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# **ooi Documentation**

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<b>1</b>	<b>User documentation</b>	<b>3</b>
1.1	User documentation . . . . .	3
<b>2</b>	<b>Developer documentation</b>	<b>15</b>
2.1	Developer documentation . . . . .	15
<b>3</b>	<b>Indices and tables</b>	<b>17</b>



ooi is an implementation the Open Grid Forum's [Open Cloud Computing Interface \(OCCI\)](#) for [OpenStack](#).



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## User documentation

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### 1.1 User documentation

Please, read the following documentation if you intend to deploy ooi in your infrastructure.

#### 1.1.1 Installation

##### Installation via packages

ooi packages are released through the EGI's [AppDB](#). In the [ooi](#) middleware page you will find the latest production and release candidates, as long as the repositories for the major GNU/Linux distributions.

##### Installation from pip

ooi can be installed via pip from OpenStack Kilo onwards. If you are running Juno, the code will still work, but there are some dependencies that may be in conflict with the existing Python modules in your system, as long as missing dependencies (`oslo.log` is not available in Juno):

```
$ pip install ooi
```

#### 1.1.2 Configuration

##### ooi configuration

ooi needs to be enabled in the OpenStack Compute configuration file. Append `ooi` to your `enabled_apis` option:

```
enabled_apis=ec2,osapi_compute,metadata,ooi
```

Moreover, the following options are available:

- `ooi_listen`: IP address where ooi will listen. Defaults to `0.0.0.0`
- `ooi_listen_port`: Port ooi will bind to. Defaults to `8787`.
- `ooi_workers`: Number of workers to spawn, by default it is set to the number of CPUs in the node.
- `neutron_ooi_endpoint`: Neutron endpoint, configures the network management by using neutron. If this is not set, the system will use nova-network.

## Paste Configuration

### TL;DR.

Add the corresponding Paste configuration according to your OpenStack version from *Pipeline examples* into your Paste configuration file (usually `/etc/nova/api-paste.ini`).

Detailed instructions

First it is needed to add the OCCI filter like this:

```
[filter:occi]
paste.filter_factory = ooi.wsgi:OCCIMiddleware.factory
openstack_version = /v2
```

`openstack_version` can be configured to any of the supported OpenStack API versions, as indicated in Table *Supported OpenStack API versions*. If it is not configured, by default it will take the `/v2.1` value.

Table 1.1: Supported OpenStack API versions

OpenStack API version	openstack_version	reference OpenStack composite section
v2	/v2	[composite:openstack_compute_api_v2]
v2.1	/v2.1	[composite:openstack_compute_api_v21]

The next step is to create a `composite` section for the OCCI interface. It is needed to duplicate the *corresponding OpenStack API “composite”* section, renaming it to `occi_api_v11`. Once duplicated, the `occi` middleware needs to be added just before the last component of the pipeline. So, in the example above where `/v2` has been configured, we need to duplicate the `[composite:openstack_compute_api_v2]` as follows:

```
[composite:occi_api_11]
use = call:nova.api.auth:pipeline_factory
noauth = compute_req_id faultwrap sizelimit noauth ratelimit occi osapi_compute_app_v2
keystone = compute_req_id faultwrap sizelimit occi authtoken keystonecontext ratelimit occi osapi_compute_app_v2
keystone_nolimit = compute_req_id faultwrap sizelimit authtoken keystonecontext occi osapi_compute_app_v2
```

The last step regarding the API configuration is to add it to create the `[composite:ooi]` section:

```
[composite:ooi]
use = call:nova.api.openstack.urlmap:urlmap_factory
/occi1.1: occi_api_11
```

Finally, you need to enable it in the OpenStack nova configuration, so that it is loaded properly. Add `ooi` to the `enabled_apis` option in the configuration file and adapt the port if needed, via the `ooi_listen_port` (by default it listens in the 8787 port). On the other hand, network management by using neutron can be configure via the `neutron_ooi_endpoint` option (if it is not set, the system will use nova-network):

```
enabled_apis=ec2,osapi_compute,metadata,ooi
ooi_listen_port=8787
neutron_ooi_endpoint=http://127.0.0.1:9696/v2.0
```

