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# **Sushy Documentation**

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**OpenStack Foundation**

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## OVERVIEW

Sushy is a Python library to communicate with [Redfish](#) based systems.

The goal of the library is to be extremely simple, small, have as few dependencies as possible and be very conservative when dealing with BMCs by issuing just enough requests to it (BMCs are very flaky).

Therefore, the scope of the library has been limited to what is supported by the [OpenStack Ironic](#) project. As the project grows and more features from [Redfish](#) are needed we can expand Sushy to fulfill those requirements.

- Free software: Apache license
- **Includes Redfish registry files licensed under** Creative Commons Attribution 4.0 License: <https://creativecommons.org/licenses/by/4.0/>
- Documentation: <https://docs.openstack.org/sushy/latest/>
- Usage: <https://docs.openstack.org/sushy/latest/reference/usage.html>
- Source: <https://opendev.org/openstack/sushy>
- Bugs: <https://storyboard.openstack.org/#!/project/960>



## FEATURES

- Abstraction around the SystemCollection and System resources (Basic server identification and asset information)
- RAID in Redfish based Systems
- Redfish Ethernet Interface
- System mappings
- System processor
- Storage management
- Systems power management (Both soft and hard; Including NMI injection)
- Changing systems boot device, frequency (Once or permanently) and mode (UEFI or BIOS)
- Chassis management
- OEM extention
- Virtual media management
- Session Management



## 3.1 Installing Sushy

At the command line:

```
$ pip install sushy
```

Or, if you have virtualenvwrapper installed:

```
$ mkvirtualenv sushy  
$ pip install sushy
```

## 3.2 Contributing to Sushy

### 3.2.1 How to contribute

If you would like to contribute to the development of OpenStack, you must follow the steps in this page:

<http://docs.openstack.org/infra/manual/developers.html>

If you already have a good understanding of how the system works and your OpenStack accounts are set up, you can skip to the development workflow section of this documentation to learn how changes to OpenStack should be submitted for review via the Gerrit tool:

<http://docs.openstack.org/infra/manual/developers.html#development-workflow>

Pull requests submitted through GitHub will be ignored.

Bugs should be filed in StoryBoard, not GitHub:

<https://storyboard.openstack.org/#!/project/960>

### 3.2.2 Running a Redfish emulator

Testing and/or developing Sushy without owning a real baremetal machine that supports the Redfish protocol is possible by running an emulator, the `sushy-tools` project ships with two emulators that can be used for this purpose. To install it run:

```
sudo pip install --user sushy-tools
```

**Note:** Installing the dependencies requires libvirt development files. For example, run the following command to install them on Fedora:

```
sudo dnf install -y libvirt-devel
```

#### Static emulator

After installing `sushy-tools` you will have a new CLI tool named `sushy-static`. This tool creates a HTTP server to serve any of the `Redfish` mockups. The files are static so operations like changing the boot device or the power state **will not** have any effect. But that should be enough for enabling people to test parts of the library.

To use `sushy-static` we need the Redfish mockup files that can be downloaded from <https://www.dmtf.org/standards/redfish>, for example:

```
wget https://www.dmtf.org/sites/default/files/standards/documents/DSP2043_
↪1.0.0.zip
```

After the download, extract the files somewhere in the file-system:

```
unzip DSP2043_1.0.0.zip -d <output-path>
```

Now run `sushy-static` pointing to those files. For example to serve the `DSP2043-server` mockup files, run:

```
sushy-static --mockup-files <output-path>/DSP2043-server
```

#### Libvirt emulator

The second emulator shipped by `sushy-tools` is the CLI tool named `sushy-emulator`. This tool starts a ReST API that users can use to interact with virtual machines using the Redfish protocol. So operations such as changing the boot device or the power state will actually affect the virtual machines. This allows users to test the library in a more dynamic way. To run it do

```
sushy-emulator

# Or, running with custom parameters
sushy-emulator --port 8000 --libvirt-uri "qemu:///system"
```

That's it, now you can test Sushy against the `http://localhost:8000` endpoint.

