "title": "...",
            "attributes": { }
        }
        ]
}
```

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 **??**

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
mutable	boolean
required	boolean
type	string
pattern	string
minimum	number
maximum	If type is a number, then maximum defines the highest number allowed. If type is a string, then maximum defines the maximal
default	string, number or boolean

```
{
    "attributes": {
        "...": {
            "mutable": true,
            "required": false,
            "type": "string",
            "pattern": ".*",
            "minimum": 1,
            "maximum": 65535,
            "default": null
        }
    }
}
```

6 Detailed examples

6.1 Resource instance format example

```
{
    "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": {
                    "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"
            }
        ],
                "id": "996ad860-2a9a-504f-8861-aeafd0b2ae29",
                "title": "Compute resource",
                "summary": "This is a compute resource",
                "links": [
                    {
                        "target": "http://myservice.tld/storage/59e06cf8-f390-5093-af2e-3685be59
                        "kind": "http://schemas.ogf.org/occi/infrastructure#storagelink",
                        "attributes": {
                            "occi": {
                                "storagelink": {
                                    "deviceid": "ide:0:1"
                                }
                            }
                        },
                        "id": "391ada15-580c-5baa-b16f-eeb35d9b1122",
                        "title": "My disk"
                    }
                ]
    }
  ]
}
```

6.2 Link instance format example

```
{
    "links": [
        {
            "kind": "http://schemas.ogf.org/occi/infrastructure#networkinterface",
            "mixins": [
                "http://schemas.ogf.org/occi/infrastructure/networkinterface#ipnetworkinterface"
            ],
            "attributes": {
                "occi": {
                    "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
                }
            ],
            "id": "22fe83ae-a20f-54fc-b436-cec85c94c5e8",
                    "title": "My network interface",
            "target": "http://myservice.tld/network/b7d55bf4-7057-5113-85c8-141871bf7635",
            "source": "http://myservice.tld/compute/996ad860-2a9a-504f-8861-aeafd0b2ae29"
        }
    ]
}
```

6.3 Kind format example

```
{
    "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])\\.)*",
                            "minimum": "1",
                            "maximum": "255"
                        },
                        "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/"
```

```
        }
    ]
}
```

6.4 Mixin format example

```
{
    "mixins": [
        {
            "term": "medium",
            "scheme": "http://example.com/template/resource#",
            "title": "Medium VM",
            "related": [
                "http://schemas.ogf.org/occi/infrastructure#resource_tpl"
            ],
            "attributes": {
                "occi": {
                    "compute": {
                        "speed": {
                            "type": "number",
                            "default": 2.8
                        }
                    }
                }
            },
            "location": "/template/resource/medium/"
        }
    ]
}
```

6.5 Action format example

```
{
    "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"
                }
            }
        }
    ]
}
```

7 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.

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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.