OpenStack has two components to support network management. On one side, nova-network provides a simple network management which creates, lists, shows information for, and deletes networks. Admin permissions are required to create and delete networks. On the other side, the neutron component allows to manage and configure advanced network features. OOI implements the OCCI interface to simple network management by using either nova-network or neutron. `neutron_ooi_endpoint` configures the neutron endpoint. It is an optional parameter that configures the network management by using neutron. If this is not set, the system will use nova-network.

If everything is OK, after rebooting the `nova-api` service you should be able to access your OCCI endpoint at:



```
$ nova credentials
# Grab the token
$ export KID=<token>
$ curl -H "x-auth-token: $KID" http://localhost:8787/occi1.1/-/
```

### 1.1.3 Usage documentation

#### Discovery

In order to discover the available resources in the system, OOI provides a view of the relevant resources for its usage:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/-/
```

It will show the OCCI and OpenStack resources related to OOI.

#### Compute

It allows to create, list, show and delete VMs.

#### List compute

It lists VMs:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/compute
```

It returns a HTTP 200 with output:

```
X-OCCI-Location: http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624
X-OCCI-Location: http://127.0.0.23:8787/occi1.1/compute/0ce5df96-7e61-4a8e-b821-9ebb88e77e07
```

#### Show compute

It shows details of a VM:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624
```

It returns a HTTP 200 with output:

```
Category: compute; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind"; title="compute"
Category: 5f4311da-2ee2-47a6-913b-5d8496486c62; scheme="http://schemas.openstack.org/template/os#"; class="os"; title="OS"
Category: 42; scheme="http://schemas.openstack.org/template/resource#"; class="mixin"; title="Flavor"
X-OCCI-Attribute: occi.core.title="vm_assig_2"
X-OCCI-Attribute: occi.compute.state="inactive"
X-OCCI-Attribute: occi.compute.memory=64
X-OCCI-Attribute: occi.compute.cores=1
X-OCCI-Attribute: occi.compute.hostname="vm_assig_2"
X-OCCI-Attribute: occi.core.id="703910d7-97f7-4e3e-9243-30830591f624"
Link: <http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624?action=start>; rel="start"
Link: <http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624?action=stop>; rel="stop"
Link: <http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624?action=restart>; rel="restart"
Link: <http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624?action=suspend>; rel="suspend"
Link: <http://127.0.0.23:8787/occi1.1/networklink/703910d7-97f7-4e3e-9243-30830591f624_cd48b7dd-9ac8-4e3e-9243-30830591f624>; rel="http://schemas.ogf.org/occi/infrastructure#network";
```