## Enabling SSL

Both mockup servers supports [SSL](#) if you want Sushy with it. To set it up, first you need to generate key and certificate files with OpenSSL use following command:

```
openssl req -x509 -newkey rsa:2048 -keyout key.pem -out cert.pem -days 365
```

Start the mockup server passing the `--ssl-certificate` and `--ssl-key` parameters to it, for example:

```
sushy-emulator --ssl-key key.pem --ssl-certificate cert.pem
```

Now to connect with [SSL](#) to the server use the `verify` parameter pointing to the certificate file when instantiating Sushy, for example:

```
import sushy

# Note the HTTP"S"
s = sushy.Sushy('https://localhost:8000', verify='cert.pem', username='foo
→', password='bar')
```

## 3.3 Sushy Library Reference

### 3.3.1 Usage

#### Using Sushy

To use sushy in a project:

#### Specifying an authentication type

There are three authentication objects. By default we use `SessionOrBasicAuth`.

Authentication Modes:

- `auth.SessionOrBasicAuth`: Use session based authentication. If we are unable to create a session we will fallback to basic authentication.
- `auth.BasicAuth`: Use basic authentication only.
- `auth.SessionAuth`: Use session based authentication only.

```
import logging

import sushy
from sushy import auth

# Enable logging at DEBUG level
LOG = logging.getLogger('sushy')
LOG.setLevel(logging.DEBUG)
LOG.addHandler(logging.StreamHandler())
```

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```
basic_auth = auth.BasicAuth(username='foo', password='bar')
session_auth = auth.SessionAuth(username='foo', password='bar')
session_or_basic_auth = auth.SessionOrBasicAuth(username='foo',
                                                password='bar')

s = sushy.Sushy('http://localhost:8000/redfish/v1',
               auth=basic_auth)

s = sushy.Sushy('http://localhost:8000/redfish/v1',
               auth=session_auth)

s = sushy.Sushy('http://localhost:8000/redfish/v1',
               auth=session_or_basic_auth)

# It is important to note that you can
# call sushy without supplying an
# authentication object. In that case we
# will use the SessionOrBasicAuth authentication
# object in an attempt to connect to all different
# types of redfish servers.
s = sushy.Sushy('http://localhost:8000/redfish/v1',
               username='foo',
               password='bar')
```

### Creating and using a sushy system object

```
import logging

import sushy

# Enable logging at DEBUG level
LOG = logging.getLogger('sushy')
LOG.setLevel(logging.DEBUG)
LOG.addHandler(logging.StreamHandler())

s = sushy.Sushy('http://localhost:8000/redfish/v1',
               username='foo', password='bar')

# Get the Redfish version
print(s.redfish_version)

# Instantiate a system object
sys_inst = s.get_system('/redfish/v1/Systems/437XR1138R2')

# Using system collections

# Instantiate a SystemCollection object
sys_col = s.get_system_collection()

# Print the ID of the systems available in the collection
print(sys_col.members_identities)
```

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```

# Get a list of systems objects available in the collection
sys_col_insts = sys_col.get_members()

# Instantiate a system object, same as getting it directly
# from the s.get_system()
sys_inst = sys_col.get_member(sys_col.members_identities[0])

# Refresh the system collection object
#
# See below for more options on how to refresh resources.
sys_col.refresh()

# Using system actions

# Power the system ON
sys_inst.reset_system(sushy.ResetType.ON)

# Get a list of allowed reset values
print(sys_inst.get_allowed_reset_system_values())

# Refresh the system object (with all its sub-resources)
sys_inst.refresh()

# Alternatively, you can only refresh the resource if it is stale by_
→passing
# force=False:
sys_inst.refresh(force=False)

# A resource can be marked stale by calling invalidate. Note that its
# subresources won't be marked as stale, and thus they won't be refreshed_
→by
# a call to refresh(force=False)
sys_inst.invalidate()

# Get the current power state
print(sys_inst.power_state)

# Set the next boot device to boot once from PXE in UEFI mode
sys_inst.set_system_boot_source(sushy.BootSource.PXE,
                                enabled=sushy.BootSourceOverrideEnabled.
→ONCE,
                                mode=sushy.BootSourceOverrideMode.UEFI)

# Get the current boot source information
print(sys_inst.boot)

# Get a list of allowed boot source target values
print(sys_inst.get_allowed_system_boot_source_values())

# Get the memory summary
print(sys_inst.memory_summary)

# Get the processor summary

