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# **Cyborg Documentation**

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**OpenStack Foundation**

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Cyborg is a general management framework for accelerators

## OVERVIEW

### 1.1 Introduction

#### 1.1.1 Background Story

OpenStack Acceleration Discussion Started from Telco Requirements:

- High level requirements first drafted in the standard organization ETSI NFV ISG
- High level requirements transformed into detailed requirements in OPNFV DPACC project.
- New project called Nomad established to address the requirements.
- BoF discussions back in OpenStack Austin Summit.

Transition to Cyborg Project:

- From a long period of conversation and discussion within the OpenStack community, we found that the initial goal of Nomad project to address acceleration management in Telco is too limited. From design summit session in Barcelona Summit, we have developers from Scientific WG help us understanding the need for acceleration management in HPC cloud, and we also had a lot of discussion on the Public Cloud support of accelerated instances.
- We decide to formally establish a project that will work on the management framework for dedicated devices in OpenStack, and there comes the Cyborg Project.

#### 1.1.2 Definition Breakdown

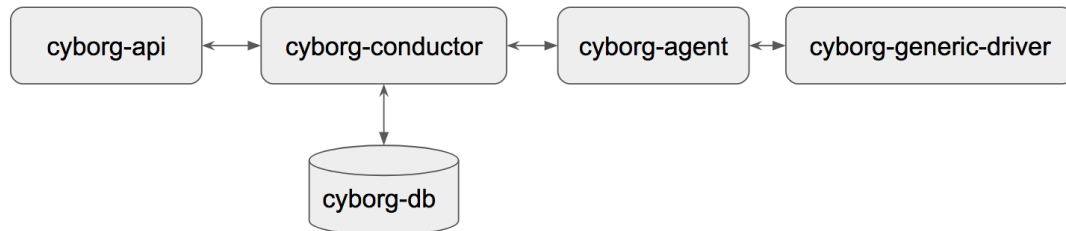
**General Management Framework:** \* Resource Discovery \* Life Cycle Management

**Accelerators:**

- Software: dpdk/spdk, pmem,
- Hardware: FPGA, GPU, ARM SoC, NVMe SSD, CCIX based Caches,

## 1.2 Cyborg architecture

Cyborg design can be described by following diagram:



**cyborg-api** - cyborg-api is a cyborg service that provides **REST API** interface for the Cyborg project. It supports POST/PUT/DELETE/GET operations and interacts with cyborg-agent and cyborg-db via cyborg-conductor.

**cyborg-conductor** - cyborg-conductor is a cyborg service that coordinates interaction, DB access between cyborg-api and cyborg-agent.

**cyborg-agent** - cyborg-agent is a cyborg service that is responsible for interaction with accelerator backends via the Cyborg Driver. For now the only implementation in play is the Cyborg generic Driver. It will also handle the communication with the Nova placement service. Cyborg-Agent will also write to a local cache for local accelerator events.

**cyborg-generic-driver** - cyborg-generic-driver is a general multipurpose driver with the common set of capabilities that any accelerators will have.

## 1.3 Usage

To use cyborg in a project:

```
import cyborg
```

## DOCUMENTATION FOR OPERATORS

The documentation in this section is aimed at Cloud Operators needing to install or configure Cyborg.

### 2.1 Installation

#### 2.1.1 Installation with pip

At the command line:

```
$ pip install openstack-cyborg
```

Or, if you have virtualenvwrapper installed:

```
$ mkvirtualenv cyborg  
$ pip install openstack-cyborg
```

#### Common Configuration

Regardless of the package or code source you must do the following to properly setup the Accelerator Life Cycle Management service. A database, service credentials, and API endpoints must be created.

1. To create the database, complete these steps:

- Use the database access client to connect to the database server as the `root` user:

```
$ mysql -u root -p
```

- Create the `cyborg` database:

```
CREATE DATABASE cyborg;
```

- Grant proper access to the `cyborg` database:

```
GRANT ALL PRIVILEGES ON cyborg.* TO 'cyborg'@'localhost'  
↳ IDENTIFIED BY 'CYBORG_DBPASS';
```

Replace `CYBORG_DBPASS` with a suitable password.

- Exit the database access client.

```
exit;
```

2. Source the admin credentials to gain access to admin-only CLI commands:

```
$ . admin-openrc
```

3. To create the service credentials, complete these steps:

- Create the cyborg user:

```
$ openstack user create --domain default --password-prompt cyborg
```

- Add the admin role to the cyborg user:

```
$ openstack role add --project service --user cyborg admin
```

- Create the cyborg service entities:

```
$ openstack service create --name cyborg --description  
↪ "Acceleration Service" accelerator
```

4. Create the Acceleration service API endpoints:

- If cyborg-api service is deployed using uwsgi, create the following endpoints:

```
$ openstack endpoint create --region RegionOne \  
accelerator public http://<cyborg-ip>/accelerator/v2  
$ openstack endpoint create --region RegionOne \  
accelerator internal http://<cyborg-ip>/accelerator/v2  
$ openstack endpoint create --region RegionOne \  
accelerator admin http://<cyborg-ip>/accelerator/v2
```

- Otherwise, if cyborg-api service is running as a python process, create the following endpoints:

```
$ openstack endpoint create --region RegionOne \  
accelerator public http://<cyborg-ip>:6666/v2  
$ openstack endpoint create --region RegionOne \  
accelerator internal http://<cyborg-ip>:6666/v2  
$ openstack endpoint create --region RegionOne \  
accelerator admin http://<cyborg-ip>:6666/v2
```

---

**Note:** URLs (publicurl, internalurl and adminurl) may be different depending on your environment.

---

## Configure Cyborg

1. Edit `cyborg.conf` with your favorite editor. Below is an example which contains basic settings you likely need to configure.

```
[DEFAULT]
transport_url = rabbit://%RABBITMQ_USER%:%RABBITMQ_PASSWORD%@
↳%OPENSTACK_HOST_IP%:5672/
use_syslog = False
state_path = /var/lib/cyborg
debug = True

...

[api]
host_ip = 0.0.0.0

...

[database]
connection = mysql+pymysql://%DATABASE_USER%:%DATABASE_PASSWORD%@
↳%OPENSTACK_HOST_IP%/cyborg

...

[service_catalog]
cafile = /opt/stack/data/ca-bundle.pem
project_domain_id = default
user_domain_id = default
project_name = service
password = cyborg
username = cyborg
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password

...

[placement]
project_domain_name = Default
project_name = service
user_domain_name = Default
password = password
username = placement
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password
auth_section = keystone_authtoken

...

[nova]
project_domain_name = Default
project_name = service
user_domain_name = Default
password = password
username = nova
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password
```

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```

auth_section = keystone_authtoken

...

[keystone_authtoken]
memcached_servers = localhost:11211
signing_dir = /var/cache/cyborg/api
cafile = /opt/stack/data/ca-bundle.pem
project_domain_name = Default
project_name = service
user_domain_name = Default
password = cyborg
username = cyborg
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password

```

2. Create database tables for Cyborg.

```
cyborg-dbsync --config-file /etc/cyborg/cyborg.conf upgrade
```

3. Install Cyborg API via WSGI *api-uwsgi*

---

**Note:** Cyborg-api service can also be run as a Python command that runs a web serve, which can be launched as follows with different Acceleration service API endpoints as mentioned in Prerequisites part. However, we would like to recommend you the uwsgi way since when a project provides a WSGI application the API service gains flexibility in terms of deployment, performance, configuration and scaling. BYW, if you choose devstack to deploy your acceleration service, uwsgi is a default choice.

cyborg-api config-file=/etc/cyborg/cyborg.conf

---

1. Launch Cyborg Conductor, Cyborg Agent services. Open a separate terminal for each service since the console will be locked by a running process.

```

cyborg-conductor --config-file=/etc/cyborg/cyborg.conf
cyborg-agent --config-file=/etc/cyborg/cyborg.conf

```

## 2.1.2 Install Cyborg from Source

This section describes how to install and configure the Acceleration Service for Ubuntu 18.04.1 LTS from source code.

### Install from git repository

1. Create a folder which will hold all Cyborg components.

```
mkdir ~/cyborg
```

2. Clone the cyborg git repository to the management server.

```

cd ~/cyborg
git clone https://opendev.org/openstack/cyborg

```

### 3. Set up the cyborg config file

First, generate a sample configuration file, using tox

```
cd ~/cyborg/cyborg
tox -e genconfig
```

And make a copy of it for further modifications

```
cp -r ~/cyborg/cyborg/etc/cyborg /etc
cd /etc/cyborg
ln -s cyborg.conf.sample cyborg.conf
```

### 4. Install Cyborg packages.

```
cd ~/cyborg/cyborg
sudo python setup.py install
```

## Common Configuration

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- Use the database access client to connect to the database server as the root user:

```
$ mysql -u root -p
```

- Create the cyborg database:

```
CREATE DATABASE cyborg;
```

- Grant proper access to the cyborg database:

```
GRANT ALL PRIVILEGES ON cyborg.* TO 'cyborg'@'localhost'
↳ IDENTIFIED BY 'CYBORG_DBPASS';
```

Replace CYBORG\_DBPASS with a suitable password.

- Exit the database access client.

```
exit;
```

#### 2. Source the admin credentials to gain access to admin-only CLI commands:

```
$ . admin-openrc
```

#### 3. To create the service credentials, complete these steps:

- Create the cyborg user:

```
$ openstack user create --domain default --password-prompt cyborg
```

- Add the admin role to the cyborg user:

```
$ openstack role add --project service --user cyborg admin
```

- Create the cyborg service entities:

```
$ openstack service create --name cyborg --description
↳ "Acceleration Service" accelerator
```

#### 4. Create the Acceleration service API endpoints:

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```
$ openstack endpoint create --region RegionOne \
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$ openstack endpoint create --region RegionOne \
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$ openstack endpoint create --region RegionOne \
  accelerator admin http://<cyborg-ip>/accelerator/v2
```

- Otherwise, if cyborg-api service is running as a python process, create the following endpoints:

```
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  accelerator public http://<cyborg-ip>:6666/v2
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  accelerator internal http://<cyborg-ip>:6666/v2
$ openstack endpoint create --region RegionOne \
  accelerator admin http://<cyborg-ip>:6666/v2
```

---

**Note:** URLs (publicurl, internalurl and adminurl) may be different depending on your environment.

---

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```
[DEFAULT]
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↳%OPENSTACK_HOST_IP%:5672/
use_syslog = False
state_path = /var/lib/cyborg
debug = True

...

[api]
host_ip = 0.0.0.0

...

[database]
connection = mysql+pymysql://%DATABASE_USER%:%DATABASE_PASSWORD%@
↳%OPENSTACK_HOST_IP%/cyborg
```

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```
...

[service_catalog]
cafile = /opt/stack/data/ca-bundle.pem
project_domain_id = default
user_domain_id = default
project_name = service
password = cyborg
username = cyborg
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password

...

[placement]
project_domain_name = Default
project_name = service
user_domain_name = Default
password = password
username = placement
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password
auth_section = keystone_authtoken

...

[nova]
project_domain_name = Default
project_name = service
user_domain_name = Default
password = password
username = nova
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password
auth_section = keystone_authtoken

...

[keystone_authtoken]
memcached_servers = localhost:11211
signing_dir = /var/cache/cyborg/api
cafile = /opt/stack/data/ca-bundle.pem
project_domain_name = Default
project_name = service
user_domain_name = Default
password = cyborg
username = cyborg
auth_url = http://%OPENSTACK_HOST_IP%/identity
auth_type = password
```

## 2. Create database tables for Cyborg.

```
cyborg-dbsync --config-file /etc/cyborg/cyborg.conf upgrade
```

## 3. Install Cyborg API via WSGI *api-uwsgi*

**Note:** Cyborg-api service can also be run as a Python command that runs a web serve, which can be launched as follows with different Acceleration service API endpoints as mentioned in Prerequisites part. However, we would like to recommend you the uwsgi way since when a project provides a WSGI application the API service gains flexibility in terms of deployment, performance, configuration and scaling. BYW, if you choose devstack to deploy your acceleration service, uwsgi is a default choice.

```
cyborg-api config-file=/etc/cyborg/cyborg.conf
```

---

1. Launch Cyborg Conductor, Cyborg Agent services. Open a separate terminal for each service since the console will be locked by a running process.

```
cyborg-conductor --config-file=/etc/cyborg/cyborg.conf
cyborg-agent --config-file=/etc/cyborg/cyborg.conf
```

### 2.1.3 Installing Cyborg API via WSGI

Cyborg-api service can be run either as a Python command that runs a web serve or As a WSGI application hosted by uwsgi. This document is a guide to deploy cyborg-api using uwsgi. In devstack, uwsgi is used by default for development.

#### WSGI Application

The function `cyborg.api.wsgi_app.init_application` will setup a WSGI application to run behind uwsgi.

#### Cyborg API behind uwsgi

Create a `cyborg-api-uwsgi` file with content below:

```
[uwsgi]
chmod-socket = 666
socket = /var/run/uwsgi/cyborg-wsgi-api.socket
lazy-apps = true
add-header = Connection: close
buffer-size = 65535
hook-master-start = unix_signal:15 gracefully_kill_them_all
thunder-lock = true
plugins = python
enable-threads = true
worker-reload-mercy = 90
exit-on-reload = false
die-on-term = true
master = true
processes = 2
wsgi-file = /usr/local/bin/cyborg-wsgi-api
```

Start cyborg-api:

```
# uwsgi --ini /etc/cyborg/cyborg-api-uwsgi.ini
```

## 2.2 Configuration Reference

### 2.2.1 Configuration Guide

#### Configuration options for the Acceleration service

The following options can be set in the `/etc/cyborg/cyborg.conf` config file. A *sample configuration file* is also available.

#### DEFAULT

##### `fatal_exception_format_errors`

**Type** boolean

**Default** `False`

Used if there is a formatting error when generating an exception message (a programming error). If `True`, raise an exception; if `False`, use the unformatted message.

##### `host`

**Type** host address

**Default** `localhost`

This option has a sample default set, which means that its actual default value may vary from the one documented above.

Name of this node. This can be an opaque identifier. It is not necessarily a hostname, FQDN, or IP address. However, the node name must be valid within an AMQP key, and if using ZeroMQ, a valid hostname, FQDN, or IP address.

##### `periodic_interval`

**Type** integer

**Default** `60`

Default interval (in seconds) for running periodic tasks.

##### `thread_pool_size`

**Type** integer

**Default** `10`

**This option specifies the size of the pool of threads used by API to do async jobs. It is possible to limit the number of concurrent connections using this option.**

##### `bind_timeout`

**Type** integer

**Default** `60`

This option specifies the timeout of async job for ARQ bind.

