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**bravado***core*

***Release 5.16.0***

**Nov 26, 2019**



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## Contents

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<b>1</b>	<b>Configuration</b>	<b>3</b>
<b>2</b>	<b>Python Models</b>	<b>5</b>
<b>3</b>	<b>User-Defined Formats</b>	<b>9</b>
<b>4</b>	<b>Changelog</b>	<b>13</b>
<b>5</b>	<b>Indices and tables</b>	<b>25</b>



bravado\_core is a Python library that implements the [Swagger 2.0](#) Specification.

Client and servers alike can use bravado\_core to implement these features:

- Swagger Schema ingestion and validation
- Validation and marshalling of requests and responses
- Validation and marshalling of user-defined Swagger formats
- Modelling Swagger *#/definitions* as Python classes or dicts

For example:

- [bravado](#) uses bravado-core to implement a fully functional Swagger client.
- [pyramid\\_swagger](#) uses bravado-core to seamlessly add Swagger support to Pyramid webapps.

Contents:



# CHAPTER 1

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## Configuration

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All configuration is stored in a dict.

```
from bravado_core.spec import Spec

spec_dict = json.loads(open('swagger.json', 'r').read())

config = {
    'validate_requests': False,
    'use_models': False,
}

swagger_spec = Spec.from_dict(spec_dict, config=config)
```

Config key	Type	Default	Description
<i>validate_swagger_spec</i>	boolean	True	Validate the Swagger spec against the Swagger 2.0 Specification.
<i>validate_requests</i>	boolean	True	On the client side, validates outgoing requests. On the server side, validates incoming requests.
<i>validate_responses</i>	boolean	True	On the client side, validates incoming responses. On the server side, validates outgoing responses.
<i>use_models</i>	boolean	True	Use python classes to represent models instead of dicts. See <i>Python Models</i> .
<i>formats</i>	list of SwaggerFormat	[]	List of user-defined formats to support. See <i>User-Defined Formats</i> .
<i>include_missing_properties</i>	boolean	True	Create properties with the value <code>None</code> if they were not submitted during object unmarshalling
<i>default_type_to_object</i>	boolean	False	When set to <code>True</code> , missing types will default to <code>object</code> and be validated as such. When set to <code>False</code> , missing types will not be validated at all.
<sup>4</sup> <i>internally_dereference_refs</i>	boolean	False	Completely dereference \$refs to maximize

Models in a Swagger spec are usually defined under the path `#/definitions`.

A model can refer to a primitive type or a container type such as a list or a dict. In dict form, there is an opportunity to make the interface to access the properties of a model a little more straight forward.

Consider the following:

```
{
  "definitions": {
    "Pet": {
      "type": "object",
      "required": ["name"],
      "properties": {
        "name": {"type": "string"},
        "age": {"type": "integer"},
        "breed": {"type": "string"}
      }
    }
  }
}
```

In python, this model easily maps to a dict:

```
pet = {
    "name": "Sumi",
    "age": 12,
    "breed": None,
}

print pet['name']

if pet['age'] < 1:
    print 'What a cute puppy!'
```

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```
if pet['breed'] is None:
    pet['breed'] = 'mutt'
```

However, if the model is implemented as a Python type, dotted access to properties becomes a reality:

```
from bravado_core.spec import Spec

spec = Spec.from_dict(...)
Pet = spec.definitions['Pet']
pet = Pet(name='Sumi', age=12)

print pet.name

if pet.age < 1:
    print 'What a cute puppy!'

if pet.breed is None:
    pet.breed = 'mutt'
```

## 2.1 Configuring Models as Python Types

bravado-core supports models as both dicts and python types.

The feature to use python types for models is enabled by default. You can always disable it if necessary.