```

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```
print(sys_inst.processors.summary)
```

## Creating and using a sushy manager object

```
import logging

import sushy

# Enable logging at DEBUG level
LOG = logging.getLogger('sushy')
LOG.setLevel(logging.DEBUG)
LOG.addHandler(logging.StreamHandler())

s = sushy.Sushy('http://localhost:8000/redfish/v1',
              username='foo', password='bar')

# Instantiate a manager object
mgr_inst = s.get_manager('BMC')

# Get the manager name & description
print(mgr_inst.name)
print(mgr_inst.description)

# Using manager collections

# Instantiate a ManagerCollection object
mgr_col = s.get_manager_collection()

# Print the ID of the managers available in the collection
print(mgr_col.members_identities)

# Get a list of manager objects available in the collection
mgr_insts = mgr_col.get_members()

# Instantiate a manager object, same as getting it directly
# from the s.get_manager()
mgr_inst = mgr_col.get_member(mgr_col.members_identities[0])

# Refresh the manager collection object
mgr_col.invalidate()
mgr_col.refresh()

# Using manager actions

# Get supported graphical console types
print(mgr_inst.get_supported_graphical_console_types())

# Get supported serial console types
print(mgr_inst.get_supported_serial_console_types())
```

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```
# Get supported command shell types
print(mgr_inst.get_supported_command_shell_types())

# Get a list of allowed manager reset values
print(mgr_inst.get_allowed_reset_manager_values())

# Reset the manager
mgr_inst.reset_manager(sushy.ResetType.FORCE_RESTART)

# Refresh the manager object (with all its sub-resources)
mgr_inst.refresh(force=True)

# Using Virtual Media

# Instantiate a VirtualMediaCollection object
virtmedia_col = mgr_inst.virtual_media

# Print the ID of the VirtualMedia available in the collection
print(virtmedia_col.members_identities)

# Get a list of VirtualMedia objects available in the collection
virtmedia_insts = virtmedia_col.get_members()

# Instantiate a VirtualMedia object
virtmedia_inst = virtmedia_col.get_member(
    virtmedia_col.members_identities[0])

# Print out some of the VirtualMedia properties
print(virtmedia_inst.name,
      virtmedia_inst.media_types)

# Insert virtual media (invalidates virtmedia_inst contents)
virtmedia_inst.insert_media('https://www.dmtf.org/freeImages/Sardine.img')

# Refresh the resource to load actual contents
virtmedia_inst.refresh()

# Print out some of the VirtualMedia properties
print(virtmedia_inst.image,
      virtmedia_inst.image_path,
      virtmedia_inst.inserted,
      virtmedia_inst.write_protected)

# ... Boot the system off the virtual media...

# Eject virtual media (invalidates virtmedia_inst contents)
virtmedia_inst.eject_media()
```

### Creating and using a sushy client with Sessions

```
import logging

import sushy

# Enable logging at DEBUG level
LOG = logging.getLogger('sushy')
LOG.setLevel(logging.DEBUG)
LOG.addHandler(logging.StreamHandler())

s = sushy.Sushy('http://localhost:8000/redfish/v1',
               username='foo', password='bar')

# Get the ComputerSystem object (if there is only one), otherwise
# the identity must be provided as a path to the system.
system = s.get_system()

# A session is created automatically for you.
# Print the boot field in the ComputerSystem.
print(system.boot)

# Upon session timeout, Sushy recreates the session based upon
# provided credentials. If this fails, an exception is raised.

# Explicitly request a session_key and session_uri.
# This is not stored, but may be useful.
session_key, session_uri = s.create_session(username='foo',
                                             password='bar')

# Retrieve the session
session = s.get_session(session_uri)

# Delete the session
session.delete()
```

### Using OEM extensions

Before running this example, please make sure you have a Redfish BMC that includes the OEM piece for a specific vendor, as well as the Sushy OEM extension package installed in the system for the same vendor.

You can check the presence of the OEM extension within each Redfish resource by specifying the vendor ID and search for them.