##### `pybasedir`

**Type** string

**Default** /usr/lib/python/site-packages/cyborg/cyborg

This option has a sample default set, which means that its actual default value may vary from the one documented above.

Directory where the cyborg python module is installed.

#### **bindir**

**Type** string

**Default** \$pybasedir/bin

Directory where cyborg binaries are installed.

#### **state\_path**

**Type** string

**Default** \$pybasedir

Top-level directory for maintaining cyborgs state.

#### **rpc\_conn\_pool\_size**

**Type** integer

**Default** 30

**Minimum Value** 1

Size of RPC connection pool.

Table 1: Deprecated Variations

Group	Name
DEFAULT	rpc_conn_pool_size

#### **conn\_pool\_min\_size**

**Type** integer

**Default** 2

The pool size limit for connections expiration policy

#### **conn\_pool\_ttl**

**Type** integer

**Default** 1200

The time-to-live in sec of idle connections in the pool

#### **executor\_thread\_pool\_size**

**Type** integer

**Default** 64

Size of executor thread pool when executor is threading or eventlet.

Table 2: Deprecated Variations

Group	Name
DEFAULT	rpc_thread_pool_size

**rpc\_response\_timeout****Type** integer**Default** 60

Seconds to wait for a response from a call.

**transport\_url****Type** string**Default** rabbit://

The network address and optional user credentials for connecting to the messaging backend, in URL format. The expected format is:

```
driver://[user:pass@]host:port[, [userN:passN@]hostN:portN]/virtual_host?query
```

Example: rabbit://rabbitmq:password@127.0.0.1:5672//

For full details on the fields in the URL see the documentation of `oslo_messaging.TransportURL` at <https://docs.openstack.org/oslo.messaging/latest/reference/transport.html>

**control\_exchange****Type** string**Default** openstack

The default exchange under which topics are scoped. May be overridden by an exchange name specified in the `transport_url` option.

**rpc\_ping\_enabled****Type** boolean**Default** False

Add an endpoint to answer to ping calls. Endpoint is named `oslo_rpc_server_ping`

**run\_external\_periodic\_tasks****Type** boolean**Default** True

Some periodic tasks can be run in a separate process. Should we run them here?

**backdoor\_port****Type** string**Default** <None>

Enable eventlet backdoor. Acceptable values are 0, <port>, and <start>:<end>, where 0 results in listening on a random tcp port number; <port> results in listening on the specified port number (and not enabling backdoor if that port is in use); and <start>:<end> results in listening on the



smallest unused port number within the specified range of port numbers. The chosen port is displayed in the services log file.

#### **backdoor\_socket**

**Type** string

**Default** <None>

Enable eventlet backdoor, using the provided path as a unix socket that can receive connections. This option is mutually exclusive with `backdoor_port` in that only one should be provided. If both are provided then the existence of this option overrides the usage of that option. Inside the path `{pid}` will be replaced with the PID of the current process.

#### **log\_options**

**Type** boolean

**Default** True

Enables or disables logging values of all registered options when starting a service (at DEBUG level).

#### **graceful\_shutdown\_timeout**

**Type** integer

**Default** 60

Specify a timeout after which a gracefully shutdown server will exit. Zero value means endless wait.

#### **debug**

**Type** boolean

**Default** False

**Mutable** This option can be changed without restarting.

If set to true, the logging level will be set to DEBUG instead of the default INFO level.

#### **log\_config\_append**

**Type** string

**Default** <None>

**Mutable** This option can be changed without restarting.

The name of a logging configuration file. This file is appended to any existing logging configuration files. For details about logging configuration files, see the Python logging module documentation. Note that when logging configuration files are used then all logging configuration is set in the configuration file and other logging configuration options are ignored (for example, `log-date-format`).

Table 3: Deprecated Variations

Group	Name
DEFAULT	log-config
DEFAULT	log_config

#### **log\_date\_format**

**Type** string

**Default** %Y-%m-%d %H:%M:%S

Defines the format string for `%(asctime)s` in log records. Default: the value above. This option is ignored if `log_config_append` is set.

### `log_file`

**Type** string

**Default** <None>

(Optional) Name of log file to send logging output to. If no default is set, logging will go to `stderr` as defined by `use_stderr`. This option is ignored if `log_config_append` is set.

Table 4: Deprecated Variations

Group	Name
DEFAULT	logfile

### `log_dir`

**Type** string

**Default** <None>

(Optional) The base directory used for relative `log_file` paths. This option is ignored if `log_config_append` is set.

Table 5: Deprecated Variations

Group	Name
DEFAULT	logdir

### `watch_log_file`

**Type** boolean

**Default** False

Uses logging handler designed to watch file system. When log file is moved or removed this handler will open a new log file with specified path instantaneously. It makes sense only if `log_file` option is specified and Linux platform is used. This option is ignored if `log_config_append` is set.

### `use_syslog`

**Type** boolean

**Default** False

Use syslog for logging. Existing syslog format is DEPRECATED and will be changed later to honor RFC5424. This option is ignored if `log_config_append` is set.

### `use_journal`

**Type** boolean

**Default** False

Enable journald for logging. If running in a systemd environment you may wish to enable journal support. Doing so will use the journal native protocol which includes structured metadata in addition to log messages. This option is ignored if `log_config_append` is set.

**syslog\_log\_facility**

**Type** string

**Default** LOG\_USER

Syslog facility to receive log lines. This option is ignored if `log_config_append` is set.

**use\_json**

**Type** boolean

**Default** False

Use JSON formatting for logging. This option is ignored if `log_config_append` is set.

**use\_stderr**

**Type** boolean

**Default** False

Log output to standard error. This option is ignored if `log_config_append` is set.

**use\_eventlog**

**Type** boolean

**Default** False

Log output to Windows Event Log.

**log\_rotate\_interval**

**Type** integer

**Default** 1

The amount of time before the log files are rotated. This option is ignored unless `log_rotation_type` is set to `interval`.

**log\_rotate\_interval\_type**

**Type** string

**Default** days

**Valid Values** Seconds, Minutes, Hours, Days, Weekday, Midnight

Rotation interval type. The time of the last file change (or the time when the service was started) is used when scheduling the next rotation.

**max\_logfile\_count**

**Type** integer

**Default** 30

Maximum number of rotated log files.

**max\_logfile\_size\_mb**

**Type** integer

**Default** 200

Log file maximum size in MB. This option is ignored if `log_rotation_type` is not set to size.

### `log_rotation_type`

**Type** string

**Default** none

**Valid Values** interval, size, none

Log rotation type.

### Possible values

**interval** Rotate logs at predefined time intervals.

**size** Rotate logs once they reach a predefined size.

**none** Do not rotate log files.

### `logging_context_format_string`

**Type** string

**Default** `%(asctime)s.%(msecs)03d %(process)d %(levelname)s  
%(name)s [%(request_id)s %(user_identity)s]  
%(instance)s%(message)s`

Format string to use for log messages with context. Used by `oslo_log.formatters.ContextFormatter`

### `logging_default_format_string`

**Type** string

**Default** `%(asctime)s.%(msecs)03d %(process)d %(levelname)s  
%(name)s [-] %(instance)s%(message)s`

Format string to use for log messages when context is undefined. Used by `oslo_log.formatters.ContextFormatter`

### `logging_debug_format_suffix`

**Type** string

**Default** `%(funcName)s %(pathname)s:%(lineno)d`

Additional data to append to log message when logging level for the message is DEBUG. Used by `oslo_log.formatters.ContextFormatter`

### `logging_exception_prefix`

**Type** string

**Default** `%(asctime)s.%(msecs)03d %(process)d ERROR %(name)s  
%(instance)s`

Prefix each line of exception output with this format. Used by `oslo_log.formatters.ContextFormatter`

### `logging_user_identity_format`

**Type** string

**Default** %(user)s %(tenant)s %(domain)s %(user\_domain)s  
%(project\_domain)s

Defines the format string for %(user\_identity)s that is used in logging\_context\_format\_string. Used by oslo\_log.formatters.ContextFormatter

### default\_log\_levels

**Type** list

**Default** ['amqp=WARN', 'amqpplib=WARN', 'boto=WARN', 'qpuid=WARN', 'sqlalchemy=WARN', 'suds=INFO', 'oslo.messaging=INFO', 'oslo\_messaging=INFO', 'iso8601=WARN', 'requests.packages.urllib3.connectionpool=WARN', 'urllib3.connectionpool=WARN', 'websocket=WARN', 'requests.packages.urllib3.util.retry=WARN', 'urllib3.util.retry=WARN', 'keystonemiddleware=WARN', 'routes.middleware=WARN', 'stevedore=WARN', 'taskflow=WARN', 'keystoneauth=WARN', 'oslo.cache=INFO', 'oslo\_policy=INFO', 'dogpile.core.dogpile=INFO']

List of package logging levels in logger=LEVEL pairs. This option is ignored if log\_config\_append is set.

### publish\_errors

**Type** boolean

**Default** False

Enables or disables publication of error events.

### instance\_format

**Type** string

**Default** "[instance: %(uuid)s] "

The format for an instance that is passed with the log message.

### instance\_uuid\_format

**Type** string

**Default** "[instance: %(uuid)s] "

The format for an instance UUID that is passed with the log message.

### rate\_limit\_interval

**Type** integer

**Default** 0

Interval, number of seconds, of log rate limiting.

### rate\_limit\_burst

**Type** integer

**Default** 0

Maximum number of logged messages per `rate_limit_interval`.

**rate\_limit\_except\_level**

**Type** string

**Default** CRITICAL

Log level name used by rate limiting: CRITICAL, ERROR, INFO, WARNING, DEBUG or empty string. Logs with level greater or equal to `rate_limit_except_level` are not filtered. An empty string means that all levels are filtered.

**fatal\_deprecations**

**Type** boolean

**Default** False

Enables or disables fatal status of deprecations.

**agent****enabled\_drivers**

**Type** list

**Default** ['fake\_driver']

The accelerator drivers enabled on this agent. Such as `intel_fpga_driver`, `in-spur_fpga_driver`, `nvidia_gpu_driver`, `intel_qat_driver`, etc.

**api****host\_ip**

**Type** host address

**Default** 127.0.0.1

The IP address on which `cyborg-api` listens.

**port**

**Type** port number

**Default** 6666

**Minimum Value** 0

**Maximum Value** 65535

The TCP port on which `cyborg-api` listens.

**api\_workers**

**Type** integer

**Default** <None>

Number of workers for OpenStack Cyborg API service. The default is equal to the number of CPUs available if that can be determined, else a default worker count of 1 is returned.

**enable\_ssl\_api****Type** boolean**Default** False

Enable the integrated stand-alone API to service requests via HTTPS instead of HTTP. If there is a front-end service performing HTTPS offloading from the service, this option should be False; note, you will want to change public API endpoint to represent SSL termination URL with `public_endpoint` option.

**public\_endpoint****Type** string**Default** <None>

Public URL to use when building the links to the API resources (for example, <https://cyborg.rocks:6666>). If None the links will be built using the requests host URL. If the API is operating behind a proxy, you will want to change this to represent the proxys URL. Defaults to None.

**api\_paste\_config****Type** string**Default** `api-paste.ini`

Configuration file for WSGI definition of API.

**database****mysql\_engine****Type** string**Default** InnoDB

MySQL engine to use.

**sqlite\_synchronous****Type** boolean**Default** True

If True, SQLite uses synchronous mode.

Table 6: Deprecated Variations

Group	Name
DEFAULT	sqlite_synchronous

**backend****Type** string**Default** `sqlalchemy`

The back end to use for the database.

Table 7: Deprecated Variations

Group	Name
DEFAULT	db_backend

**connection****Type** string**Default** <None>

The SQLAlchemy connection string to use to connect to the database.

Table 8: Deprecated Variations

Group	Name
DEFAULT	sql_connection
DATABASE	sql_connection
sql	connection

**slave\_connection****Type** string**Default** <None>

The SQLAlchemy connection string to use to connect to the slave database.

**mysql\_sql\_mode****Type** string**Default** TRADITIONAL

The SQL mode to be used for MySQL sessions. This option, including the default, overrides any server-set SQL mode. To use whatever SQL mode is set by the server configuration, set this to no value. Example: `mysql_sql_mode=`

**mysql\_enable\_ndb****Type** boolean**Default** False

If True, transparently enables support for handling MySQL Cluster (NDB).

**connection\_recycle\_time****Type** integer**Default** 3600

Connections which have been present in the connection pool longer than this number of seconds will be replaced with a new one the next time they are checked out from the pool.

**max\_pool\_size****Type** integer**Default** 5



Maximum number of SQL connections to keep open in a pool. Setting a value of 0 indicates no limit.

**max\_retries**

**Type** integer

**Default** 10

Maximum number of database connection retries during startup. Set to -1 to specify an infinite retry count.

Table 9: Deprecated Variations

Group	Name
DEFAULT	sql_max_retries
DATABASE	sql_max_retries

**retry\_interval**

**Type** integer

**Default** 10

Interval between retries of opening a SQL connection.

Table 10: Deprecated Variations

Group	Name
DEFAULT	sql_retry_interval
DATABASE	reconnect_interval

**max\_overflow**

**Type** integer

**Default** 50

If set, use this value for max\_overflow with SQLAlchemy.

Table 11: Deprecated Variations

Group	Name
DEFAULT	sql_max_overflow
DATABASE	sqlalchemy_max_overflow

**connection\_debug**

**Type** integer

**Default** 0

**Minimum Value** 0

**Maximum Value** 100

Verbosity of SQL debugging information: 0=None, 100=Everything.

Table 12: Deprecated Variations

Group	Name
DEFAULT	sql_connection_debug

**connection\_trace****Type** boolean**Default** False

Add Python stack traces to SQL as comment strings.

Table 13: Deprecated Variations

Group	Name
DEFAULT	sql_connection_trace

**pool\_timeout****Type** integer**Default** <None>

If set, use this value for pool\_timeout with SQLAlchemy.

Table 14: Deprecated Variations

Group	Name
DATABASE	sqlalchemy_pool_timeout

**use\_db\_reconnect****Type** boolean**Default** False

Enable the experimental use of database reconnect on connection lost.

**db\_retry\_interval****Type** integer**Default** 1

Seconds between retries of a database transaction.

**db\_inc\_retry\_interval****Type** boolean**Default** True

If True, increases the interval between retries of a database operation up to db\_max\_retry\_interval.

**db\_max\_retry\_interval****Type** integer**Default** 10

If db\_inc\_retry\_interval is set, the maximum seconds between retries of a database operation.

**db\_max\_retries****Type** integer**Default** 20

Maximum retries in case of connection error or deadlock error before error is raised. Set to -1 to specify an infinite retry count.