```
from bravado_core.spec import Spec
swagger_dict = {...}
spec = Spec.from_dict(swagger_dict, config={'use_models': False})
```

## 2.2 Allowing null values for properties

Typically, bravado-core will complain during validation if it encounters fields with `null` values. This can be problematic, especially when you're adding Swagger support to pre-existing APIs. In that case, declare your model properties as `x-nullable`:

```
{
  "Pet": {
    "type": "object",
    "properties": {
      "breed": {
        "type": "string",
        "x-nullable": true
      }
    }
  }
}
```

`x-nullable` is an extension to the Swagger 2.0 spec. A nullable attribute is being [considered](#) for the next major version of Swagger.

## 2.3 Sensitive Data

Typically, if bravado-core encounters an error validating a request or a response, the value will be included in the exception message. If you have sensitive data, this can be problematic. To prevent a sensitive value from appearing in the exception details, declare the field as `x-sensitive`:

```
{
  "Pet": {
    "type": "object",
    "properties": {
      "breed": {
        "type": "string",
        "x-sensitive": true
      }
    }
  }
}
```

`x-sensitive` is an extension to the Swagger 2.0 spec. The `x-sensitive` extension can be applied to arrays and primitives as well as objects.

## 2.4 Model Discovery

Keep in mind that bravado-core has to do some extra legwork to figure out which parts of your spec represent Swagger models and which parts don't to make this feature work automatically. With a single-file Swagger spec, this is pretty straight forward - almost everything under `#/definitions` is a model. However, with more complicated specs that span multiple files and use external refs, it becomes a bit more involved. For this reason, the discovery process for models is best effort with a fallback to explicit annotations as follows:

1. Search for refs that refer to `#/definitions` in local scope
2. Search for refs that refer to external definitions with pattern `<filename>#/definitions/<model name>`.

*swagger.json*

```
{
  "paths": {
    "/pet": {
      "get": {
        "responses": {
          "200": {
            "description": "A pet",
            "schema": {
              "$ref": "another_file.json#/definitions/Pet"
            }
          }
        }
      }
    }
  }
}
```

*another\_file.json*

```
{
  "definitions": {
    "Pet": {
      ...
    }
  }
}
```

3. Search for the "x-model": "<model name>" or "title": "<model name>" annotation to identify models that can't be found via method 1. or 2. In case x-model and title are both defined, x-model has precedence. *swagger.json*

```
{
  "paths": {
    "/pet": {
      "get": {
        "responses": {
          "200": {
            "description": "A pet",
            "schema": {
              "$ref": "https://my.company.com/definitions/models.
↪json#/models/Pet"
            }
          }
        }
      }
    }
  }
}
```

*models.json* (served up via <https://my.company.com/definitions/models.json>)

```
{
  "models": {
    "Pet": {
      "x-model": "Pet"
      ...
    }
  }
}
```

---

**Note:** Models will be generated only for object types ("type": "object").

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## User-Defined Formats

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Primitive types in Swagger support an optional modifier property `format` as explained in detail in the [Swagger Specification](#). With this feature, you can define your own domain specific formats and have validation and marshalling to/from python/json handled transparently.

### 3.1 Creating a user-defined format

This is best explained with a simple example. Let's create a user-defined format for [CIDR notation](#).

In a Swagger spec, the schema-object for a CIDR would resemble:

```
{
  "type": "string",
  "format": "cidr",
  "description": "IPv4 CIDR"
}
```

In python, we'd like CIDRs to automatically be converted to a CIDR object that makes them easy to work with.

```
class CIDR(object):
    def __init__(self, cidr):
        """
        :param cidr: CIDR in string form.
        """
        self.cidr = cidr

    def overlaps(self, other_cidr):
        """Return true if other_cidr overlaps with this cidr"""
        ...

    def subnet_mask(self):
        """Return the subnet mask of this cidr"""
        ...
```

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...

We would also like CIDRs to be validated by bravado-core whenever they are part of a HTTP request or response.

Create a `bravado_core.formatter.SwaggerFormat` to define the CIDR format:

```
from bravado_core.formatter import SwaggerFormat

def validate_cidr(cidr_string):
    if '/' not in cidr_string:
        raise SwaggerValidationError('CIDR {0} is invalid'.format(cidr_string))

cidr_format = SwaggerFormat(
    # name of the format as used in the Swagger spec
    format='cidr',

    # Callable to convert a python CIDR object to a string
    to_wire=lambda cidr_object: cidr_object.cidr,

    # Callable to convert a string to a python CIDR object
    to_python=lambda cidr_string: CIDR(cidr_string),

    # Callable to validate the cidr in string form
    validate=validate_cidr
)
```

## 3.2 Configuring user-defined formats

Now that we have a `cidr_format`, just pass it to a `Spec` as part of the `config` parameter on `Spec` creation.