```
self="http://127.0.0.23:8787/occi1.1/networklink/703910d7-97f7-4e3e-9243-30830591f624_cd48b7dd-9ac8-44fc-aec0-5ea679941ced";
occi.networkinterface.mac="fa:16:3e:20:14:f2"; occi.networkinterface.interface="eth0"; occi.networkinterface.allocation="dynamic";
occi.networkinterface.address="12.0.0.87";
occi.core.source="http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624";
occi.core.target="http://127.0.0.23:8787/occi1.1/network/cd48b7dd-9ac8-44fc-aec0-5ea679941ced";
occi.core.id="703910d7-97f7-4e3e-9243-30830591f624_cd48b7dd-9ac8-44fc-aec0-5ea679941ced_12.0.0.87";
Link: <http://127.0.0.23:8787/occi1.1/networklink/703910d7-97f7-4e3e-9243-30830591f624_PUBLIC_11.0.0.44>;
rel="http://schemas.ogf.org/occi/infrastructure#network"; self="http://127.0.0.23:8787/occi1.1/networklink/703910d7-97f7-4e3e-9243-30830591f624_f551d92d-1992-4625-91ff-5e48d96d03c9";
occi.networkinterface.mac="fa:16:3e:20:14:f2"; occi.networkinterface.interface="eth0"; occi.networkinterface.allocation="dynamic";
occi.networkinterface.address="11.0.0.44"; occi.core.source="http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624";
occi.core.target="http://127.0.0.23:8787/occi1.1/network/PUBLIC"; occi.core.id="703910d7-97f7-4e3e-9243-30830591f624_f551d92d-1992-4625-91ff-5e48d96d03c9";
Link: <http://127.0.0.23:8787/occi1.1/storagelink/703910d7-97f7-4e3e-9243-30830591f624_f551d92d-1992-4625-91ff-5e48d96d03c9>;
rel="http://schemas.ogf.org/occi/infrastructure#storage";
self="https://127.0.0.23:8787/occi1.1/storagelink/703910d7-97f7-4e3e-9243-30830591f624_f551d92d-1992-4625-91ff-5e48d96d03c9";
occi.storagelink.deviceid="/dev/xvdb"; occi.core.source="https://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-30830591f624";
occi.core.target="https://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9";
occi.core.id="703910d7-97f7-4e3e-9243-30830591f624_f551d92d-1992-4625-91ff-5e48d96d03c9"
```

## Create compute

It creates a VM using the default resources, including links to storage and private networks:

```
curl -X POST http://127.0.0.23:8787/occi1.1/compute/ \
-H 'X-Auth-Token: '$SOS_TOKEN \
-H 'Category: compute; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind", \
5f4311da-2ee2-47a6-913b-5d8496486c62; scheme="http://schemas.openstack.org/template/os#"; class="os"; \
2; scheme="http://schemas.openstack.org/template/resource#"; class="mixin" \
-H 'Content-Type: text/occi' -H 'X-OCCT-Attribute: occi.core.title="OOI_VM_1"'
```

Also we can specify the network to be linked:

```
curl -X POST http://127.0.0.23:8787/occi1.1/compute/ \
-H 'X-Auth-Token: '$SOS_TOKEN \
-H 'Category: compute; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind", \
5f4311da-2ee2-47a6-913b-5d8496486c62; scheme="http://schemas.openstack.org/template/os#"; class="os"; \
2; scheme="http://schemas.openstack.org/template/resource#"; class="mixin" \
-H 'Link: </bar>; rel="http://schemas.ogf.org/occi/infrastructure#network"; \
occi.core.target="http://127.0.0.23:8787/occi1.1/network/f8186fda-a389-468b-9c13-24b8eda65d7f"; \
-H 'Content-Type: text/occi' -H 'X-OCCT-Attribute: occi.core.title="OOI_VM_1"'
```

Links to storage can be also specified:

```
curl -X POST http://127.0.0.23:8787/occi1.1/compute/ \
-H 'X-Auth-Token: '$SOS_TOKEN \
-H 'Category: compute; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind", \
5f4311da-2ee2-47a6-913b-5d8496486c62; scheme="http://schemas.openstack.org/template/os#"; class="os"; \
2; scheme="http://schemas.openstack.org/template/resource#"; class="mixin" \
-H 'Link: </bar>; rel="http://schemas.ogf.org/occi/infrastructure#storage"; \
occi.core.target="http://127.0.0.23:8787/occi1.1/storage/567ed104-3ddf-11e6-ad65-00219702a0b8"; \
-H 'Content-Type: text/occi' -H 'X-OCCT-Attribute: occi.core.title="OOI_VM_1"'
```

It returns a HTTP 201 with output:

```
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/compute/4a7dc666-33d2-495e-93fe-ccd224c98c11
```

## Delete compute

It deletes a VM, including all the links associated to it:

```
curl -X DELETE -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e
```

It returns a 204 empty response.

## Storage

Storage management provides list, show, create and deletion of volumes to a specific tenant.

### List storage

It lists volumes:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/storage
```