**connection\_parameters****Type** string**Default** ''

Optional URL parameters to append onto the connection URL at connect time; specify as param1=value1&param2=value2&

**glance**

Configuration options for the Image service

**num\_retries****Type** integer**Default** 0**Minimum Value** 0

Enable glance operation retries.

Specifies the number of retries when uploading / downloading an image to / from glance. 0 means no retries.

**verify\_glance\_signatures****Type** boolean**Default** False

Enable image signature verification.

cyborg uses the image signature metadata from glance and verifies the signature of a signed image while downloading that image. If the image signature cannot be verified or if the image signature metadata is either incomplete or unavailable, then cyborg will not boot the image and instead will place the instance into an error state. This provides end users with stronger assurances of the integrity of the image data they are using to create servers.

Related options:

- The options in the *key\_manager* group, as the *key\_manager* is used for the signature validation.
- Both *enable\_certificate\_validation* and *default\_trusted\_certificate\_ids* below depend on this option being enabled.

**enable\_certificate\_validation****Type** boolean**Default** False

Enable certificate validation for image signature verification.

During image signature verification cyborg will first verify the validity of the images signing certificate using the set of trusted certificates associated with the instance. If certificate validation fails, signature verification will not be performed and the instance will be placed into an error state. This provides end users with stronger assurances that the image data is unmodified and trustworthy. If left disabled, image signature verification can still occur but the end user will not have any assurance that the signing certificate used to generate the image signature is still trustworthy.

Related options:

- This option only takes effect if `verify_glance_signatures` is enabled.
- The value of `default_trusted_certificate_ids` may be used when this option is enabled.

**Warning:** This option is deprecated for removal since 16.0.0. Its value may be silently ignored in the future.

**Reason** This option is intended to ease the transition for deployments leveraging image signature verification. The intended state long-term is for signature verification and certificate validation to always happen together.

#### `default_trusted_certificate_ids`

**Type** list

**Default** []

List of certificate IDs for certificates that should be trusted.

May be used as a default list of trusted certificate IDs for certificate validation. The value of this option will be ignored if the user provides a list of trusted certificate IDs with an instance API request. The value of this option will be persisted with the instance data if signature verification and certificate validation are enabled and if the user did not provide an alternative list. If left empty when certificate validation is enabled the user must provide a list of trusted certificate IDs otherwise certificate validation will fail.

Related options:

- The value of this option may be used if both `verify_glance_signatures` and `enable_certificate_validation` are enabled.

#### `debug`

**Type** boolean

**Default** False

Enable or disable debug logging with glanceclient.

#### `cafile`

**Type** string

**Default** <None>

PEM encoded Certificate Authority to use when verifying HTTPs connections.

#### `certfile`

**Type** string

**Default** <None>

PEM encoded client certificate cert file

#### **keyfile**

**Type** string

**Default** <None>

PEM encoded client certificate key file

#### **insecure**

**Type** boolean

**Default** False

Verify HTTPS connections.

#### **timeout**

**Type** integer

**Default** <None>

Timeout value for http requests

#### **collect\_timing**

**Type** boolean

**Default** False

Collect per-API call timing information.

#### **split\_loggers**

**Type** boolean

**Default** False

Log requests to multiple loggers.

#### **service\_type**

**Type** string

**Default** image

The default service\_type for endpoint URL discovery.

#### **service\_name**

**Type** string

**Default** <None>

The default service\_name for endpoint URL discovery.

#### **valid\_interfaces**

**Type** list

**Default** ['internal', 'public']

List of interfaces, in order of preference, for endpoint URL.

**region\_name**

**Type** string

**Default** <None>

The default region\_name for endpoint URL discovery.

**endpoint\_override**

**Type** string

**Default** <None>

Always use this endpoint URL for requests for this client. NOTE: The unversioned endpoint should be specified here; to request a particular API version, use the *version*, *min-version*, and/or *max-version* options.

**connect\_retries**

**Type** integer

**Default** <None>

The maximum number of retries that should be attempted for connection errors.

**connect\_retry\_delay**

**Type** floating point

**Default** <None>

Delay (in seconds) between two retries for connection errors. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

**status\_code\_retries**

**Type** integer

**Default** <None>

The maximum number of retries that should be attempted for retrieable HTTP status codes.

**status\_code\_retry\_delay**

**Type** floating point

**Default** <None>

Delay (in seconds) between two retries for retrieable status codes. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

## gpu\_devices

This is used to config vGPU types for nvidia GPU devices.

### enabled\_vgpu\_types

**Type** list

**Default** []

The vGPU types enabled in the compute node.

Cyborg supports multiple vGPU types in one host. Usually, a single physical GPU can only set one vgpu type. Some pGPUs (e.g. NVIDIA GRID K1) support multiple vGPU types.

If more than one single vGPU type are provided, then for each *vGPU type*, you must add an additional section `[vgpu_$(VGPU_TYPE)]` with a single configuration option `device_addresses` to assign this type to the target physical GPU(s). PGPUs should be configured explicitly now, we will improve this after we implement the enable/disable interface.

If the same PCI address is provided for two different types, cyborg-agent will return an InvalidGPUConfig exception at restart.

An example is as the following:

```
[gpu_devices]
enabled_vgpu_types = nvidia-35, nvidia-36

[vgpu_nvidia-35]
device_addresses = 0000:84:00.0,0000:85:00.0

[vgpu_nvidia-36]
device_addresses = 0000:86:00.0
```

## keystone

Configuration options for the identity service

### cafile

**Type** string

**Default** <None>

PEM encoded Certificate Authority to use when verifying HTTPs connections.

### certfile

**Type** string

**Default** <None>

PEM encoded client certificate cert file

### keyfile

**Type** string

**Default** <None>

PEM encoded client certificate key file

**insecure****Type** boolean**Default** False

Verify HTTPS connections.

**timeout****Type** integer**Default** <None>

Timeout value for http requests

**collect\_timing****Type** boolean**Default** False

Collect per-API call timing information.

**split\_loggers****Type** boolean**Default** False

Log requests to multiple loggers.

**service\_type****Type** string**Default** identity

The default service\_type for endpoint URL discovery.

**service\_name****Type** string**Default** <None>

The default service\_name for endpoint URL discovery.

**valid\_interfaces****Type** list**Default** ['internal', 'public']

List of interfaces, in order of preference, for endpoint URL.

**region\_name****Type** string**Default** <None>

The default region\_name for endpoint URL discovery.

**endpoint\_override****Type** string



**Default** <None>

Always use this endpoint URL for requests for this client. NOTE: The unversioned endpoint should be specified here; to request a particular API version, use the *version*, *min-version*, and/or *max-version* options.

#### **connect\_retries**

**Type** integer

**Default** <None>

The maximum number of retries that should be attempted for connection errors.

#### **connect\_retry\_delay**

**Type** floating point

**Default** <None>

Delay (in seconds) between two retries for connection errors. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

#### **status\_code\_retries**

**Type** integer

**Default** <None>

The maximum number of retries that should be attempted for retrieable HTTP status codes.

#### **status\_code\_retry\_delay**

**Type** floating point

**Default** <None>

Delay (in seconds) between two retries for retrieable status codes. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

### **keystone\_authtoken**

#### **www\_authenticate\_uri**

**Type** string

**Default** <None>

Complete public Identity API endpoint. This endpoint should not be an admin endpoint, as it should be accessible by all end users. Unauthenticated clients are redirected to this endpoint to authenticate. Although this endpoint should ideally be unversioned, client support in the wild varies. If youre using a versioned v2 endpoint here, then this should *not* be the same endpoint the service user utilizes for validating tokens, because normal end users may not be able to reach that endpoint.

Table 15: Deprecated Variations

Group	Name
keystone_authtoken	auth_uri

#### **auth\_uri**

**Type** string

**Default** <None>

Complete public Identity API endpoint. This endpoint should not be an admin endpoint, as it should be accessible by all end users. Unauthenticated clients are redirected to this endpoint to authenticate. Although this endpoint should ideally be unversioned, client support in the wild varies. If you're using a versioned v2 endpoint here, then this should *not* be the same endpoint the service user utilizes for validating tokens, because normal end users may not be able to reach that endpoint. This option is deprecated in favor of `www_authenticate_uri` and will be removed in the S release.

**Warning:** This option is deprecated for removal since Queens. Its value may be silently ignored in the future.

**Reason** The `auth_uri` option is deprecated in favor of `www_authenticate_uri` and will be removed in the S release.

#### **auth\_version**

**Type** string

**Default** <None>

API version of the Identity API endpoint.

#### **interface**

**Type** string

**Default** `internal`

Interface to use for the Identity API endpoint. Valid values are `public`, `internal` (default) or `admin`.

#### **delay\_auth\_decision**

**Type** boolean

**Default** `False`

Do not handle authorization requests within the middleware, but delegate the authorization decision to downstream WSGI components.

#### **http\_connect\_timeout**

**Type** integer

**Default** <None>

Request timeout value for communicating with Identity API server.

#### **http\_request\_max\_retries**

**Type** integer

**Default** `3`

How many times are we trying to reconnect when communicating with Identity API Server.

#### **cache**

**Type** string

**Default** <None>

Request environment key where the Swift cache object is stored. When `auth_token` middleware is deployed with a Swift cache, use this option to have the middleware share a caching backend with swift. Otherwise, use the `memcached_servers` option instead.

#### **certfile**

**Type** string

**Default** <None>

Required if identity server requires client certificate

#### **keyfile**

**Type** string

**Default** <None>

Required if identity server requires client certificate

#### **cafile**

**Type** string

**Default** <None>

A PEM encoded Certificate Authority to use when verifying HTTPs connections. Defaults to system CAs.

#### **insecure**

**Type** boolean

**Default** False

Verify HTTPS connections.

#### **region\_name**

**Type** string

**Default** <None>

The region in which the identity server can be found.

#### **memcached\_servers**

**Type** list

**Default** <None>

Optionally specify a list of memcached server(s) to use for caching. If left undefined, tokens will instead be cached in-process.

Table 16: Deprecated Variations

Group	Name
keystone_authtoken	memcache_servers

#### **token\_cache\_time**

**Type** integer

**Default** 300

In order to prevent excessive effort spent validating tokens, the middleware caches previously-seen tokens for a configurable duration (in seconds). Set to -1 to disable caching completely.

#### **memcache\_security\_strategy**

**Type** string

**Default** None

**Valid Values** None, MAC, ENCRYPT

(Optional) If defined, indicate whether token data should be authenticated or authenticated and encrypted. If MAC, token data is authenticated (with HMAC) in the cache. If ENCRYPT, token data is encrypted and authenticated in the cache. If the value is not one of these options or empty, `auth_token` will raise an exception on initialization.

#### **memcache\_secret\_key**

**Type** string

**Default** <None>

(Optional, mandatory if `memcache_security_strategy` is defined) This string is used for key derivation.

#### **memcache\_pool\_dead\_retry**

**Type** integer

**Default** 300

(Optional) Number of seconds memcached server is considered dead before it is tried again.

#### **memcache\_pool\_maxsize**

**Type** integer

**Default** 10

(Optional) Maximum total number of open connections to every memcached server.

#### **memcache\_pool\_socket\_timeout**

**Type** integer

**Default** 3

(Optional) Socket timeout in seconds for communicating with a memcached server.

#### **memcache\_pool\_unused\_timeout**

**Type** integer

**Default** 60

(Optional) Number of seconds a connection to memcached is held unused in the pool before it is closed.

#### **memcache\_pool\_conn\_get\_timeout**

**Type** integer

**Default** 10

(Optional) Number of seconds that an operation will wait to get a memcached client connection from the pool.

**memcache\_use\_advanced\_pool**

**Type** boolean

**Default** True

(Optional) Use the advanced (eventlet safe) memcached client pool.

**include\_service\_catalog**

**Type** boolean

**Default** True

(Optional) Indicate whether to set the X-Service-Catalog header. If False, middleware will not ask for service catalog on token validation and will not set the X-Service-Catalog header.

**enforce\_token\_bind**

**Type** string

**Default** permissive

Used to control the use and type of token binding. Can be set to: disabled to not check token binding. permissive (default) to validate binding information if the bind type is of a form known to the server and ignore it if not. strict like permissive but if the bind type is unknown the token will be rejected. required any form of token binding is needed to be allowed. Finally the name of a binding method that must be present in tokens.

**service\_token\_roles**

**Type** list

**Default** ['service']

A choice of roles that must be present in a service token. Service tokens are allowed to request that an expired token can be used and so this check should tightly control that only actual services should be sending this token. Roles here are applied as an ANY check so any role in this list must be present. For backwards compatibility reasons this currently only affects the allow\_expired check.

**service\_token\_roles\_required**

**Type** boolean

**Default** False

For backwards compatibility reasons we must let valid service tokens pass that dont pass the service\_token\_roles check as valid. Setting this true will become the default in a future release and should be enabled if possible.

**service\_type**

**Type** string

**Default** <None>

The name or type of the service as it appears in the service catalog. This is used to validate tokens that have restricted access rules.

**auth\_type**

**Type** unknown type

**Default** <None>

Authentication type to load

Table 17: Deprecated Variations

Group	Name
keystone_authtoken	auth_plugin

### **auth\_section**

**Type** unknown type

**Default** <None>

Config Section from which to load plugin specific options

### **nic\_devices**

This is used to config specific nic devices.

### **enabled\_nic\_types**

**Type** list

**Default** []

### **nova**

#### **cafile**

**Type** string

**Default** <None>

PEM encoded Certificate Authority to use when verifying HTTPs connections.

#### **certfile**

**Type** string

**Default** <None>

PEM encoded client certificate cert file

#### **keyfile**

**Type** string

**Default** <None>

PEM encoded client certificate key file

#### **insecure**

**Type** boolean

**Default** False

Verify HTTPS connections.

#### **timeout**

**Type** integer

**Default** <None>

Timeout value for http requests

#### **collect\_timing**

**Type** boolean

**Default** False

Collect per-API call timing information.

#### **split\_loggers**

**Type** boolean

**Default** False

Log requests to multiple loggers.