```
from bravado_core.spec import Spec

spec_dict = json.loads(open('swagger.json', 'r').read())
config = {
    'validate_responses': True,
    'validate_requests': True,
    'formats': [cidr_format],
}
spec = Spec.from_dict(spec_dict, config=config)
```

All validation and processing of HTTP requests and responses will now use the configured format where appropriate.

## 3.3 Putting it all together

A simple example of passing a CIDR object to a request and getting a list of CIDR objects back from the response.

```
{
  "paths": {
    "/get_overlapping_cidrs": {
      "get": {
        "parameters": [
```

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```

        {
            "name": "cidr",
            "in": "query",
            "type": "string",
            "format": "cidr"
        }
    ],
    "responses": {
        "200": {
            "description": "List of overlapping cidrs",
            "schema": {
                "type": "array",
                "items": {
                    "type": "string",
                    "format": "cidr"
                }
            }
        }
    }
}

```

```

from bravado_core.spec import Spec
from bravado_core.response import unmarshal_response
from bravado_core.param import marshal_param

# Retrieve the swagger spec from the server and json.load() it
spec_dict = ...

# Create cidr_format add it to the config dict
config = ...

# Create a bravado_core.spec.Spec
swagger_spec = Spec.from_dict(spec_dict, config=config)

# Get the operation to invoke
op = swagger_spec.get_op_for_request('GET', '/get_overlapping_cidrs')

# Get the Param that represents the cidr query parameter
cidr_param = op.params.get('cidr')

# Create a CIDR object - to_wire() will be called on this during marshalling
cidr_object = CIDR('192.168.1.1/24')
request_dict = {}

# Marshal the cidr_object into the request_dict.
marshal_param(cidr_param, cidr_object, request_dict)

# Lots of hand-wavey stuff here - use whatever http client you have to
# send the request and receive a response
response = http_client.send(request_dict)

# Extract the list of cidrs
cidrs = unmarshal_response(response)

```

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```
# Verify cidrs are CIDR objects and not strings
for cidr in cidrs:
    assert type(cidr) == CIDR
```

## 3.4 Overriding built-in formats is also possible with a user-defined format

By default format 'double' is internally converted to a float in python. This runs the risk of being imprecise due to the way floats are handled. If you would like to instead use the `decimal.Decimal()` type for more precision, you can override this built-in format. See Also: [Floating Point Precision](#).

You'd define the type:

```
from decimal import Decimal
import re

is_decimal = re.compile(r'^\d+(?:\.\d+)?$')
def validate_decimaltype(x):
    """Validate input is a str in valid decimal format"""
    if not (isinstance(x, str) and is_decimal.match(x)):
        raise bravado_core.exception.SwaggerValidationError()

mydouble = SwaggerFormat(
    format='double',
    to_wire=lambda x: str(x) if isinstance(x, Decimal) else str(Decimal(x)),
    to_python=lambda x: x if isinstance(x, Decimal) else Decimal(x),
    validate=validate_decimaltype,
    description="model format double internally as Decimal()"
)
```

Then in your config block you include this format:

```
config = {
    'formats': [mydouble],
    ...
}

# Create a bravado_core.spec.Spec
swagger_spec = Spec.from_dict(spec_dict, config=config)
```

## 3.5 Note about using precise Decimal format in Spec

The above works when the openapi schema is written as `string(double)` e.g. the spec passes the value as string on the wire and format is double. If the spec said it was a `number(double)`, it is likely that json will first convert the number from the wire to a float and then pass that into `Decimal()` with unguaranteed precision. The calls to json would need `use_decimals=True` for that to work.

### 4.1 5.16.0 (2019-11-26)

- Add equality and deepcopy support for Spec objects - [PR #360](#)

### 4.2 5.15.0 (2019-11-15)

- Properly build the list of required properties for a schema with `allOf` from the sub-schemas - [PR #358](#) - Thanks nickgaya for your contribution!
- Add type annotations to `is_ref`, `is_list_like` and `is_dict_like` - [PR #356](#)

### 4.3 5.14.0 (2019-10-23)

- Add option to automatically base64-encode/decode strings with byte format - [PR #351](#) - Thanks nickgaya for your contribution!
- Ensure [PEP-561](#) compatibility - [PR #352](#) Thanks nickgaya for your contribution!
- Enhance documentation, typing of `bravado_core.model.Model` - [PR #354](#) - Thanks nickgaya for your contribution!
- Update Model equality method - [PR #355](#)

### 4.4 5.13.2 (2019-09-04)

- Improve header validation error message - [PR #347](#) Thanks brycedrennan for your contribution!
- Fix Spec flattening regression - [PR #350](#)

## 4.5 5.13.1 (2019-06-12)

- Fix `isinstance` regression - PR #345

## 4.6 5.13.0 (2019-06-03)

The release is mainly based on performance improvements of marshalling and unmarshalling processes.

- Model instances use `__slots__` and `@lazy_class_attribute` to reduce Model class footprint - PR #330
- `unmarshal_schema_object` honours the additional properties and default values - PR #333
- `unmarshal_model/unmarshal_object` do not raise `SwaggerMappingError` in case of unknown polymorphic objects (better distinction between unmarshalling and validating processes) - PR #333
- Refactor `bravado_core.unmarshal` module to enhance runtime performances - PR #336
- `@memoize_by_id` performance improvements when used with `kwargs` only - PR #337
- Refactor `bravado_core.marshall` module to enhance runtime performance - PR #339

## 4.7 5.12.1 (2019-05-07)

- Prevent `DeprecationWarning` in Python 3.7 - PR #326
- Ensure compatibility with Windows Platform - PR #327, PR #328

## 4.8 5.12.0 (2019-04-10)

- Allow `Spec` subclasses to provide their own `$ref` handlers - PR #323
- Fix model name and model discovery bugs, better logic for including models in flattened spec - PR #324
- Add `deepcopy` support to `Model` instances - PR #325

## 4.9 5.11.0 (2019-03-08)

- Do not throw `SwaggerMappingError` in case of missing body with optional body parameter - Issue #321, PR #322

## 4.10 5.10.2 (2019-03-06)

- Fix issue with `jsonschema 3.0` compatibility on Python 2.7 - Issue #318, PR #319, PR #320

## 4.11 5.10.1 (2019-01-15)

- Ensure that flattening Swagger Spec with `$ref: None` will not cause unbounded recursion - PR #315
- Enhance `is_ref` detection to recognize only objects with `$ref` attribute and `string` value as reference - PR #315

## 4.12 5.10.0 (2018-11-20)

- Add `use_spec_url_for_base_path` configuration option - PR #300 - Thanks DStape for your contribution!
- Ensure `jsonschema >= 3` compatibility - PR #304
- Minor improvement on discriminator validation - PR #302

## 4.13 5.0.7 (2018-09-18)

- Fix security object validation issue - PR #294
- Fix unbounded recursion during object validation (if `internally_dereference_refs` is enabled) - PR #297
- Fix `api_url` generation - PR #295. Thanks mulmschneider for your contribution!

## 4.14 5.0.6 (2018-08-06)

- Swagger Spec flattening - fix regression that led to some model definitions not having the `x-model` marker anymore - PR #293
- Fix marshalling of array params that use `collectionFormat multi` - PR #292

## 4.15 5.0.5 (2018-08-02)

- Swagger Spec flattening - use model names instead of generated keys - PR #284
- Swagger Spec flattening - replace inline models with top level definitions - PR #285