It returns a HTTP 200 with output:

```
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/storage/91bb7532-3ddb-11e6-9770-00219702a0b8
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/storage/a10abe94-3ddb-11e6-bc5d-00219702a0b8
```

### Show storage

It shows details of a volume:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9
```

It returns a HTTP 200 with output:

```
Category: storage; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind"; title="compute
X-OCCT-Attribute: occi.storage.state="online"
X-OCCT-Attribute: occi.core.id="f551d92d-1992-4625-91ff-5e48d96d03c9"
X-OCCT-Attribute: occi.storage.size=1
X-OCCT-Attribute: occi.core.title="vol1"
Link: <http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9?action=online>; re
Link: <http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9?action=offline>; r
Link: <http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9?action=backup>; re
Link: <http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9?action=snapshot>;
Link: <http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9?action=resize>; re
```

### Delete storage

It deletes a volume, including all the links associated to it:

```
curl -X DELETE -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9
```

It returns a 204 empty response.

## Storage Link

OOI allows to link virtual machines to existing volumes.

### List storage links

It lists links between VMs and volumes:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/storagelink
```

It returns a HTTP 200 with output:

```
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/storagelink/8a97b403-3ec6-4002-988b-1f34dd836eff_f551d92d-1992-4625-91ff-5e48d96d03c9
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/storagelink/e9bf4dle-3dde-11e6-8479-00219702a0b8_f382
```

### Show storage link

It shows the storage attachemet featuresr:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/storagelink/8a97b403-3ec6-4002-988b-
```

It returns a HTTP 200 with output:

```
Category: storagelink; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind"; title="storagelink"
X-OCCT-Attribute: occi.storagelink.deviceid="/dev/xvdb"
X-OCCT-Attribute: occi.core.source="http://127.0.0.23:8787/occi1.1/compute/8a97b403-3ec6-4002-988b-1f34dd836eff_f551d92d-1992-4625-91ff-5e48d96d03c9"
X-OCCT-Attribute: occi.core.target="http://127.0.0.23:8787/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9"
X-OCCT-Attribute: occi.core.id="8a97b403-3ec6-4002-988b-1f34dd836eff_f551d92d-1992-4625-91ff-5e48d96d03c9"
```

### Create storage link

It allows you to attach volumes to VMs:

```
curl -X POST http://127.0.0.23:8787/occi1.1/storagelink/ \
-H 'X-Auth-Token: '$OS_TOKEN \
-H 'Content-Type: text/occi' \
-H 'Category: storagelink;scheme="http://schemas.ogf.org/occi/infrastructure#";class="kind";' \
-H 'X-OCCT-Attribute: occi.core.target=/occi1.1/storage/f551d92d-1992-4625-91ff-5e48d96d03c9, \
  occi.core.source="/occi1.1/compute/8a97b403-3ec6-4002-988b-1f34dd836eff"
```

It returns a HTTP 200 with output:

```
http://127.0.0.23:8787/occi1.1/storagelink/8a97b403-3ec6-4002-988b-1f34dd836eff_f551d92d-1992-4625-91ff-5e48d96d03c9
```

### Delete storage link

It detaches a volume from VM:

```
curl -X DELETE -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/storagelink/8a97b403-3ec6-
```

It returns a 204 empty response.

## Network

Network management provides list, show, create and deletion of networks to a specific tenant.

## List networks

It lists all networks available for connecting virtual machines:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/network
```

It returns a HTTP 200 with output:

```
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/network/2c9868b4-f71a-45d2-ba8c-dbf42f0b3120
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/network/4213c7ef-68d4-42e8-a3cd-1c5bab3abe6
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/network/PUBLIC
```

## Show network

It shows the network features:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/network/b8a3d813-65da-4910-a80c-f97b
```

It returns a HTTP 200 with output:

```
Category: network; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind"; title="network"
rel="http://schemas.ogf.org/occi/core#resource"; location="http://127.0.0.23:8787/occi1.1/network/"
Category: ipnetwork; scheme="http://schemas.ogf.org/occi/infrastructure/network#"; class="mixin";
title="IP Networking Mixin"
Category: osnetwork; scheme="http://schemas.openstack.org/infrastructure/network#"; class="mixin";
title="openstack network"
X-OCCT-Attribute: occi.network.address="20.0.0.0/24"
X-OCCT-Attribute: occi.network.state="active"
X-OCCT-Attribute: occi.core.title="CommandLineOCCT"
X-OCCT-Attribute: occi.network.gateway="20.0.0.1"
X-OCCT-Attribute: occi.core.id="4a7dc666-33d2-495e-93fe-ccd224c98c11"
Link: <http://127.0.0.23:8787/occi1.1/network/4a7dc666-33d2-495e-93fe-ccd224c98c11?action=up>;
rel="http://schemas.ogf.org/occi/infrastructure/network/action#up"
Link: <http://127.0.0.23:8787/occi1.1/network/4a7dc666-33d2-495e-93fe-ccd224c98c11?action=down>;
rel="http://schemas.ogf.org/occi/infrastructure/network/action#down"
```

## Create network

It creates a network:

```
curl -X POST http://127.0.0.23:8787/occi1.1/network/ \
-H 'X-Auth-Token: '$OS_TOKEN \
-H 'Category: network; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind", \
ipnetwork; scheme="http://schemas.ogf.org/occi/infrastructure/network#"; class="mixin"' \
-H 'Content-Type: text/occi' \
-H 'X-OCCT-Attribute: occi.core.title="OCCT_NET", occi.network.address="15.0.0.0/24"'
```

It returns a HTTP 201 with output:

```
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/network/4a7dc666-33d2-495e-93fe-ccd224c98c11
```

## Delete network

It deletes a network:

```
curl -X DELETE -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/network/cb94496e-7e8e-4cb
```

It returns a 204 empty response.

### Network Link

OOI allows to link virtual machines to private networks, and request for public floating IPs.

#### List network links

It lists links between VMs and networks:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/networklink
```

It returns a HTTP 200 with output:

```
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/networklink/9524a622-5d1a-4c7c-bb83-e0d539e2c69b_PUB
X-OCCT-Location: http://127.0.0.23:8787/occi1.1/networklink/703910d7-97f7-4e3e-9243-30830591f624_cd4
```

#### Show network link

It shows the network link features. It could be with a private or public network. In case of private network:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/networklink/703910d7-97f7-4e3e-9243-
```

It returns a HTTP 200 with output:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/networklink/703910d7-97f7-4e3e-9243-
Category: networkinterface; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind"; \
  title="network link resource"; rel="http://schemas.ogf.org/occi/core#link"; location="http://127.0.
Category: ipnetworkinterface; scheme="http://schemas.ogf.org/occi/infrastructure/networkinterface#";
  class="mixin"; title="IP Network interface Mixin"
X-OCCT-Attribute: occi.networkinterface.mac="fa:16:3e:20:14:f2"
X-OCCT-Attribute: occi.networkinterface.interface="eth0"
X-OCCT-Attribute: occi.networkinterface.state="active"
X-OCCT-Attribute: occi.networkinterface.allocation="dynamic"
X-OCCT-Attribute: occi.networkinterface.address="12.0.0.87"
X-OCCT-Attribute: occi.core.source="http://127.0.0.23:8787/occi1.1/compute/703910d7-97f7-4e3e-9243-3
X-OCCT-Attribute: occi.core.target="http://127.0.0.23:8787/occi1.1/network/cd48b7dd-9ac8-44fc-aec0-5e
X-OCCT-Attribute: occi.core.id="703910d7-97f7-4e3e-9243-30830591f624_cd48b7dd-9ac8-44fc-aec0-5ea6799
```

In case of public network:

```
curl -H "X-Auth-token: "$OS_TOKEN http://127.0.0.23:8787/occi1.1/networklink/4f11383c-b104-40d4-a17c-
```