#### **auth\_type**

**Type** unknown type

**Default** <None>

Authentication type to load

Table 18: Deprecated Variations

Group	Name
nova	auth_plugin

#### **auth\_section**

**Type** unknown type

**Default** <None>

Config Section from which to load plugin specific options

#### **auth\_url**

**Type** unknown type

**Default** <None>

Authentication URL

#### **system\_scope**

**Type** unknown type

**Default** <None>

Scope for system operations

#### **domain\_id**

**Type** unknown type

**Default** <None>

Domain ID to scope to

**domain\_name**

**Type** unknown type

**Default** <None>

Domain name to scope to

**project\_id**

**Type** unknown type

**Default** <None>

Project ID to scope to

**project\_name**

**Type** unknown type

**Default** <None>

Project name to scope to

**project\_domain\_id**

**Type** unknown type

**Default** <None>

Domain ID containing project

**project\_domain\_name**

**Type** unknown type

**Default** <None>

Domain name containing project

**trust\_id**

**Type** unknown type

**Default** <None>

Trust ID

**default\_domain\_id**

**Type** unknown type

**Default** <None>

Optional domain ID to use with v3 and v2 parameters. It will be used for both the user and project domain in v3 and ignored in v2 authentication.

**default\_domain\_name**

**Type** unknown type

**Default** <None>



Optional domain name to use with v3 API and v2 parameters. It will be used for both the user and project domain in v3 and ignored in v2 authentication.

**user\_id**

**Type** unknown type

**Default** <None>

User ID

**username**

**Type** unknown type

**Default** <None>

Username

Table 19: Deprecated Variations

Group	Name
nova	user-name
nova	user_name

**user\_domain\_id**

**Type** unknown type

**Default** <None>

Users domain id

**user\_domain\_name**

**Type** unknown type

**Default** <None>

Users domain name

**password**

**Type** unknown type

**Default** <None>

Users password

**tenant\_id**

**Type** unknown type

**Default** <None>

Tenant ID

**tenant\_name**

**Type** unknown type

**Default** <None>

Tenant Name

**service\_type**

**Type** string

**Default** `compute`

The default `service_type` for endpoint URL discovery.

**service\_name**

**Type** string

**Default** `<None>`

The default `service_name` for endpoint URL discovery.

**valid\_interfaces**

**Type** list

**Default** `['internal', 'public']`

List of interfaces, in order of preference, for endpoint URL.

**region\_name**

**Type** string

**Default** `<None>`

The default `region_name` for endpoint URL discovery.

**endpoint\_override**

**Type** string

**Default** `<None>`

Always use this endpoint URL for requests for this client. NOTE: The unversioned endpoint should be specified here; to request a particular API version, use the *version*, *min-version*, and/or *max-version* options.

**connect\_retries**

**Type** integer

**Default** `<None>`

The maximum number of retries that should be attempted for connection errors.

**connect\_retry\_delay**

**Type** floating point

**Default** `<None>`

Delay (in seconds) between two retries for connection errors. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

**status\_code\_retries**

**Type** integer

**Default** `<None>`

The maximum number of retries that should be attempted for retrieable HTTP status codes.

**status\_code\_retry\_delay**

**Type** floating point

**Default** <None>

Delay (in seconds) between two retries for retrievable status codes. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

## oslo\_messaging\_amqp

### container\_name

**Type** string

**Default** <None>

Name for the AMQP container. must be globally unique. Defaults to a generated UUID

Table 20: Deprecated Variations

Group	Name
amqp1	container_name

### idle\_timeout

**Type** integer

**Default** 0

Timeout for inactive connections (in seconds)

Table 21: Deprecated Variations

Group	Name
amqp1	idle_timeout

### trace

**Type** boolean

**Default** False

Debug: dump AMQP frames to stdout

Table 22: Deprecated Variations

Group	Name
amqp1	trace

### ssl

**Type** boolean

**Default** False

Attempt to connect via SSL. If no other ssl-related parameters are given, it will use the systems CA-bundle to verify the servers certificate.

### ssl\_ca\_file

**Type** string

**Default** ''

CA certificate PEM file used to verify the servers certificate

Table 23: Deprecated Variations

Group	Name
amqp1	ssl_ca_file

### **ssl\_cert\_file**

**Type** string

**Default** ''

Self-identifying certificate PEM file for client authentication

Table 24: Deprecated Variations

Group	Name
amqp1	ssl_cert_file

### **ssl\_key\_file**

**Type** string

**Default** ''

Private key PEM file used to sign ssl\_cert\_file certificate (optional)

Table 25: Deprecated Variations

Group	Name
amqp1	ssl_key_file

### **ssl\_key\_password**

**Type** string

**Default** <None>

Password for decrypting ssl\_key\_file (if encrypted)

Table 26: Deprecated Variations

Group	Name
amqp1	ssl_key_password

### **ssl\_verify\_vhost**

**Type** boolean

**Default** False

By default SSL checks that the name in the servers certificate matches the hostname in the transport\_url. In some configurations it may be preferable to use the virtual hostname instead, for

example if the server uses the Server Name Indication TLS extension (rfc6066) to provide a certificate per virtual host. Set `ssl_verify_vhost` to `True` if the servers SSL certificate uses the virtual host name instead of the DNS name.

### **sasl\_mechanisms**

**Type** string

**Default** ''

Space separated list of acceptable SASL mechanisms

Table 27: Deprecated Variations

Group	Name
amqp1	sasl_mechanisms

### **sasl\_config\_dir**

**Type** string

**Default** ''

Path to directory that contains the SASL configuration

Table 28: Deprecated Variations

Group	Name
amqp1	sasl_config_dir

### **sasl\_config\_name**

**Type** string

**Default** ''

Name of configuration file (without `.conf` suffix)

Table 29: Deprecated Variations

Group	Name
amqp1	sasl_config_name

### **sasl\_default\_realm**

**Type** string

**Default** ''

SASL realm to use if no realm present in username

### **connection\_retry\_interval**

**Type** integer

**Default** 1

**Minimum Value** 1

Seconds to pause before attempting to re-connect.

### **connection\_retry\_backoff**

**Type** integer

**Default** 2

**Minimum Value** 0

Increase the `connection_retry_interval` by this many seconds after each unsuccessful failover attempt.

#### `connection_retry_interval_max`

**Type** integer

**Default** 30

**Minimum Value** 1

Maximum limit for `connection_retry_interval` + `connection_retry_backoff`

#### `link_retry_delay`

**Type** integer

**Default** 10

**Minimum Value** 1

Time to pause between re-connecting an AMQP 1.0 link that failed due to a recoverable error.

#### `default_reply_retry`

**Type** integer

**Default** 0

**Minimum Value** -1

The maximum number of attempts to re-send a reply message which failed due to a recoverable error.

#### `default_reply_timeout`

**Type** integer

**Default** 30

**Minimum Value** 5

The deadline for an rpc reply message delivery.

#### `default_send_timeout`

**Type** integer

**Default** 30

**Minimum Value** 5

The deadline for an rpc cast or call message delivery. Only used when caller does not provide a timeout expiry.

#### `default_notify_timeout`

**Type** integer

**Default** 30

**Minimum Value 5**

The deadline for a sent notification message delivery. Only used when caller does not provide a timeout expiry.

**default\_sender\_link\_timeout**

**Type** integer

**Default** 600

**Minimum Value 1**

The duration to schedule a purge of idle sender links. Detach link after expiry.

**addressing\_mode**

**Type** string

**Default** dynamic

Indicates the addressing mode used by the driver. Permitted values: legacy - use legacy non-routable addressing routable - use routable addresses dynamic - use legacy addresses if the message bus does not support routing otherwise use routable addressing

**pseudo\_vhost**

**Type** boolean

**Default** True

Enable virtual host support for those message buses that do not natively support virtual hosting (such as qpid). When set to true the virtual host name will be added to all message bus addresses, effectively creating a private subnet per virtual host. Set to False if the message bus supports virtual hosting using the hostname field in the AMQP 1.0 Open performative as the name of the virtual host.

**server\_request\_prefix**

**Type** string

**Default** exclusive

address prefix used when sending to a specific server

Table 30: Deprecated Variations

Group	Name
amqp1	server_request_prefix

**broadcast\_prefix**

**Type** string

**Default** broadcast

address prefix used when broadcasting to all servers

Table 31: Deprecated Variations

Group	Name
amqp1	broadcast_prefix

**group\_request\_prefix****Type** string**Default** unicast

address prefix when sending to any server in group

Table 32: Deprecated Variations

Group	Name
amqp1	group_request_prefix

**rpc\_address\_prefix****Type** string**Default** openstack.org/om/rpc

Address prefix for all generated RPC addresses

**notify\_address\_prefix****Type** string**Default** openstack.org/om/notify

Address prefix for all generated Notification addresses

**multicast\_address****Type** string**Default** multicast

Appended to the address prefix when sending a fanout message. Used by the message bus to identify fanout messages.

**unicast\_address****Type** string**Default** unicast

Appended to the address prefix when sending to a particular RPC/Notification server. Used by the message bus to identify messages sent to a single destination.

**anycast\_address****Type** string**Default** anycast

Appended to the address prefix when sending to a group of consumers. Used by the message bus to identify messages that should be delivered in a round-robin fashion across consumers.

**default\_notification\_exchange****Type** string**Default** <None>

Exchange name used in notification addresses. Exchange name resolution precedence: Target.exchange if set else default\_notification\_exchange if set else control\_exchange if set else notify



**default\_rpc\_exchange****Type** string**Default** <None>

Exchange name used in RPC addresses. Exchange name resolution precedence: Target.exchange if set else default\_rpc\_exchange if set else control\_exchange if set else rpc

**reply\_link\_credit****Type** integer**Default** 200**Minimum Value** 1

Window size for incoming RPC Reply messages.

**rpc\_server\_credit****Type** integer**Default** 100**Minimum Value** 1

Window size for incoming RPC Request messages

**notify\_server\_credit****Type** integer**Default** 100**Minimum Value** 1

Window size for incoming Notification messages

**pre\_settled****Type** multi-valued**Default** rpc-cast**Default** rpc-reply

Send messages of this type pre-settled. Pre-settled messages will not receive acknowledgement from the peer. Note well: pre-settled messages may be silently discarded if the delivery fails. Permitted values: rpc-call - send RPC Calls pre-settled rpc-reply- send RPC Replies pre-settled rpc-cast - Send RPC Casts pre-settled notify - Send Notifications pre-settled

**oslo\_messaging\_kafka****kafka\_max\_fetch\_bytes****Type** integer**Default** 1048576

Max fetch bytes of Kafka consumer

**kafka\_consumer\_timeout**

**Type** floating point

**Default** 1.0

Default timeout(s) for Kafka consumers

#### **pool\_size**

**Type** integer

**Default** 10

Pool Size for Kafka Consumers

**Warning:** This option is deprecated for removal. Its value may be silently ignored in the future.

**Reason** Driver no longer uses connection pool.

#### **conn\_pool\_min\_size**

**Type** integer

**Default** 2

The pool size limit for connections expiration policy

**Warning:** This option is deprecated for removal. Its value may be silently ignored in the future.

**Reason** Driver no longer uses connection pool.

#### **conn\_pool\_ttl**

**Type** integer

**Default** 1200

The time-to-live in sec of idle connections in the pool

**Warning:** This option is deprecated for removal. Its value may be silently ignored in the future.

**Reason** Driver no longer uses connection pool.

#### **consumer\_group**

**Type** string

**Default** oslo\_messaging\_consumer

Group id for Kafka consumer. Consumers in one group will coordinate message consumption

#### **producer\_batch\_timeout**

**Type** floating point

**Default** 0.0

Upper bound on the delay for KafkaProducer batching in seconds

**producer\_batch\_size**

**Type** integer

**Default** 16384

Size of batch for the producer async send

**compression\_codec**

**Type** string

**Default** none

**Valid Values** none, gzip, snappy, lz4, zstd

The compression codec for all data generated by the producer. If not set, compression will not be used. Note that the allowed values of this depend on the kafka version

**enable\_auto\_commit**

**Type** boolean

**Default** False

Enable asynchronous consumer commits

**max\_poll\_records**

**Type** integer

**Default** 500

The maximum number of records returned in a poll call

**security\_protocol**

**Type** string

**Default** PLAINTEXT

**Valid Values** PLAINTEXT, SASL\_PLAINTEXT, SSL, SASL\_SSL

Protocol used to communicate with brokers

**sasl\_mechanism**

**Type** string

**Default** PLAIN

Mechanism when security protocol is SASL

**ssl\_cafile**

**Type** string

**Default** ''

CA certificate PEM file used to verify the server certificate

**ssl\_client\_cert\_file**

**Type** string

**Default** ''

Client certificate PEM file used for authentication.

#### **ssl\_client\_key\_file**

**Type** string

**Default** ''

Client key PEM file used for authentication.

#### **ssl\_client\_key\_password**

**Type** string

**Default** ''

Client key password file used for authentication.

### **oslo\_messaging\_notifications**

#### **driver**

**Type** multi-valued

**Default** ''

The Drivers(s) to handle sending notifications. Possible values are messaging, messagingv2, routing, log, test, noop

Table 33: Deprecated Variations

Group	Name
DEFAULT	notification_driver

#### **transport\_url**

**Type** string

**Default** <None>

A URL representing the messaging driver to use for notifications. If not set, we fall back to the same configuration used for RPC.

Table 34: Deprecated Variations

Group	Name
DEFAULT	notification_transport_url

#### **topics**

**Type** list

**Default** ['notifications']

AMQP topic used for OpenStack notifications.

Table 35: Deprecated Variations

Group	Name
rpc_notifier2	topics
DEFAULT	notification_topics

**retry****Type** integer**Default** -1

The maximum number of attempts to re-send a notification message which failed to be delivered due to a recoverable error. 0 - No retry, -1 - indefinite

**oslo\_messaging\_rabbit****amqp\_durable\_queues****Type** boolean**Default** False

Use durable queues in AMQP.

**amqp\_auto\_delete****Type** boolean**Default** False

Auto-delete queues in AMQP.

Table 36: Deprecated Variations

Group	Name
DEFAULT	amqp_auto_delete

**ssl****Type** boolean**Default** False

Connect over SSL.

Table 37: Deprecated Variations

Group	Name
oslo_messaging_rabbit	rabbit_use_ssl

**ssl\_version****Type** string**Default** ''

SSL version to use (valid only if SSL enabled). Valid values are TLSv1 and SSLv23. SSLv2, SSLv3, TLSv1\_1, and TLSv1\_2 may be available on some distributions.

Table 38: Deprecated Variations

Group	Name
oslo_messaging_rabbit	kombu_ssl_version

**ssl\_key\_file****Type** string**Default** ''

SSL key file (valid only if SSL enabled).

Table 39: Deprecated Variations

Group	Name
oslo_messaging_rabbit	kombu_ssl_keyfile

**ssl\_cert\_file****Type** string**Default** ''

SSL cert file (valid only if SSL enabled).

Table 40: Deprecated Variations

Group	Name
oslo_messaging_rabbit	kombu_ssl_certfile

**ssl\_ca\_file****Type** string**Default** ''

SSL certification authority file (valid only if SSL enabled).