- Fix query parameter marshalling in case of boolean parameters - Issue #281 - PR #286

## 4.16 5.0.4 (2018-06-29)

- Properly sanitize names with multiple leading digits, handle more edge cases correctly - PR #282

## 4.17 5.0.3 (2018-06-06)

- Make sure spaces in path param values are quoted using percent notation instead of using `+`. Issue #278, PR #279

## 4.18 5.0.2 (2018-06-04)

- Fix regression if `internally_dereference_refs` is used. [Issue #275](#), [PR #276](#)

## 4.19 5.0.1 (2018-05-30)

- No longer make sure that all config keys are known; this allows users of the library to store additional configuration. - [PR #274](#)

## 4.20 5.0.0 (2018-05-30)

- Refactor: model discovery is now handled in `bravado_core.model` - [PR #270](#)
- Remove deprecated methods from `Model` type - [PR #270](#)
- Remove deprecated parameters from `bravado_core.spec_flattening.flattened_spec` - [PR #269](#)
- Ensure that models in `#/definitions` of referenced files are discovered - [PR #273](#)

**Warning:** This release contains breaking changes! The signature of `bravado_core.spec_flattening.flattened_spec` has been updated. The following methods have been removed from the public interface: `bravado_core.model.tag_models`, `bravado_core.model.bless_models`, `bravado_core.model.collect_models` and `bravado_core.spec.post_process_spec`.

## 4.21 4.13.4 (2018-05-24)

- Fix marshalling and unmarshalling of optional body parameters. [PR #268](#)

## 4.22 4.13.3 (2018-05-16)

- Add support for Content-Disposition filename - [PR #262](#). Thanks elmirjagudin for your contribution!
- Improve specs flattening and dereferencing in case of relative references - [PR #263](#)

## 4.23 4.13.2 (2018-03-19)

- Fix bug where multiple schemes in the spec would sometimes cause a `SwaggerSchemaError` - [PR #260](#)

## 4.24 4.13.1 (2018-03-02)

- Catch `TypeError`s during param unmarshalling, allowing JSON Schema to handle the error - [Issue #258](#), [PR #259](#). Thanks Nick DiRienzo for your contribution!

## 4.25 4.13.0 (2018-02-23)

- Models are generated only for objects - PR #246.
- Fix: ensure that models do not have references if `internally_dereference_refs` is used - PR #247.
- Model name detection uses title attribute too - PR #249.
- Duplicated models do not raise exception if `use_models` is not used - PR #253.
- Alert or warn if pre-tagged duplicate models are found - PR #254.

## 4.26 4.12.1 (2018-02-07)

- Make sure unsanitized param names are used when unmarshalling a request - PR #245.
- Expose the `determine_object_type` method as part of our API - PR #244.

## 4.27 4.12.0 (2018-02-06)

- Sanitize resource and parameter names so that they're valid Python identifiers. It uses the same logic as for `operationIds` - invalid characters are replaced with underscores, multiple consecutive underscores are merged into one, and leading / trailing underscores are removed. Using the unsanitized names will still work - Issue #200, PR #243.
- Allow overriding built-in default formats - Issue #235, PR #240. Thanks Brian J. Dowling for your contribution!
- Include `additionalProperties` in a models' `__repr__` - PR #242. Thanks again Brian J. Dowling!

## 4.28 4.11.5 (2018-01-30)

- Use `yaml.safe_load` for parsing specs - PR #241.

## 4.29 4.11.4 (2018-01-19)

- Properly quote request parameters sent as part of the URL path - PR #237, PR #238.

## 4.30 4.11.3 (2018-01-16)

- Remove strict `isinstance` check when marshalling models - PR #236.

## 4.31 4.11.2 (2018-01-08)

- Ensure `internally_dereference_refs` works with recursive specs - PR #234.

### 4.32 4.11.1 (2017-12-18)

- Speed up marshalling and unmarshalling of objects - PR #226.
- Use `msgpack-python` instead of `u-msgpack-python` for performance improvements - Issue #227, PR #228.

### 4.33 4.11.0 (2017-11-09)

- Add support for `msgpack` in responses (i.e. when unmarshalling) - Issue #214, PR #216.
- Improve performance by removing debug logging when dereferencing - PR #208.

### 4.34 4.10.1 (2017-11-06)

- Don't remove unrecognized configs; fixes compatibility with bravado - PR #218.

### 4.35 4.10.0 (2017-11-03)

- New config `internally_dereference_refs` that can significantly speed up unmarshalling. Currently disabled by default - PR #204.
