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**pysnow**  
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<b>1</b>	<b>Compatibility</b>	<b>3</b>
<b>2</b>	<b>Installing</b>	<b>5</b>
<b>3</b>	<b>Testing</b>	<b>7</b>
<b>4</b>	<b>Demo!</b>	<b>9</b>
<b>5</b>	<b>License</b>	<b>11</b>
<b>6</b>	<b>Client</b>	<b>13</b>
<b>7</b>	<b>OAuthClient</b>	<b>15</b>
<b>8</b>	<b>QueryBuilder</b>	<b>17</b>
<b>9</b>	<b>Resource</b>	<b>19</b>
<b>10</b>	<b>ParamsBuilder</b>	<b>21</b>
<b>11</b>	<b>Response</b>	<b>23</b>
<b>12</b>	<b>Exceptions</b>	<b>25</b>
12.1	Generic Exceptions . . . . .	25
12.2	Response Exceptions . . . . .	25
12.3	OAuthClient Exceptions . . . . .	25
12.4	QueryBuilder Exceptions . . . . .	25
<b>13</b>	<b>The Client</b>	<b>27</b>
13.1	Using pysnow.Client . . . . .	27
13.2	Using pysnow.OAuthClient . . . . .	28
<b>14</b>	<b>Resources</b>	<b>29</b>
<b>15</b>	<b>Request parameters</b>	<b>31</b>
15.1	Client object parameters . . . . .	31
15.2	Resource object parameters . . . . .	31

<b>16 Querying</b>	<b>33</b>
16.1 Key-value . . . . .	33
16.2 Using the query builder . . . . .	33
16.3 SN Pass-through . . . . .	34
<b>17 Fetching data</b>	<b>35</b>
17.1 Multiple records . . . . .	35
17.2 First record . . . . .	36
17.3 First or none . . . . .	36
17.4 Exactly one . . . . .	36
17.5 One or none . . . . .	37
<b>18 Creating a new record</b>	<b>39</b>
<b>19 Updating a record</b>	<b>41</b>
<b>20 Deleting a record</b>	<b>43</b>
<b>21 Using the OAuthClient</b>	<b>45</b>
<b>22 Using the QueryBuilder</b>	<b>47</b>
<b>23 Attaching a file</b>	<b>49</b>
<b>24 Using threaded queries</b>	<b>51</b>
<b>25 Session with auto-retry</b>	<b>53</b>
<b>Python Module Index</b>	<b>55</b>

Library written in Python that makes interacting with the ServiceNow REST API much enjoyable.



# CHAPTER 1

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## Compatibility

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Python 2.6+ and Python 3.3+





## CHAPTER 2

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### Installing

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```
$ pip install pysnow
```



## CHAPTER 3

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### Testing

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The code is automatically tested using **travis** and **nose**.

To run tests manually, move to the cloned directory and run:

```
$ nosetests --cover-package=pysnow --with-coverage --cover-erase
```



## CHAPTER 4

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Demo!

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This demo features the `pysnow.QueryBuilder` and shows an example of how to fetch records using the **incident** table API.



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```
class pysnow.client.Client (instance=None, host=None, user=None, password=None,  
raise_on_empty=None, request_params=None, use_ssl=True,  
session=None)
```

User-created Client object.

#### Parameters

- **instance** – Instance name, used to construct host
- **host** – Host can be passed as an alternative to instance
- **user** – User name
- **password** – Password
- **raise\_on\_empty** – Whether or not to raise an exception on 404 (no matching records), defaults to True
- **request\_params** – Request params to send with requests globally (deprecated)
- **use\_ssl** – Enable or disable the use of SSL, defaults to True
- **session** – Optional `requests.Session` object to use instead of passing user/pass to `Client`

#### Raises

- `InvalidUsage`: On argument validation error

```
resource (api_path=None, base_path='/api/now', chunk_size=None)
```

Creates a new `Resource` object after validating paths

#### Parameters

- **api\_path** – Path to the API to operate on
- **base\_path** – (optional) Base path override
- **chunk\_size** – Response stream parser chunk size (in bytes)