Table 41: Deprecated Variations

Group	Name
oslo_messaging_rabbit	kombu_ssl_ca_certs

**heartbeat\_in\_pthread****Type** boolean**Default** True

Run the health check heartbeat thread through a native python thread by default. If this option is equal to False then the health check heartbeat will inherit the execution model from the parent process. For example if the parent process has monkey patched the stdlib by using eventlet/greenlet then the heartbeat will be run through a green thread.

**Warning:** This option is deprecated for removal. Its value may be silently ignored in the future.

**kombu\_reconnect\_delay****Type** floating point**Default** 1.0

How long to wait before reconnecting in response to an AMQP consumer cancel notification.

Table 42: Deprecated Variations

Group	Name
DEFAULT	kombu_reconnect_delay

**kombu\_compression****Type** string**Default** <None>

EXPERIMENTAL: Possible values are: gzip, bz2. If not set compression will not be used. This option may not be available in future versions.

**kombu\_missing\_consumer\_retry\_timeout****Type** integer**Default** 60

How long to wait a missing client before abandoning to send it its replies. This value should not be longer than `rpc_response_timeout`.

Table 43: Deprecated Variations

Group	Name
oslo_messaging_rabbit	kombu_reconnect_timeout

**kombu\_failover\_strategy****Type** string**Default** round-robin**Valid Values** round-robin, shuffle

Determines how the next RabbitMQ node is chosen in case the one we are currently connected to becomes unavailable. Takes effect only if more than one RabbitMQ node is provided in config.

**rabbit\_login\_method****Type** string**Default** AMQPLAIN**Valid Values** PLAIN, AMQPLAIN, RABBIT-CR-DEMO

The RabbitMQ login method.

Table 44: Deprecated Variations

Group	Name
DEFAULT	rabbit_login_method

**rabbit\_retry\_interval****Type** integer**Default** 1

How frequently to retry connecting with RabbitMQ.

**rabbit\_retry\_backoff****Type** integer**Default** 2

How long to backoff for between retries when connecting to RabbitMQ.

Table 45: Deprecated Variations

Group	Name
DEFAULT	rabbit_retry_backoff

**rabbit\_interval\_max****Type** integer**Default** 30

Maximum interval of RabbitMQ connection retries. Default is 30 seconds.

**rabbit\_ha\_queues****Type** boolean**Default** False

Try to use HA queues in RabbitMQ (x-ha-policy: all). If you change this option, you must wipe the RabbitMQ database. In RabbitMQ 3.0, queue mirroring is no longer controlled by the x-ha-policy argument when declaring a queue. If you just want to make sure that all queues (except those with auto-generated names) are mirrored across all nodes, run: `rabbitmqctl set_policy HA ^(?!amq).* {ha-mode: all}`

Table 46: Deprecated Variations

Group	Name
DEFAULT	rabbit_ha_queues

**rabbit\_transient\_queues\_ttl****Type** integer**Default** 1800**Minimum Value** 1



Positive integer representing duration in seconds for queue TTL (x-expires). Queues which are unused for the duration of the TTL are automatically deleted. The parameter affects only reply and fanout queues.

**rabbit\_qos\_prefetch\_count**

**Type** integer

**Default** 0

Specifies the number of messages to prefetch. Setting to zero allows unlimited messages.

**heartbeat\_timeout\_threshold**

**Type** integer

**Default** 60

Number of seconds after which the Rabbit broker is considered down if heartbeats keep-alive fails (0 disables heartbeat).

**heartbeat\_rate**

**Type** integer

**Default** 2

How often times during the heartbeat\_timeout\_threshold we check the heartbeat.

**direct\_mandatory\_flag**

**Type** boolean

**Default** True

(DEPRECATED) Enable/Disable the RabbitMQ mandatory flag for direct send. The direct send is used as reply, so the MessageUndeliverable exception is raised in case the client queue does not exist. MessageUndeliverable exception will be used to loop for a timeout to let a chance to sender to recover. This flag is deprecated and it will not be possible to deactivate this functionality anymore

<p><b>Warning:</b> This option is deprecated for removal. Its value may be silently ignored in the future.</p>
--

<p><b>Reason</b> Mandatory flag no longer deactivable.</p>
--

**enable\_cancel\_on\_failover**

**Type** boolean

**Default** False

Enable x-cancel-on-ha-failover flag so that rabbitmq server will cancel and notify consumers when queue is down

## oslo\_policy

### enforce\_scope

**Type** boolean

**Default** False

This option controls whether or not to enforce scope when evaluating policies. If `True`, the scope of the token used in the request is compared to the `scope_types` of the policy being enforced. If the scopes do not match, an `InvalidScope` exception will be raised. If `False`, a message will be logged informing operators that policies are being invoked with mismatching scope.

### enforce\_new\_defaults

**Type** boolean

**Default** False

This option controls whether or not to use old deprecated defaults when evaluating policies. If `True`, the old deprecated defaults are not going to be evaluated. This means if any existing token is allowed for old defaults but is disallowed for new defaults, it will be disallowed. It is encouraged to enable this flag along with the `enforce_scope` flag so that you can get the benefits of new defaults and `scope_type` together

### policy\_file

**Type** string

**Default** `policy.json`

The relative or absolute path of a file that maps roles to permissions for a given service. Relative paths must be specified in relation to the configuration file setting this option.

Table 47: Deprecated Variations

Group	Name
DEFAULT	<code>policy_file</code>

### policy\_default\_rule

**Type** string

**Default** `default`

Default rule. Enforced when a requested rule is not found.

Table 48: Deprecated Variations

Group	Name
DEFAULT	<code>policy_default_rule</code>

### policy\_dirs

**Type** multi-valued

**Default** `policy.d`

Directories where policy configuration files are stored. They can be relative to any directory in the search path defined by the `config_dir` option, or absolute paths. The file defined by `policy_file` must exist for these directories to be searched. Missing or empty directories are ignored.

Table 49: Deprecated Variations

Group	Name
DEFAULT	<code>policy_dirs</code>

**remote\_content\_type****Type** string**Default** `application/x-www-form-urlencoded`**Valid Values** `application/x-www-form-urlencoded`, `application/json`

Content Type to send and receive data for REST based policy check

**remote\_ssl\_verify\_server\_cert****Type** boolean**Default** `False`

server identity verification for REST based policy check

**remote\_ssl\_ca\_cert\_file****Type** string**Default** `<None>`

Absolute path to ca cert file for REST based policy check

**remote\_ssl\_client\_cert\_file****Type** string**Default** `<None>`

Absolute path to client cert for REST based policy check

**remote\_ssl\_client\_key\_file****Type** string**Default** `<None>`

Absolute path client key file REST based policy check

**placement****cafile****Type** string**Default** `<None>`

PEM encoded Certificate Authority to use when verifying HTTPs connections.

**certfile**

**Type** string

**Default** <None>

PEM encoded client certificate cert file

#### **keyfile**

**Type** string

**Default** <None>

PEM encoded client certificate key file

#### **insecure**

**Type** boolean

**Default** False

Verify HTTPS connections.

#### **timeout**

**Type** integer

**Default** <None>

Timeout value for http requests

#### **collect\_timing**

**Type** boolean

**Default** False

Collect per-API call timing information.

#### **split\_loggers**

**Type** boolean

**Default** False

Log requests to multiple loggers.

#### **auth\_type**

**Type** unknown type

**Default** <None>

Authentication type to load

Table 50: Deprecated Variations

Group	Name
placement	auth_plugin

#### **auth\_section**

**Type** unknown type

**Default** <None>

Config Section from which to load plugin specific options

**auth\_url****Type** unknown type**Default** <None>

Authentication URL

**system\_scope****Type** unknown type**Default** <None>

Scope for system operations

**domain\_id****Type** unknown type**Default** <None>

Domain ID to scope to

**domain\_name****Type** unknown type**Default** <None>

Domain name to scope to

**project\_id****Type** unknown type**Default** <None>

Project ID to scope to

**project\_name****Type** unknown type**Default** <None>

Project name to scope to

**project\_domain\_id****Type** unknown type**Default** <None>

Domain ID containing project

**project\_domain\_name****Type** unknown type**Default** <None>

Domain name containing project

**trust\_id****Type** unknown type

**Default** <None>

Trust ID

#### **default\_domain\_id**

**Type** unknown type

**Default** <None>

Optional domain ID to use with v3 and v2 parameters. It will be used for both the user and project domain in v3 and ignored in v2 authentication.

#### **default\_domain\_name**

**Type** unknown type

**Default** <None>

Optional domain name to use with v3 API and v2 parameters. It will be used for both the user and project domain in v3 and ignored in v2 authentication.

#### **user\_id**

**Type** unknown type

**Default** <None>

User ID

#### **username**

**Type** unknown type

**Default** <None>

Username

Table 51: Deprecated Variations

Group	Name
placement	user-name
placement	user_name

#### **user\_domain\_id**

**Type** unknown type

**Default** <None>

Users domain id

#### **user\_domain\_name**

**Type** unknown type

**Default** <None>

Users domain name

#### **password**

**Type** unknown type

**Default** <None>

Users password

**tenant\_id**

**Type** unknown type

**Default** <None>

Tenant ID

**tenant\_name**

**Type** unknown type

**Default** <None>

Tenant Name

**service\_type**

**Type** string

**Default** placement

The default service\_type for endpoint URL discovery.

**service\_name**

**Type** string

**Default** <None>

The default service\_name for endpoint URL discovery.

**valid\_interfaces**

**Type** list

**Default** ['internal', 'public']

List of interfaces, in order of preference, for endpoint URL.

**region\_name**

**Type** string

**Default** <None>

The default region\_name for endpoint URL discovery.

**endpoint\_override**

**Type** string

**Default** <None>

Always use this endpoint URL for requests for this client. NOTE: The unversioned endpoint should be specified here; to request a particular API version, use the *version*, *min-version*, and/or *max-version* options.

**connect\_retries**

**Type** integer

**Default** <None>

The maximum number of retries that should be attempted for connection errors.

**connect\_retry\_delay****Type** floating point**Default** <None>

Delay (in seconds) between two retries for connection errors. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

**status\_code\_retries****Type** integer**Default** <None>

The maximum number of retries that should be attempted for retrieable HTTP status codes.

**status\_code\_retry\_delay****Type** floating point**Default** <None>

Delay (in seconds) between two retries for retrieable status codes. If not set, exponential retry starting with 0.5 seconds up to a maximum of 60 seconds is used.

**service\_user**

Configuration options for service to service authentication using a service token. These options allow sending a service token along with the users token when contacting external REST APIs.

**send\_service\_user\_token****Type** boolean**Default** False

When True, if sending a user token to a REST API, also send a service token.

**cafile****Type** string**Default** <None>

PEM encoded Certificate Authority to use when verifying HTTPs connections.

**certfile****Type** string**Default** <None>

PEM encoded client certificate cert file

**keyfile****Type** string**Default** <None>

PEM encoded client certificate key file

**insecure**



**Type** boolean

**Default** `False`

Verify HTTPS connections.

#### **timeout**

**Type** integer

**Default** `<None>`

Timeout value for http requests

#### **collect\_timing**

**Type** boolean

**Default** `False`

Collect per-API call timing information.

#### **split\_loggers**

**Type** boolean

**Default** `False`

Log requests to multiple loggers.

#### **auth\_type**

**Type** unknown type

**Default** `<None>`

Authentication type to load

Table 52: Deprecated Variations

Group	Name
service_user	auth_plugin

#### **auth\_section**

**Type** unknown type

**Default** `<None>`

Config Section from which to load plugin specific options

#### **auth\_url**

**Type** unknown type

**Default** `<None>`

Authentication URL

#### **system\_scope**

**Type** unknown type

**Default** `<None>`

Scope for system operations

**domain\_id****Type** unknown type**Default** <None>

Domain ID to scope to

**domain\_name****Type** unknown type**Default** <None>

Domain name to scope to

**project\_id****Type** unknown type**Default** <None>

Project ID to scope to

**project\_name****Type** unknown type**Default** <None>

Project name to scope to

**project\_domain\_id****Type** unknown type**Default** <None>

Domain ID containing project

**project\_domain\_name****Type** unknown type**Default** <None>

Domain name containing project

**trust\_id****Type** unknown type**Default** <None>

Trust ID

**default\_domain\_id****Type** unknown type**Default** <None>

Optional domain ID to use with v3 and v2 parameters. It will be used for both the user and project domain in v3 and ignored in v2 authentication.

**default\_domain\_name****Type** unknown type

**Default** <None>

Optional domain name to use with v3 API and v2 parameters. It will be used for both the user and project domain in v3 and ignored in v2 authentication.

**user\_id**

**Type** unknown type

**Default** <None>

User ID

**username**

**Type** unknown type

**Default** <None>

Username

Table 53: Deprecated Variations

Group	Name
service_user	user-name
service_user	user_name

**user\_domain\_id**

**Type** unknown type

**Default** <None>

Users domain id

**user\_domain\_name**

**Type** unknown type

**Default** <None>

Users domain name

**password**

**Type** unknown type

**Default** <None>

Users password

**tenant\_id**

**Type** unknown type

**Default** <None>

Tenant ID

**tenant\_name**

**Type** unknown type

**Default** <None>

Tenant Name

**ssl****ca\_file****Type** string**Default** <None>

CA certificate file to use to verify connecting clients.

Table 54: Deprecated Variations

Group	Name
DEFAULT	ssl_ca_file

**cert\_file****Type** string**Default** <None>

Certificate file to use when starting the server securely.

Table 55: Deprecated Variations

Group	Name
DEFAULT	ssl_cert_file

**key\_file****Type** string**Default** <None>

Private key file to use when starting the server securely.

Table 56: Deprecated Variations

Group	Name
DEFAULT	ssl_key_file

**version****Type** string**Default** <None>

SSL version to use (valid only if SSL enabled). Valid values are TLSv1 and SSLv23. SSLv2, SSLv3, TLSv1\_1, and TLSv1\_2 may be available on some distributions.

**ciphers****Type** string**Default** <None>

Sets the list of available ciphers. value should be a string in the OpenSSL cipher list format.

## Cyborg Configuration Sample

Sample configuration files for all Cyborg services are found in the online version of this documentation.

## Cyborg Sample Policy

**Warning:** JSON formatted policy file is deprecated since Cyborg 5.0.0(Victoria). Use YAML formatted file. Use `oslopolicy-convert-json-to-yaml` tool to convert the existing JSON to YAML formatted policy file in backward compatible way.