- Added support for new extension `x-sensitive` to scrub sensitive values from validation errors. Please check the [Sensitive Data](#) documentation for further details - PR #213.
- Fixed an issue that would cause validation errors if `obj_type` was `None` - PR #196.
- Fixed handling of defaults for array parameters - PR #199.
- Performance improvements - PR #207.

### 4.36 4.9.1 (2017-09-19)

- Properly marshal a model even if it's not created from the same `Spec` instance - PR #194.

### 4.37 4.9.0 (2017-09-11)

- `type` is no longer required. By default, validation will not be performed if `type` is omitted. This is configurable with `default_type_to_object` - Issue #166, PR #192, PR #183, PR #193

### 4.38 4.8.4 (2017-09-06)

- Make sure all models are properly tagged when flattening the spec - PR #191.

### 4.39 4.8.3 (2017-09-05)

- Improve spec flattening: recognize response objects and expose un-referenced models - PR #184.
- Fix a bug when marshalling properties with no spec that have the value `None` - PR #189.

### 4.40 4.8.2 (2017-09-04)

- Fix marshalling of `null` values for properties with `x-nullable` set to `true` - Issue #185, PR #186. Thanks Jan Baraniewski for the contribution!
- Add `_asdict()` method to each model, similar to what `namedtuples` have - PR #188.

### 4.41 4.8.1 (2017-08-24)

- Make unmarshalling objects roughly 30% faster - PR #182.

### 4.42 4.8.0 (2017-07-15)

- Add support for Swagger spec flattening - PR #177.
- Fix handling of API calls that return non-JSON content (specifically text content) - PR #175. Thanks mostrows2 for your contribution!
- Fix error message text when trying to unmarshal an invalid model - PR #179.

### 4.43 4.7.3 (2017-05-05)

- Fix support for object composition (`allOf`) for data passed in the request body - PR #167. Thanks Zi Li for your contribution!
- Return the default value for an optional field missing in the response - PR #171.

### 4.44 4.7.2 (2017-03-23)

- Fix unmarshalling of null values for properties with no spec - Issue #163, PR #165.

### 4.45 4.7.1 (2017-03-22)

- Fix backward-incompatible Model API change which renames all model methods to have a single underscore in front of them. A deprecation warning has been added - Issue #160, PR #161. Thanks Adam Ever-Hadani for the contribution!

## 4.46 4.7.0 (2017-03-21)

- Added support for nullable fields in the format validator - PR #143. Thanks Adam Ever-Hadani
- Add include\_missing\_properties configuration - PR #152
- Consider default when unmarshalling - PR #154
- Add discriminator support - PR #128, PR #159. Thanks Michael Jared Lumpe for your contribution
- Make sure pre-commit hooks are installed and run when running tests - PR #155, PR #158

## 4.47 4.6.1 (2017-02-15)

- Fix unmarshalling empty array types - PR #148
- Removed support for Python 2.6 - PR #147

## 4.48 4.6.0 (2016-11-28)

- Security Requirement validation (for ApiKey) - PR #124
- Allow self as name for model property, adds new “create” alternate model constructor - Issue #125, PR #126.
- Allow overriding of security specs - PR #121
- Adds minimal support for responses with text/\* content\_type.

## 4.49 4.5.1 (2016-09-27)

- Add marshal and unmarshal methods to models - PR #113, PR #120.

## 4.50 4.5.0 (2016-09-12)

- Support for model composition through the allOf property - Issue #7, PR #63, PR #110. Thanks David Bartle for the initial contribution!
- Fix issue with header parameter values being non-string types - PR #115.

## 4.51 4.4.0 (2016-08-26)

- Adds support for security scheme definitions, mostly focusing on the “apiKey” type - PR #112.

## 4.52 4.3.2 (2016-08-17)

- Fixes around unmarshalling, x-nullable and required behavior - Issue #108, PR #109. Big thanks to Zachary Roadhouse for the report and pull request!

- Fix AttributeError when trying to unmarshal a required array param that's not present - PR #111.

### 4.53 4.3.1 (2016-08-09)

- Check if a parameter is bool-type before assuming it's a string - PR #107. Thanks to Nick DiRienzo for the pull request!

### 4.54 4.3.0 (2016-08-04)

- Add support for x-nullable - Issue #47, PR #64 and PR #103. Thanks to Andreas Hug for the pull request!