It returns a HTTP 200 with output:

```
Category: networkinterface; scheme="http://schemas.ogf.org/occi/infrastructure#"; class="kind";
  title="network link resource"; rel="http://schemas.ogf.org/occi/core#link";
  location="http://127.0.0.23:8787/occi1.1/networklink/"
Category: ipnetworkinterface; scheme="http://schemas.ogf.org/occi/infrastructure/networkinterface#";
X-OCCT-Attribute: occi.networkinterface.mac="fa:16:3e:81:52:b9"
X-OCCT-Attribute: occi.networkinterface.interface="eth0"
X-OCCT-Attribute: occi.networkinterface.state="active"
X-OCCT-Attribute: occi.networkinterface.allocation="dynamic"
X-OCCT-Attribute: occi.networkinterface.address="20.0.0.5"
```



```
keystone = compute_req_id faultwrap sizelimit authtoken keystonecontext ratelimit occi osapi_compute_
keystone_nolimit = compute_req_id faultwrap sizelimit authtoken keystonecontext occi osapi_compute_ap
```

## Kilo (2015.1)

```
[composite:ooi]
use = call:nova.api.openstack.urlmap:urlmap_factory
/occi1.1: occi_api_11

[filter:occi]
paste.filter_factory = ooi.wsgi:OCCIMiddleware.factory
openstack_version = /v2.1

[composite:occi_api_11]
use = call:nova.api.auth:pipeline_factory_v21
noauth = compute_req_id faultwrap sizelimit noauth occi osapi_compute_app_v21
noauth2 = compute_req_id faultwrap sizelimit noauth2 occi osapi_compute_app_v21
keystone = compute_req_id faultwrap sizelimit authtoken keystonecontext occi osapi_compute_app_v21
```

## Juno (2014.2)

```
[composite:ooi]
use = call:nova.api.openstack.urlmap:urlmap_factory
/occi1.1: occi_api_11

[filter:occi]
paste.filter_factory = ooi.wsgi:OCCIMiddleware.factory
openstack_version = /v2.0

[composite:occi_api_11]
[composite:openstack_compute_api_v2]
use = call:nova.api.auth:pipeline_factory
noauth = compute_req_id faultwrap sizelimit noauth ratelimit occi osapi_compute_app_v2
keystone = compute_req_id faultwrap sizelimit authtoken keystonecontext ratelimit occi osapi_compute_
keystone_nolimit = compute_req_id faultwrap sizelimit authtoken keystonecontext occi osapi_compute_ap
```

## Kilo (2015.1)

```
[composite:ooi]
use = call:nova.api.openstack.urlmap:urlmap_factory
/occi1.1: occi_api_11

[filter:occi]
paste.filter_factory = ooi.wsgi:OCCIMiddleware.factory
openstack_version = /v2.1

[composite:occi_api_11]
use = call:nova.api.auth:pipeline_factory_v21
noauth = compute_req_id faultwrap sizelimit noauth occi osapi_compute_app_v21
noauth2 = compute_req_id faultwrap sizelimit noauth2 occi osapi_compute_app_v21
keystone = compute_req_id faultwrap sizelimit authtoken keystonecontext occi osapi_compute_app_v21
```



**Liberty (2015.2)**

```
[composite:ooi]
use = call:nova.api.openstack.urlmap:urlmap_factory
/occi1.1: occi_api_11

[filter:occi]
paste.filter_factory = ooi.wsgi:OCCIMiddleware.factory
openstack_version = /v2.1

[composite:occi_api_11]
use = call:nova.api.auth:pipeline_factory_v21
noauth2 = compute_req_id faultwrap sizelimit noauth2 occi osapi_compute_app_v21
keystone = compute_req_id faultwrap sizelimit authtoken keystonecontext occi osapi_compute_app_v21
```



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## Developer documentation

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### 2.1 Developer documentation

#### 2.1.1 ooi's modules



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## Indices and tables

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- `genindex`
- `modindex`
- `search`