The following is a sample cyborg policy file that has been auto-generated from default policy values in code. If you're using the default policies, then the maintenance of this file is not necessary, and it should not be copied into a deployment. Doing so will result in duplicate policy definitions. It is here to help explain which policy operations protect specific cyborg APIs, but it is not suggested to copy and paste into a deployment unless you're planning on providing a different policy for an operation that is not the default.

If you wish build a policy file, you can also use `tox -e genpolicy` to generate it.

The sample policy file can also be downloaded in [file form](#).

```
# Default rule for System Admin APIs.
#"system_admin_api": "role:admin and system_scope:all"

# Default rule for System level read only APIs.
#"system_reader_api": "role:reader and system_scope:all"

# Default rule for Project level admin APIs.
#"project_admin_api": "role:admin and project_id:%(project_id)s"

# Default rule for Project level non admin APIs.
#"project_member_api": "role:member and project_id:%(project_id)s"

# Default rule for Project level read only APIs.
#"project_reader_api": "role:reader and project_id:%(project_id)s"

# Default rule for system_admin+owner APIs.
#"system_admin_or_owner": "rule:system_admin_api or rule:project_member_api
↪"

# Default rule for System+Project read only APIs.
#"system_or_project_reader": "rule:system_reader_api or rule:project_
↪reader_api"

# DEPRECATED
# "public_api" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# legacy rule of Internal flag for public API routes
```

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```

#"public_api": "is_public_api:True"

# DEPRECATED
# "allow" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# legacy rule: any access will be passed
#"allow": "@"

# DEPRECATED
# "deny" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# legacy rule: all access will be forbidden
#"deny": "!"

# DEPRECATED
# "default" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# Legacy rule for default rule
#"default": "rule:admin_or_owner"

# DEPRECATED
# "admin_api" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# Legacy rule for cloud admin access
#"admin_api": "role:admin or role:administrator"

# DEPRECATED
# "is_admin" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# Full read/write API access
#"is_admin": "rule:admin_api"

```

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```

# DEPRECATED
# "admin_or_owner" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# Admin or owner API access
#"admin_or_owner": "is_admin:True or project_id:%(project_id)s"

# DEPRECATED
# "admin_or_user" has been deprecated since W.
# Cyborg API policies are introducing new default roles with
# scope_type capabilities. We will start to deprecate old policies
# from WALLABY release, and are going to ignore all the old policies
# silently from X release. Be sure to take these new defaults into
# consideration if you are relying on overrides in your deployment for
# the policy API.
# Admin or user API access
#"admin_or_user": "is_admin:True or user_id:%(user_id)s"

# Retrieve all device_profiles
# GET /v2/device_profiles
# Intended scope(s): system, project
#"cyborg:device_profile:get_all": "rule:system_or_project_reader"

# DEPRECATED
# "cyborg:device_profile:get_all":"rule:admin_or_owner" has been
# deprecated since W in favor of
# "cyborg:device_profile:get_all":"rule:system_or_project_reader".
# request admin_or_owmer rule is too strict for listing device_profile

# Retrieve a specific device_profile
# GET /v2/device_profiles/{device_profiles_uuid}
# Intended scope(s): system, project
#"cyborg:device_profile:get_one": "rule:system_or_project_reader"

# DEPRECATED
# "cyborg:device_profile:get_one":"rule:admin_or_owner" has been
# deprecated since W in favor of
# "cyborg:device_profile:get_one":"rule:system_or_project_reader".
# request admin_or_owmer rule is too strict for retrieving a
# device_profile

# Create a device_profile
# POST /v2/device_profiles
# Intended scope(s): system
#"cyborg:device_profile:create": "rule:system_admin_api"

# DEPRECATED
# "cyborg:device_profile:create":"rule:is_admin" has been deprecated
# since W in favor of
# "cyborg:device_profile:create":"rule:system_admin_api".
# project_admin_or_owner is too permissive, introduce system_scoped

```

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```
# admin for creation

# Delete device_profile(s)
# DELETE /v2/device_profiles/{device_profiles_uuid}
# DELETE /v2/device_profiles?value={device_profile_name1}
# Intended scope(s): system
#"cyborg:device_profile:delete": "rule:system_admin_api"

# DEPRECATED
# "cyborg:device_profile:delete":"rule:admin_or_owner" has been
# deprecated since W in favor of
# "cyborg:device_profile:delete":"rule:system_admin_api".
# project_admin_or_owner is too permissive, introduce system_scoped
# admin for deletion

# Show device detail
#"cyborg:device:get_one": "rule:allow"

# Retrieve all device records
#"cyborg:device:get_all": "rule:allow"

# Show deployable detail
#"cyborg:deployable:get_one": "rule:allow"

# Retrieve all deployable records
#"cyborg:deployable:get_all": "rule:allow"

# FPGA programming.
#"cyborg:deployable:program": "rule:allow"

# Retrieve accelerator request records.
#"cyborg:arq:get_all": "rule:default"

# Get an accelerator request record.
#"cyborg:arq:get_one": "rule:default"

# Create accelerator request records.
#"cyborg:arq:create": "rule:allow"

# Delete accelerator request records.
#"cyborg:arq:delete": "rule:default"

# Update accelerator request records.
#"cyborg:arq:update": "rule:default"

# Show fpga detail
#"cyborg:fpga:get_one": "rule:allow"

# Retrieve all fpga records
#"cyborg:fpga:get_all": "rule:allow"

# Update fpga records
#"cyborg:fpga:update": "rule:allow"
```



## Cyborg Policy Configuration Guide

Cyborg, like most OpenStack projects, uses a policy language to restrict permissions on REST API actions.

- *Policy Concepts*: In the Victoria release, Cyborg API policy defines new default roles with system scope capabilities. These new changes improve the security level and manageability of Cyborg API as they are richer in terms of handling access at system and project level token with Read and Write roles.

## Understanding Cyborg Policies

**Warning:** JSON formatted policy file is deprecated since Cyborg (Victoria). Use YAML formatted file. Use `oslopolicy-convert-json-to-yaml` tool to convert the existing JSON to YAML formatted policy file in backward compatible way.

Cyborg supports a rich policy system that has evolved significantly over its lifetime. Initially, cyborg policy defaults have been defined in the codebase, requiring the `policy.json` file only to override these defaults. Starting in the Victoria release, policy file has been changed from `policy.json` to `policy.yaml`.

The old default policy in Cyborg is incomplete and not good enough. Since Cyborg V2 API is newly implemented in Train, RBAC check for V2 API still remains incomplete. So in the Ussuri release, the specification of policy refresh was approved. In the Victoria release, Cyborg landed the new default roles to improve some issues that had been identified:

1. No `allow`. Old policy `allow` means any access will be passed. `allow` rule was used by `cyborg:arq:create`, which is too slack.
2. No global vs project admin. The old role `is_admin` is used for the global admin that is able to make almost any change to Cyborg, and see all details of the Cyborg system. The rule passes for any user with an admin role, it doesnt matter which project is used.
3. No `admin_or_owner`. Old role `admin_or_owner` sounds like it checks if the user is a member of a project. However, for most APIs we use the default target which means this rule will pass for any authenticated user.
4. Introduce `scope_type` and `reader` role. There still some cases which are not well covered. For example, it is impossible to allow a user to retrieve/update devices which are shared by multiple projects from a system level without being given the global admin role. In addition, cyborg now doesnt have a `reader` role.

Keystone comes with `admin`, `member` and `reader` roles by default. Please refer to [keystone document](#) for more information about these new defaults. In addition, keystone supports a new system scope concept that makes it easier to protect deployment level resources from project or system level resources. Please refer to [token scopes](#) and [system scope specification](#) to understand the scope concept.

In the Cyborg (Victoria) release, Cyborg policies implemented the scope concept and default roles provided by keystone (`admin`, `member`, and `reader`). Using common roles from keystone reduces the likelihood of similar, but different, roles implemented across projects or deployments. With the help of the new defaults it is easier to understand who can do what across projects, reduces divergence, and increases interoperability.

The below sections explain how these new defaults in the Cyborg can solve the issues mentioned above and extend more functionality to end users in a safe and secure way.

More information is provided in the [cyborg specification](#)

## Scope

OpenStack Keystone supports different scopes in tokens. These are described [here](#). Token scopes represent the layer of authorization. Policy `scope_types` represent the layer of authorization required to access an API.

---

**Note:** The `scope_type` of each policy is hardcoded and is not overridable via the policy file.

---

Cyborg policies have implemented the scope concept by defining the `scope_type` in policies. To know each policy's `scope_type`, please refer to the *Policy Reference* and look for `Scope Types` or `Intended scope(s)` in *Policy Sample File* as shown in below examples.

### system scope

Policies with a `scope_type` of `system` means a user with a `system-scoped` token has permission to access the resource. This can be seen as a global role. All the system-level operations policies have defaulted to `scope_type` of `['system']`.

For example, consider the `POST /v2/device_profiles` API.

```
# Create a device_profile
# POST /v2/device_profiles
# Intended scope(s): system
#"cyborg:device_profile:create": "rule:system_admin_api"
```

### project scope

Policies with a `scope_type` of `project` means a user with a `project-scoped` token has permission to access the resource. This can be seen as a project role. All the project-level operations policies should be set to `scope_type` of `['project']` by default.

### system and project scope

Policies with a `scope_type` of `system` and `project` means a user with a `system-scoped` or `project-scoped` token has permission to access the resource. All the system and project level operations policies have defaulted to `scope_type` of `['system', 'project']`.

For example, consider the `GET /v2/device_profiles/{device_profiles_uuid}` API.

```
# Retrieve a specific device_profile
# GET /v2/device_profiles/{device_profiles_uuid}
# Intended scope(s): system, project
#"cyborg:device_profile:get_one": "rule:system_or_project_reader"
```

These scope types provide a way to differentiate between system-level and project-level access roles. You can control the information with scope of the users.

Policy scope is disabled by default to allow operators to migrate from the old policy enforcement system in a graceful way. This can be enabled by configuring the `oslo_policy.enforce_scope` option to True.

---

**Note:** [oslo\_policy] enforce\_scope=True

---

## Roles

You can refer to [this](#) document to know about all available defaults from Keystone.

Along with the `scope_type` feature, Cyborg policy defines new defaults for each policy.

### reader

This provides read-only access to the resources within the `system` or `project`. Cyborg policies are defaulted to below rules:

```
system_reader_api
  Default
    role:reader and system_scope:all

project_reader_api
  Default
    role:reader and project_id:%(project_id)s

system_or_project_reader
  Default
    rule:system_reader_api or rule:project_reader_api
```

### member

This role is to perform the project level write operation with combination to the system admin. Cyborg policies are defaulted to below rules:

```
project_member_api
  Default
    role:member and project_id:%(project_id)s

system_admin_or_owner
  Default
    rule:system_admin_api or rule:project_member_api
```

## admin

This role is to perform the admin level write operation at system as well as at project-level operations. Cyborg policies are defaulted to below rules:

```
system_admin_api
  Default
  role:admin and system_scope:all

project_admin_api
  Default
  role:admin and project_id:%(project_id)s

system_admin_or_owner
  Default
  rule:system_admin_api or rule:project_member_api
```

With these new defaults, you can solve the problem of:

1. Providing the read-only access to the user. Policies are made more granular and defaulted to reader rules. For example: If you need to let someone audit your deployment for security purposes.
2. Customize the policy in better way. For example, you will be able to provide access to project level member to perform arq patch/post for instance boot with the projects token.

## Backward Compatibility

During the development period (Victoria and Wallaby releases), the new and old policy will both work for backward compatibility by supporting the old defaults and disabling the `scope_type` feature by default. This means the old defaults and deployments that use them will keep working as-is. However, we encourage every deployment to switch to new policy. `scope_type` will be enabled by default and the old defaults will be removed starting in the X release.

To implement the new default reader roles, some policies needed to become granular. They have been renamed, with the old names still supported for backwards compatibility.

## Migration Plan

To have a graceful migration, Cyborg provides two flags to switch to the new policy completely. You do not need to overwrite the policy file to adopt the new policy defaults.

Here is step wise guide for migration:

1. Create scoped token:

You need to create the new token with scope knowledge via below CLI:

- [Create System Scoped Token.](#)
- [Create Project Scoped Token.](#)

2. Create new default roles in keystone if not done:

If you do not have new defaults in Keystone then you can create and re-run the [Keystone Bootstrap](#). Keystone added this support in 14.0.0 (Rocky) release.

### 3. Enable Scope Checks

The `oslo_policy.enforce_scope` flag is to enable the `scope_type` features. The scope of the token used in the request is always compared to the `scope_type` of the policy. If the scopes do not match, one of two things can happen. If `oslo_policy.enforce_scope` is True, the request will be rejected. If `oslo_policy.enforce_scope` is False, an warning will be logged, but the request will be accepted (assuming the rest of the policy passes). The default value of this flag is False.

---

**Note:** Before you enable this flag, you need to audit your users and make sure everyone who needs system-level access has a system role assignment in keystone.

---

### 4. Enable new defaults

The `oslo_policy.enforce_new_defaults` flag switches the policy to new defaults-only. This flag controls whether or not to use old deprecated defaults when evaluating policies. If True, the old deprecated defaults are not evaluated. This means if any existing token is allowed for old defaults but is disallowed for new defaults, it will be rejected. The default value of this flag is False.

---

**Note:** Before you enable this flag, you need to educate users about the different roles they need to use to continue using Cyborg APIs.

---

### 5. Check for deprecated policies

A few policies were made more granular to implement the reader roles. New policy names are available to use. If old policy names which are renamed are overwritten in policy file, then warning will be logged. Please migrate those policies to new policy names.

We expect all deployments to migrate to new policy by X release so that we can remove the support of old policies.

- *Policy Reference*: A complete reference of all policy points in cyborg and what they impact.

## Cyborg Policies

The following is an overview of all available policies in Cyborg.

**Warning:** JSON formatted policy file is deprecated since Cyborg (Victoria). Use YAML formatted file. Use `oslopolicy-convert-json-to-yaml` tool to convert the existing JSON to YAML formatted policy file in backward compatible way.

## cyborg.api

### system\_admin\_api

**Default** `role:admin and system_scope:all`

Default rule for System Admin APIs.

### system\_reader\_api

**Default** `role:reader and system_scope:all`

Default rule for System level read only APIs.

### project\_admin\_api

**Default** `role:admin and project_id:%(project_id)s`

Default rule for Project level admin APIs.

### project\_member\_api

**Default** `role:member and project_id:%(project_id)s`

Default rule for Project level non admin APIs.

### project\_reader\_api

**Default** `role:reader and project_id:%(project_id)s`

Default rule for Project level read only APIs.

### system\_admin\_or\_owner

**Default** `rule:system_admin_api or rule:project_member_api`

Default rule for system\_admin+owner APIs.

### system\_or\_project\_reader

**Default** `rule:system_reader_api or rule:project_reader_api`

Default rule for System+Project read only APIs.

### public\_api

**Default** `is_public_api:True`

legacy rule of Internal flag for public API routes

### allow

**Default** `@`

legacy rule: any access will be passed

### deny

**Default** `!`

legacy rule: all access will be forbidden

### default

**Default** `rule:admin_or_owner`

Legacy rule for default rule

**admin\_api**

**Default** `role:admin` or `role:administrator`

Legacy rule for cloud admin access

**is\_admin**

**Default** `rule:admin_api`

Full read/write API access

**admin\_or\_owner**

**Default** `is_admin:True` or `project_id:%(project_id)s`

Admin or owner API access

**admin\_or\_user**

**Default** `is_admin:True` or `user_id:%(user_id)s`

Admin or user API access

**cyborg:device\_profile:get\_all**

**Default** `rule:system_or_project_reader`

**Operations**

- **GET** `/v2/device_profiles`

**Scope Types**

- **system**
- **project**

Retrieve all device\_profiles

**cyborg:device\_profile:get\_one**

**Default** `rule:system_or_project_reader`

**Operations**

- **GET** `/v2/device_profiles/{device_profiles_uuid}`

**Scope Types**

- **system**
- **project**

Retrieve a specific device\_profile

**cyborg:device\_profile:create**

**Default** `rule:system_admin_api`

**Operations**

- **POST** `/v2/device_profiles`

**Scope Types**

- **system**

Create a device\_profile

**cyborg:device\_profile:delete**

**Default** rule:system\_admin\_api

**Operations**

- **DELETE** /v2/device\_profiles/{device\_profiles\_uuid}
- **DELETE** /v2/device\_profiles?value={device\_profile\_name1}

**Scope Types**

- **system**

Delete device\_profile(s)

**cyborg:device:get\_one**

**Default** rule:allow

Show device detail

**cyborg:device:get\_all**

**Default** rule:allow

Retrieve all device records

**cyborg:deployable:get\_one**

**Default** rule:allow

Show deployable detail

**cyborg:deployable:get\_all**

**Default** rule:allow

Retrieve all deployable records

**cyborg:deployable:program**

**Default** rule:allow

FPGA programming.

**cyborg:arq:get\_all**

**Default** rule:default

Retrieve accelerator request records.

**cyborg:arq:get\_one**

**Default** rule:default

Get an accelerator request record.

**cyborg:arq:create**

**Default** rule:allow

Create accelerator request records.

**cyborg:arq:delete**



**Default** rule:default

Delete accelerator request records.

**cyborg:arq:update**

**Default** rule:default

Update accelerator request records.

**cyborg:fpga:get\_one**

**Default** rule:allow

Show fpga detail

**cyborg:fpga:get\_all**

**Default** rule:allow

Retrieve all fpga records

**cyborg:fpga:update**

**Default** rule:allow

Update fpga records

## 2.2.2 Cyborg Support Matrix

Cyborg supports specific operations on VMs with attached accelerator resources, which are generally a subset of the full set of VM operations supported by Nova ([nova-vm-ops](#)).

In this release, these operations have a dependency on specific Nova patches ([nova-patches](#)). They can be expected to work in Cyborg only if and when these Nova patches get merged without significant changes. These operations are not supported in this release since the dependencies are not met.

Table 57: VM Operations Expected to Work With Nova Dependencies

VM Operation	Command
VM creation	openstack server create
VM deletion	openstack server delete
Reboot within VM	ssh to VM and reboot in OS
Soft reboot	openstack server reboot --soft
Pause/Unpause	openstack server pause, openstack server unpause
Lock/Unlock	openstack server lock, openstack server unlock
Rebuild/Evacuate	openstack server rebuild
Shelve/Unshelve	openstack server shelve, openstack server unshelve

Operations not listed here may or may not work.

## Driver Support

The list of drivers available as part of the Cyborg distribution at the time of release can be found in: `cyborg.accelerator.driver` section of `Cyborgs setup.cfg`

The following table provides additional information for individual drivers.

Table 58: Driver Support

Driver Name	Supported Products	Description	Notes	Temporary Test Report
Fake Driver	None	A driver that creates a fake device with accelerator resources of type FPGA. Useful for exploring Cyborg without hardware and for Continuous Integration testing.	None	None
Intel FPGA OPAE Driver	Intel PAC	The driver for Intel FPGA devices with OPAE software stack.	Supports programming of FPGA bitstreams of type gbs.	None
Nvidia GPU driver	None	The driver for Nvidia GPUs.	None	None
Ascend AI Chip driver	None	The driver for Huawei's Ascend AI chips.	None	None
Intel QAT Driver	Intel Quick-Assist Technology Card	The driver for Intel QAT Cards.	None	Test results reported at Aug 2020. Please reference: <a href="#">Intel QAT Driver Test Report</a>
Inspur FPGA Driver	None	The driver for Inspur FPGA Cards.	None	Test results reported at Aug 2020. Please reference: <a href="#">Inspur FPGA Driver Test Report</a>
Intel NIC Driver	None	The driver for Intel NIC Cards.	None	Test results reported at Feb 2021. Please reference: <a href="#">Intel NIC Driver Test Report</a>
Inspur NVMe SSD Driver	None	The driver for Inspur NVMe SSD DISK.	None	Test results reported at Feb 2021. Please reference: <a href="#">Inspur NVMe SSD Driver Test Report</a>

**Note:** Temporary Test Report: This is a temporary test report, it is only valid for a short time, if you encounter problems, please contact the [Cyborg team](#).

## FOR END USERS

As an end user of Cyborg, you'll use Cyborg to create and manage accelerators with either tools or the API directly.

### 3.1 Tools for using Cyborg

Information on the commands available through Cyborg's Command Line Interface (CLI) can be found in this section of documentation.

#### 3.1.1 Command-Line Interface Reference

##### **cyborg-status**

##### Synopsis

```
cyborg-status <category> <command> [<args>]
```

##### Description

**cyborg-status** is a tool that provides routines for checking the status of a Cyborg deployment.

##### Options

The standard pattern for executing a **cyborg-status** command is:

```
cyborg-status <category> <command> [<args>]
```

Run without arguments to see a list of available command categories:

```
cyborg-status
```

Categories are:

- upgrade

Detailed descriptions are below.

You can also run with a category argument such as `upgrade` to see a list of all commands in that category:

```
cyborg-status upgrade
```

These sections describe the available categories and arguments for `cyborg-status`.

## Upgrade

**cyborg-status upgrade check** Performs a release-specific readiness check before restarting services with new code. This command expects to have complete configuration and access to databases and services.

### Return Codes

Return code	Description
0	All upgrade readiness checks passed successfully and there is nothing to do.
1	At least one check encountered an issue and requires further investigation. This is considered a warning but the upgrade may be OK.
2	There was an upgrade status check failure that needs to be investigated. This should be considered something that stops an upgrade.
255	An unexpected error occurred.

### History of Checks

#### 2.0.0 (Stein)

- Placeholder to be filled in with checks as they are added in Stein.

## 3.2 Using the API

Following the Ussuri release, every Cyborg deployment should have the following endpoints:

`/` - list of available versions

`/v2` - the version 2 of the Acceleration API, it uses microversions

`/v2.0` - same API as `v2`, except uses microversions

The following guide concentrates on documenting the `v2` API, please note that the `v2.0` is the first microversion of the `v2` API and are also covered by this guide.

- [Cyborg API Reference](#): The complete reference for the accelerator API, including all methods and request / response parameters and their meaning.

## DOCUMENTATION FOR DEVELOPERS

### 4.1 Contributor Documentation

Contributing to Cybrog gives you the power to help add features, fix bugs, enhance documentation, and increase testing. Contributions of any type are valuable, and part of what keeps the project going. Here are a list of resources to get your started.

#### 4.1.1 Basic Information

##### So You Want to Contribute

For general information on contributing to OpenStack, please check out the [contributor guide](#) to get started. It covers all the basics that are common to all OpenStack projects: the accounts you need, the basics of interacting with our Gerrit review system, how we communicate as a community, etc.

Below will cover the more project specific information you need to get started with `{{cookiecutter.service}}`.

##### Communication

We use the `#openstack-cyborg` IRC channel.

The weekly meetings happen in this channel. You can find the meeting times, previous meeting logs and proposed meeting agendas at [Cyborg Team Meeting Page](#).

##### Contacting the Core Team

The core reviewers of Cyborg and their emails are listed in [Cyborg core team](#).

## New Feature Planning

To propose or plan new features, we add a new story in the [Cyborg Storyboard](#) and/or propose a specification in the [cyborg-specs](#) repository.

## Task Tracking

We track our tasks in the [Cyborg Storyboard](#).

If you're looking for some smaller, easier work item to pick up and get started on, ask in the IRC meeting.

## Reporting a Bug

You found an issue and want to make sure we are aware of it? You can do so by adding an entry in the [Cyborg Storyboard](#) or raising it in the IRC meeting.

## Getting Your Patch Merged

To merge a patch, it must pass all voting Zuul checks and get two +2s from core reviewers. We strive to avoid scenarios where one person from a company or organization proposes a patch, and two other core reviewers from the same organization approve it to get it merged. In other words, at least one among the patch author and the two approving reviewers must be from another organization.

We are constantly striving to improve quality. Proposed patches must generally have unit tests and/or functional tests that cover the changes, and strive to improve code coverage.

## Project Team Lead Duties

All common PTL duties are enumerated in the [PTL guide](#).

### 4.1.2 Reviewing

- *API Microversions*: How the API is (micro)versioned and what you need to do when adding an API exposed feature that needs a new microversion.
- *Release Notes*: When we need a release note for a contribution.
- *DevStack Quick Start*: Guidelines for handling setup devstack
- *Driver Development Guide*: Get your driver development guide to contribute

## API Microversions

### Background

Cyborg uses a framework we call API Microversions for allowing changes to the API while preserving backward compatibility. The basic idea is that a user has to explicitly ask for their request to be treated with a particular version of the API. So breaking changes can be added to the API without breaking users who don't specifically ask for it. This is done with an HTTP header `OpenStack-API-Version` which has as its value a string containing the name of the service, `accelerator`, and a monotonically increasing semantic version number starting from `2.0`. The full form of the header takes the form:

```
OpenStack-API-Version: accelerator 2.0
```

If a user makes a request without specifying a version, they will get the `_MIN_VERSION_STRING` (defined in `cyborg/api/controllers/v2/versions.py`) as the default version. This value is currently `2.0` and is expected to remain so for quite a long time.

There is a special value `latest` which can be specified, which will allow a client to always receive the most recent version (`_MAX_VERSION_STRING` defined in `cyborg/api/controllers/v2/versions.py`) of API responses from the server.

**Warning:** The `latest` value is mostly meant for integration testing and would be dangerous to rely on in client code since Cyborg microversions are not following semver and therefore backward compatibility is not guaranteed. Clients, like `python-cyborgclient`, should always require a specific microversion but limit what is acceptable to the version range that it understands at the time.

For full details please read the [Ussuri spec for microversions](#) and [Microversion Specification](#).

### When do I need a new Microversion?

A microversion is needed when the contract to the user is changed. The user contract covers many kinds of information such as:

- the Request
  - the list of resource urls which exist on the accelerator
    - Example: adding a new `accelerator_requests/{ID}/foo` which didn't exist in a previous version of the code
  - the list of query parameters that are valid on urls
    - Example: adding a new parameter `is_yellow` `accelerator_requests/{ID}?is_yellow=True`
  - the list of query parameter values for non free form fields
    - Example: parameter `filter_by` takes a small set of constants/enums A, B, C. Adding support for new enum D.
  - new headers accepted on a request
  - the list of attributes and data structures accepted.
    - Example: adding a new attribute description to the accelerator request body

- the Response
  - the list of attributes and data structures returned  
Example: adding a new attribute description to the output of `accelerator_requests/{ID}`
  - the allowed values of non free form fields  
Example: adding a new allowed `state` to `accelerator_requests/{ID}`
  - the list of status codes allowed for a particular request  
Example: an API previously could return 200, 400, 403, 404 and the change would make the API now also be allowed to return 409.  
See<sup>2</sup> for the 400, 403, 404 and 415 cases.
  - new headers returned on a response.
  - changing a status code on a particular response.  
Example: changing the return code of an API from 501 to 400.

---

**Note:** Fixing a bug so that a 400+ code is returned rather than a 500 or 503 does not require a microversion change. Its assumed that clients are not expected to handle a 500 or 503 response and therefore should not need to opt-in to microversion changes that fixes a 500 or 503 response from happening. According to the Open-Stack API Working Group, a **500 Internal Server Error** should **not** be returned to the user for failures due to user error that can be fixed by changing the request on the client side. See<sup>1</sup>.

---

The following flow chart attempts to walk through the process of do we need a microversion.

---

<sup>2</sup> The exception to not needing a microversion when returning a previously unspecified error code is the 400, 403, 404 and 415 cases. This is considered OK to return even if previously unspecified in the code since its implied given keystone authentication can fail with a 403 and API validation can fail with a 400 for invalid json request body. Request to url/resource that does not exist always fails with 404. Invalid content types are handled before API methods are called which results in a 415.

---

**Note:** When in doubt about whether or not a microversion is required for changing an error response code, consult the [Cyborg team](#).

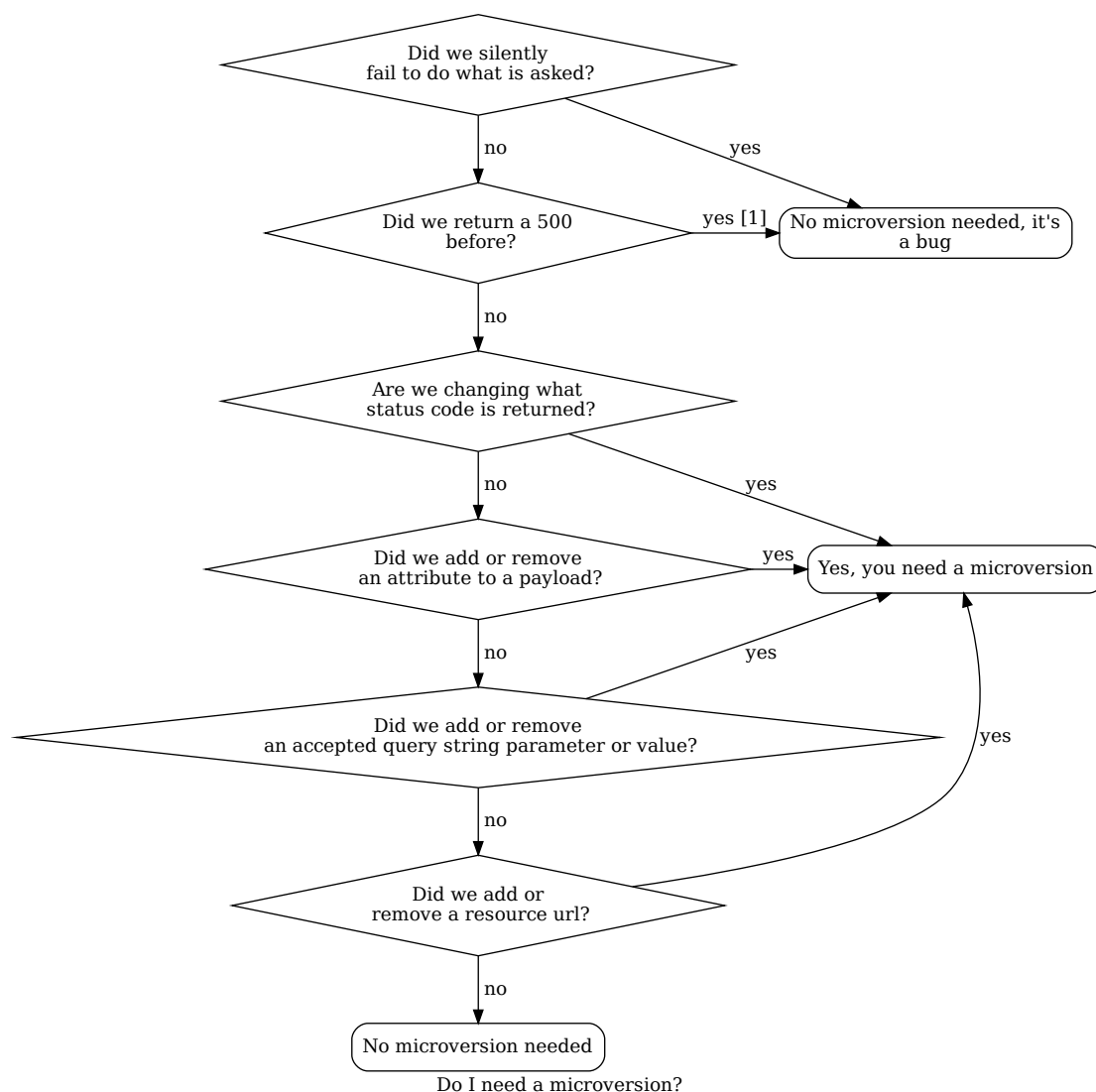
---

<sup>1</sup> When fixing 500 errors that previously caused stack traces, try to map the new error into the existing set of errors that API call could previously return (400 if nothing else is appropriate). Changing the set of allowed status codes from a request is changing the contract, and should be part of a microversion (except in<sup>2</sup>).

The reason why we are so strict on contract is that wed like application writers to be able to know, for sure, what the contract is at every microversion in Cyborg. If they do not, they will need to write conditional code in their application to handle ambiguities.

When in doubt, consider application authors. If it would work with no client side changes on both Cyborg versions, you probably dont need a microversion. If, on the other hand, there is any ambiguity, a microversion is probably needed.





## Footnotes

### When a microversion is not needed

A microversion is not needed in the following situation:

- the response
  - Changing the error message without changing the response code does not require a new microversion.
  - Removing an inapplicable HTTP header, for example, suppose the Retry-After HTTP header is being returned with a 4xx code. This header should only be returned with a 503 or 3xx response, so it may be removed without bumping the microversion.
  - An obvious regression bug in an admin-only API where the bug can still be fixed upstream on active stable branches. Admin-only APIs are less of a concern for interoperability and generally a regression in behavior can be dealt with as a bug fix when the documentation

clearly shows the API behavior was unexpectedly regressed.

## In Code

In `cyborg/api/controllers/v2/versions.py` we define some constants below:

- `BASE_VERSION`: value is 2 which is intended to be used as the Cyborg API version.
- `MINOR_0_INITIAL_VERSION`: value is 0 to be used as the initial value of microversion.
- `MINOR_X_Y`: Y is the change you want to make, X is the min version to support Y. For example, `MINOR_1_PROJECT_ID` means that the request `project_id` is supported from microversion 2.1.
- `MINOR_MAX_VERSION`: the max version, which equals to latest.
- `_MIN_VERSION_STRING`: the combination of `BASE_VERSION` and `MINOR_0_INITIAL_VERSION`, which means the min version of Cyborg API.
- `_MAX_VERSION_STRING` with the combination of `BASE_VERSION` and `MINOR_MAX_VERSION`, which means the max version of Cyborg API.

In `cyborg/api/controllers/v2/utils.py`, we define the check function of microversion.

For the example of `allow_project_id()` function, we compare the request version and the defined `MINOR_1_PROJECT_ID` to check whether the request is allowed. If the users request with the version which is lower than `MINOR_1_PROJECT_ID`, we will raise `Request not acceptable.` exception to the user.

```
def allow_project_id():
    # v2.1 added project_id for arq patch
    return api.request.version.minor >= versions.MINOR_1_PROJECT_ID
```

## Adding a new API method

In the controller class:

```
def my_api_method(self, req, id):
    if not utils.allow_project_id():
        raise exception.NotAcceptable(_(
            "Request not acceptable. The minimal required API "
            "version should be %(base)s.%(opr)s") %
            {'base': versions.BASE_VERSION,
             'opr': versions.MINOR_1_PROJECT_ID})
```

This method would only be available if the caller had specified an `OpenStack-API-Version` of `>= accelerator 2.1`. If they had specified a lower version (or not specified it and received the default of `accelerator 2.0`) the server would respond with `HTTP/406`.

## Other necessary changes

If you are adding a patch which adds a new microversion, it is necessary to add changes to other places which describe your change:

- Define `MINOR_{int}_{**}` in `cyborg/api/controllers/v2/versions.py`
- Update `MINOR_MAX_VERSION` to the defined `MINOR_{int}_{**}` in `cyborg/api/controllers/v2/versions.py`
- Add a verbose description of what changed in the new version to `cyborg/api/rest_api_version_history.rst`.
- Add a *release note* with a features section announcing the new or changed feature and the microversion.
- Update the expected versions in affected tests, for example in `cyborg.tests.unit.api.controllers.v2.test_args.TestARQsController#test_apply_patch_allow_project_id`.
- Make a new commit to `python-cyborgclient` and update corresponding files to enable the newly added microversion API.
- Update the [API Reference](#) documentation as appropriate. The source is located under `api-ref/source/`.

If applicable, add functional sample tests under `cyborg_tempest_plugin/tests/api/`

## Allocating a microversion

If you are adding a patch which adds a new microversion, it is necessary to allocate the next microversion number. The minor number of `_MAX_API_VERSION` will be incremented. This will also be the new microversion number for the API change. Developers may need over time to rebase their patch calculating a new version number as above based on the updated value of `_MAX_API_VERSION`.

## Testing Microversioned API Methods

Testing a microversioned API method is very similar to a normal controller method test, you just need to add the `OpenStack-API-Version` header, for example:

```
req = fakes.HTTPRequest.blank('/testable/url/endpoint')
req.headers = {'OpenStack-API-Version': 'accelerator 2.1'}
req.api_version_request = api_version.APIVersionRequest('2.1')

controller = controller.TestableController()

res = controller.index(req)
... assertions about the response ...
```

For many examples of testing, the canonical examples are in `cyborg.tests.unit.api.controllers.v2.test_args.TestARQsController#test_apply_patch_allow_project_id`.

## Release Notes

### What is reno ?

Cyborg uses `reno` for providing release notes in-tree. That means that a patch can include a *reno file* or a series can have a follow-on change containing that file explaining what the impact is.

A *reno file* is a YAML file written in the `releasenotes/notes` tree which is generated using the *reno* tool this way:

```
$ tox -e venv -- reno new <name-your-file>
```

where usually `<name-your-file>` can be `bp-<blueprint_name>` for a blueprint or `bug-XXXXXX` for a bugfix.

Refer to the [reno documentation](#) for more information.

### When a release note is needed

A release note is required anytime a reno section is needed. Below are some examples for each section. Any sections that would be blank should be left out of the note file entirely. If no section is needed, then you know you dont need to provide a release note :-)

- **upgrade**
  - The patch has an `UpgradeImpact` tag
  - A DB change needs some deployer modification (like a migration)
  - A configuration option change (deprecation, removal or modified default)
  - some specific changes that have a `DocImpact` tag but require further action from an deployer perspective
  - any patch that requires an action from the deployer in general
- **security**
  - If the patch fixes a known vulnerability
- **features**
  - If the patch has an `APIImpact` tag
  - For Cyborg api and python-cyborgclient changes, if it adds or changes a new command, including adding new options to existing commands
  - a new accelerator driver is provided or an existing driver impacts the *DriversSupport-Matrix*
- **critical**
  - Bugfixes categorized as Critical in storyboard *impacting users*
- **fixes**
  - No clear definition of such bugfixes. Hairy long-standing bugs with high importance that have been fixed are good candidates though.

Three sections are left intentionally unexplained (`prelude`, `issues` and `other`). Those are targeted to be filled in close to the release time for providing details about the soon-ish release. Dont use them unless you know exactly what you are doing.

## DevStack Quick Start

### Create stack user (optional)

Devstack should be run as a non-root user with sudo enabled (standard logins to cloud images such as ubuntu or cloud-user are usually fine).

You can quickly create a separate stack user to run DevStack with.

```
$ sudo useradd -s /bin/bash -d /opt/stack -m stack
```

Since this user will be making many changes to your system, it should have sudo privileges:

```
$ echo "stack ALL=(ALL) NOPASSWD: ALL" | sudo tee /etc/sudoers.d/stack
```

```
$ sudo su - stack
```

## Download DevStack

```
$ git clone https://opendev.org/openstack/devstack
```

```
$ cd devstack
```

The *devstack* repo contains a script that installs OpenStack.

### Create local.conf file

Create a *local.conf* file at the root of the devstack git repo.

### Host settings

```
[[local|localrc]]
HOST_IP=YOUR_IP_CONFIG
SERVICE_HOST=$HOST_IP
DATABASE_TYPE=mysql
MYSQL_HOST=$HOST_IP
RABBIT_HOST=$HOST_IP
```

- Replace `YOUR_IP_CONFIG` with your host IP (e.g. `10.0.0.72` or `localhost`).

## Password settings

```
# Passwords
DATABASE_PASSWORD=123
ADMIN_PASSWORD=123
MYSQL_PASSWORD=123
RABBIT_PASSWORD=123
SERVICE_PASSWORD=123
SERVICE_TOKEN=ADMIN
```

- Pre-set the passwords to prevent interactive prompts.

## Enable services

```
#FIXED_RANGE=192.168.128.0/24
#IPV4_ADDRS_SAFE_TO_USE=192.168.128.0/24
#GIT_BASE=/opt/git
disable_service n-net
disable_service tempest
disable_service heat
enable_service q-svc
enable_service q-agt
enable_service q-dhcp
enable_service q-l3
enable_service q-meta
enable_service neutron
enable_service n-novnc
enable_plugin cyborg https://opendev.org/openstack/cyborg
NOVA_VNC_ENABLED=True
NOVNC_PROXY_URL="http://$SERVICE_HOST:6080/vnc_auto.html"
VNC_SERVER_LISTEN=0.0.0.0
VNC_SERVER_PROXYCLIENT_ADDRESS=$SERVICE_HOST
RECLONE=False
#enable Logging
LOGFILE=/opt/stack/logs/stack.sh.log
VERBOSE=True
LOG_COLOR=True
LOGDIR=/opt/stack/logs
```

- Uncomment `GIT_BASE` configuration if you have a local git repo
- `enable_plugin cyborg` will execute `cyborg/devstack/plugin.sh` and start cyborg service
- The devstack logs will appear in `$LOGDIR`

---

**Note:** If you got version conflicts, please set `PIP_UPGRADE` to `True` in `local.conf`

---

## Multi-Node Lab

If you want to setup an OpenStack with cyborg in a realistic test configuration with multiple physical servers. Please ref<sup>1</sup>.

## Cluster Controller

```
disable_service cyborg-agent
```

## Compute Nodes

```
enable_service cyborg-agent
disable_service cyborg-api
disable_service cyborg-cond
```

- If you do not want to setup cyborg-agent on controller, you can disable it.
- You do not need to enable cyborg-api and cyborg-cond on compute nodes.

## Testing with unmerged changes

To test with changes that have not been merged, the `enable_plugin` line can be modified to specify the branch/reference to be cloned.

```
enable_plugin cyborg https://review.opendev.org/openstack/cyborg refs/
↳changes/28/708728/1
```

the format is

```
enable_plugin <directory name> <git repo url> <change/revision>
```

## Cell V2 Deployment

Compute node services must be mapped to a cell before they can be used. Cell V2 deployment, please ref<sup>2</sup>.

---

<sup>1</sup> Openstack Multi-Node Lab Setup

<sup>2</sup> Openstack Cell V2 Deployment Guide

## Run DevStack

```
$ ./stack.sh
```

This will take a 30-40 minutes, largely depending on the speed of your internet connection. Many git trees and packages will be installed during this process.

It will speed up your installation if you have a local GIT\_BASE.

## Use OpenStack

### Command line

You can *source openrc YOUR\_USER YOUR\_USER* (e.g. *source openrc admin admin*) in your shell, and then use the *openstack* command line tool to manage your devstack.

### Horizon

You can access horizon to experience the web interface to OpenStack, and manage vms, networks, volumes, and images from there.

## References

### Driver Development Guide

The goal of this document is to explain how to develop a new kind of Cyborg accelerator driver.

---

**Note:** Make sure you have installed Openstack environment using [devstack](#) before development.

---

### Derive a new driver class

Imply the necessary interface, the list of interfaces is as follows:

```
class NewCyborgDriver(object):
    """Cyborg new accelerator driver.
    """

    def discover(self):
        """Discover specific accelerator
        :return: list of cyborg.objects.driver_objects.driver_device.
               DriverDevice
        """
        pass
```



## Modify setup.cfg

Add the new driver map into file `cyborg/setup.cfg`:

```
[entry_points]
cyborg.accelerator.driver =
    intel_fpga_driver = cyborg.accelerator.drivers.fpga.intel.
→driver:IntelFPGADriver
    new_driver_name = cyborg.accelerator.drivers.example.
→driver:NewCyborgDriver
```

## Reinstall and Test

Reinstall cyborg:

```
$ python setup.py develop
```

Restart cyborg-agent:

```
$ sudo systemctl restart devstack@cyborg-agent
```

## INDICES AND TABLES

- search