In the following example, we are looking up “Acme” vendor extension to Redfish Manager resource.

```
import sushy

root = sushy.Sushy('http://localhost:8000/redfish/v1')

# Instantiate a system object
system = root.get_system('/redfish/v1/Systems/437XR1138R2')

print('Working on system resource %s' % system.identity)
```

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```
for manager in system.managers:

    print('Using System manager %s' % manager.identity)

    # Get a list of OEM extension names for the system manager
    oem_vendors = manager.oem_vendors

    print('Listing OEM extension name(s) for the System '
          'manager %s' % manager.identity )

    print(*oem_vendors, sep="\n")

    try:
        manager_oem = manager.get_oem_extension('Acme')

    except sushy.exceptions.OEMExtensionNotFoundError:
        print('ERROR: Acme OEM extension not found in '
              'Manager %s' % manager.identity)
        continue

    print('%s is an OEM extension of Manager %s'
          % (manager_oem.get_extension(), manager.identity))

    # set boot device to a virtual media device image
    manager_oem.set_virtual_boot_device(sushy.VirtualMediaType.CD,
                                        manager=manager)
```

If you do not have any real baremetal machine that supports the Redfish protocol you can look at the [Contributing to Sushy](#) page to learn how to run a Redfish emulator.

For the OEM extension example, presently, both of the emulators (static/dynamic) do not expose any OEM; as a result, users may need to add manually some OEM resources to emulators' templates. It may be easier to start with a static emulator.

### 3.3.2 Sushy Python API Reference

- [modindex](#)

#### [sushy](#)

#### [sushy package](#)

#### [Subpackages](#)

#### [sushy.resources package](#)

#### [Subpackages](#)

#### [sushy.resources.certificateservice package](#)

### Submodules

`sushy.resources.certificateservice.certificate` module

`sushy.resources.certificateservice.certificateservice` module

`sushy.resources.certificateservice.constants` module

### Module contents

`sushy.resources.chassis` package

### Subpackages

`sushy.resources.chassis.power` package

### Submodules

`sushy.resources.chassis.power.constants` module

`sushy.resources.chassis.power.power` module

### Module contents

`sushy.resources.chassis.thermal` package

### Submodules

`sushy.resources.chassis.thermal.constants` module

`sushy.resources.chassis.thermal.thermal` module

### Module contents

### Submodules

`sushy.resources.chassis.chassis` module

`sushy.resources.chassis.constants` module

### Module contents

`sushy.resources.compositionservice` package

### Submodules

`sushy.resources.compositionservice.compositionservice` module

`sushy.resources.compositionservice.constants` module

`sushy.resources.compositionservice.resourceblock` module

`sushy.resources.compositionservice.resourcezone` module

### Module contents

`sushy.resources.eventservice` package

### Submodules

`sushy.resources.eventservice.constants` module

`sushy.resources.eventservice.eventdestination` module

`sushy.resources.eventservice.eventservice` module

### Module contents

`sushy.resources.fabric` package

### Submodules

`sushy.resources.fabric.constants` module

`sushy.resources.fabric.endpoint` module

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### Module contents

`sushy.resources.manager` package

### Submodules

`sushy.resources.manager.constants` module

`sushy.resources.manager.manager` module

sushy.resources.manager.virtual\_media module

#### Module contents

sushy.resources.oem package

#### Submodules

sushy.resources.oem.base module

sushy.resources.oem.common module

sushy.resources.oem.fake module

#### Module contents

sushy.resources.registry package

#### Submodules

sushy.resources.registry.attribute\_registry module

sushy.resources.registry.constants module

sushy.resources.registry.message\_registry module

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sushy.resources.sessionservice package

#### Submodules

sushy.resources.sessionservice.session module

sushy.resources.sessionservice.sessionservice module

#### Module contents

sushy.resources.system package

#### Subpackages

`sushy.resources.system.network` package

#### Submodules

`sushy.resources.system.network.adapter` module

`sushy.resources.system.network.constants` module

`sushy.resources.system.network.device_function` module

`sushy.resources.system.network.port` module

#### Module contents

`sushy.resources.system.storage` package

#### Submodules

`sushy.resources.system.storage.constants` module

`sushy.resources.system.storage.controller` module

`sushy.resources.system.storage.drive` module

`sushy.resources.system.storage.storage` module