- Fix support for vendor extensions at the path level - PR #95, PR #106. Thanks to Mikołaj Siedlarek for the initial pull request!

### 4.55 4.2.5 (2016-07-27)

- Add basepython python2.7 for flake8, docs, and coverage tox commands

### 4.56 4.2.4 (2016-07-26)

- coverage v4.2 was incompatible and was breaking the build. Added --append for the fix.

### 4.57 4.2.3 (2016-07-26)

- Accept tuples as a type list as well.

### 4.58 4.2.2 (2016-04-01)

- Fix marshalling of an optional array query parameter when not passed in the service call - PR #87

### 4.59 4.2.1 (2016-03-23)

- Fix optional enums in request params - Issue #77
- Fix resolving refs during validation - Issue #82

### 4.60 4.2.0 (2016-03-10)

- More robust handling of operationId which contains non-standard chars - PR #76
- Provide a client ingestible version of spec\_dict with x-scope metadata removed. Accessible as Spec.client\_spec\_dict - Issue #78

## 4.61 4.1.0 (2016-03-01)

- Better handling of query parameters that don't have a value - [Issue #68](#)
- Allow marshalling of objects which are subclasses of dict - [PR #61](#)
- Fix boolean query params to support case-insensitive true/false and 0/1 - [Issue #70](#)
- Support for Swagger specs in yaml format - [Issue #42](#)
- Fix validation of server side request parameters when collectionFormat=multi and item type is not string - [Issue #66](#)
- Fix unmarshalling of server side request parameters when collectionFormat=multi and cardinality is one - [PR #75](#)

## 4.62 4.0.1 (2016-01-11)

- Fix unmarshalling of an optional array query parameter when not passed in the query string.

## 4.63 4.0.0 (2015-11-17)

- Support for recursive \$refs - [Issue #35](#)
- Requires swagger-spec-validator 2.0.1
- Unqualified \$refs no longer supported. Bad: {"\$ref": "User"} Good: {"\$ref": "#/definitions/User"}
- Automatic tagging of models is only supported in the root swagger spec file. If you have models defined in \$ref targets that are in other files, you must manually tag them with 'x-model' for them to be available as python types. See [Model Discovery](#) for more info.

## 4.64 3.1.1 (2015-10-19)

- Fix the creation of operations that contain shared parameters for a given endpoint.

## 4.65 3.1.0 (2015-10-19)

- Added http headers to `bravado_core.response.IncomingResponse`.

## 4.66 3.0.2 (2015-10-12)

- Added docs on how to use [User-Defined Formats](#).
- Added docs on how to [Configure](#) bravado-core.
- formats added as a config option

## 4.67 3.0.1 (2015-10-09)

- Automatically tag models in external \$refs - [Issue #45](#) - see [Model Discovery](#) for more info.

## 4.68 3.0.0 (2015-10-07)

- User-defined formats are now scoped to a Swagger spec - [Issue #50](#) (this is a non-backwards compatible change)
- Deprecated `bravado_core.request.RequestLike` and renamed to `bravado_core.request.IncomingRequest`
- Added `make docs` target and updated docs (still needs a lot of work though)

## 4.69 2.4.1 (2015-09-30)

- Fixed validation of user-defined formats - [Issue #48](#)

## 4.70 2.4.0 (2015-08-13)

- Support relative “\$ref” external references in `swagger.json`
- Fix dereferencing of `jsonref` when given in a list

## 4.71 2.3.0 (2015-08-10)

- Raise `MatchingResponseNotFound` instead of `SwaggerMappingError` when a response can’t be matched to the Swagger schema.

## 4.72 2.2.0 (2015-08-06)

- Add `reason` to `IncomingResponse`

## 4.73 2.1.0 (2015-07-17)

- Handle user defined formats for serialization and validation.

## 4.74 2.0.0 (2015-07-13)

- Move http invocation to `bravado`
- Fix unicode in model docstrings
- Require `swagger-spec-validator 1.0.12` to pick up bug fixes

## 4.75 1.1.0 (2015-06-25)

- Better unicode support
- Python 3 support

## 4.76 1.0.0-rc2 (2015-06-01)

- Fixed file uploads when marshalling a request
- Renamed ResponseLike to IncomingResponse
- Fixed repr of a model when it has an attr with a unicode value

## 4.77 1.0.0-rc1 (2015-05-26)

- Use basePath when matching an operation to a request
- Refactored exception hierarchy
- Added use\_models config option

## 4.78 0.1.0 (2015-05-13)

- Initial release

## CHAPTER 5

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### Indices and tables

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