`sushy.resources.system.storage.volume` module

#### Module contents

#### Submodules

`sushy.resources.system.bios` module

`sushy.resources.system.constants` module

`sushy.resources.system.ethernet_interface` module

`sushy.resources.system.processor` module

`sushy.resources.system.secure_boot` module

`sushy.resources.system.secure_boot_database` module

sushy.resources.system.simple\_storage module

sushy.resources.system.system module

**Module contents**

sushy.resources.taskservice package

**Submodules**

sushy.resources.taskservice.constants module

sushy.resources.taskservice.task module

sushy.resources.taskservice.taskservice module

**Module contents**

sushy.resources.updateservice package

**Submodules**

sushy.resources.updateservice.constants module

sushy.resources.updateservice.softwareinventory module

sushy.resources.updateservice.updateservice module

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**Submodules**

sushy.resources.base module

sushy.resources.common module

sushy.resources.constants module

sushy.resources.ipaddresses module

sushy.resources.settings module

**Module contents**

## Submodules

### sushy.auth module

### sushy.connector module

### sushy.exceptions module

**exception** `sushy.exceptions.AccessError` (*method, url, response*)

Bases: `sushy.exceptions.HTTPError`

**exception** `sushy.exceptions.ArchiveParsingError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = `'Failed parsing archive "%(path)s": %(error)s'`

**exception** `sushy.exceptions.BadRequestError` (*method, url, response*)

Bases: `sushy.exceptions.HTTPError`

**exception** `sushy.exceptions.ConnectionError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = `'Unable to connect to %(url)s. Error: %(error)s'`

**exception** `sushy.exceptions.ExtensionError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = `'Sushy Extension Error: %(error)s'`

**exception** `sushy.exceptions.HTTPError` (*method, url, response*)

Bases: `sushy.exceptions.SushyError`

Basic exception for HTTP errors

**body** = `None`

Error JSON body, if present.

**code** = `'Base.1.0.GeneralError'`

Error code defined in the Redfish specification, if present.

**detail** = `None`

Error message defined in the Redfish specification, if present.

**extended\_info** = `None`

Extended information provided in the response.

**message** = `'HTTP %(method)s %(url)s returned code %(code)s.  
%(error)s Extended information: %(ext_info)s'`

**property related\_properties**

List of properties related to the error.

**status\_code** = `None`

HTTP status code.

**exception** `sushy.exceptions.InvalidParameterValueError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = 'The parameter "%(parameter)s" value "%(value)s" is invalid. Valid values are: %(valid\_values)s'

**exception** `sushy.exceptions.MalformedAttributeError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = 'The attribute %(attribute)s is malformed in the resource %(resource)s: %(error)s'

**exception** `sushy.exceptions.MissingActionError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = 'The action %(action)s is missing from the resource %(resource)s'

**exception** `sushy.exceptions.MissingAttributeError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = 'The attribute %(attribute)s is missing from the resource %(resource)s'

**exception** `sushy.exceptions.MissingHeaderError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = 'Response to %(target\_uri)s did not contain a %(header)s header'

**exception** `sushy.exceptions.MissingXAuthToken` (*method, url, response*)

Bases: `sushy.exceptions.HTTPError`

**message** = 'No X-Auth-Token returned from remote host when attempting to establish a session. Error: %(error)s'

**exception** `sushy.exceptions.OEMExtensionNotFoundError` (*message=None, \*\*kwargs*)

Bases: `sushy.exceptions.SushyError`

**message** = 'No %(resource)s OEM extension found by name "%(name)s".'

**exception** `sushy.exceptions.ResourceNotFoundError` (*method, url, response*)

Bases: `sushy.exceptions.HTTPError`

**message** = 'Resource %(url)s not found'

**exception** `sushy.exceptions.ServerSideError` (*method, url, response*)

Bases: `sushy.exceptions.HTTPError`

**exception** `sushy.exceptions.SushyError` (*message=None, \*\*kwargs*)

Bases: `Exception`

Basic exception for errors raised by Sushy

```
message = None
```

```
exception sushy.exceptions.UnknownDefaultError(message=None, **kwargs)
```

```
Bases: sushy.exceptions.SushyError
```

```
message = 'Failed at determining default for "%(entity)s":  
%(error)s'
```

```
sushy.exceptions.raise_for_response(method, url, response)
```

```
Raise a correct error class, if needed.
```

**sushy.main module**

**sushy.taskmonitor module**

**sushy.utils module**

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