#### Returns

- Resource object

**Raises**

- InvalidUsage: If a path fails validation

```
class pysnow.oauth_client.OAuthClient (client_id=None, client_secret=None, token_updater=None, **kwargs)
    Pysnow Client with extras for oauth session and token handling.
```

**Parameters**

- **client\_id** – client\_id from ServiceNow
- **client\_secret** – client\_secret from ServiceNow
- **token\_updater** – function called when a token has been refreshed
- **kwargs** – kwargs passed along to `pysnow.Client`

```
set_token (token)
    Validate and set token
```

**Parameters** **token** – the token (dict) to set

```
resource (api_path=None, base_path='/api/now', chunk_size=None)
    Overrides resource() provided by pysnow.Client with extras for OAuth
```

**Parameters**

- **api\_path** – Path to the API to operate on
- **base\_path** – (optional) Base path override
- **chunk\_size** – Response stream parser chunk size (in bytes)

**Returns**

- Resource object

**Raises**

- `InvalidUsage`: If a path fails validation

```
generate_token (user, password)
    Takes user and password credentials and generates a new token
```

**Parameters**

- **user** – user
- **password** – password

**Returns**

- dictionary containing token data

**Raises**

- `TokenCreateError`: If there was an error generating the new token

**class** pysnow.query\_builder.**QueryBuilder**  
Query builder - for constructing advanced ServiceNow queries

**field** (*field*)  
Sets the field to operate on  
**Parameters** **field** – field (str) to operate on

**order\_descending** ()  
Sets ordering of field descending

**order\_ascending** ()  
Sets ordering of field ascending

**starts\_with** (*starts\_with*)  
Adds new STARTSWITH condition  
**Parameters** **starts\_with** – Match field starting with the provided value

**ends\_with** (*ends\_with*)  
Adds new ENDSWITH condition  
**Parameters** **ends\_with** – Match field ending with the provided value

**contains** (*contains*)  
Adds new LIKE condition  
**Parameters** **contains** – Match field containing the provided value

**not\_contains** (*not\_contains*)  
Adds new NOTLIKE condition  
**Parameters** **not\_contains** – Match field not containing the provided value

**is\_empty** ()  
Adds new ISEMPY condition

**equals** (*data*)  
Adds new IN or = condition depending on if a list or string was provided

**Parameters** `data` – string or list of values

**Raise**

- QueryTypeError: if `data` is of an unexpected type

**not\_equals** (`data`)

Adds new NOT IN or = condition depending on if a list or string was provided

**Parameters** `data` – string or list of values

**Raise**

- QueryTypeError: if `data` is of an unexpected type

**greater\_than** (`greater_than`)

Adds new > condition

**Parameters** `greater_than` – str or datetime compatible object

**Raise**

- QueryTypeError: if `greater_than` is of an unexpected type

**less\_than** (`less_than`)

Adds new < condition

**Parameters** `less_than` – str or datetime compatible object

**Raise**

- QueryTypeError: if `less_than` is of an unexpected type

**between** (`start`, `end`)

Adds new BETWEEN condition

**Parameters**

- `start` – int or datetime compatible object
- `end` – int or datetime compatible object

**Raise**

- QueryTypeError: if `start` or `end` arguments is of an invalid type

**AND** ()

Adds an and-operator

**OR** ()

Adds an or-operator

**NQ** ()

Adds a NQ-operator (new query)

**class** `pysnow.resource.Resource` (*base\_url=None, base\_path=None, api\_path=None, parameters=None, \*\*kwargs*)

Creates a new *Resource* object

Resources provides a natural way of interfacing with ServiceNow APIs.

### Parameters

- **base\_path** – Base path
- **api\_path** – API path
- **chunk\_size** – Response stream parser chunk size (in bytes)
- **\*\*kwargs** – Arguments to pass along to Request

**get** (*query, limit=None, offset=None, fields=[]*)

Queries the API resource

### Parameters

- **query** – Dictionary, string or `QueryBuilder` object
- **limit** – (optional) Limits the number of records returned
- **fields** – (optional) List of fields to include in the response created\_on in descending order.
- **offset** – (optional) Number of records to skip before returning records

### Returns

- Response object

**create** (*payload*)

Creates a new record in the API resource

**Parameters** **payload** – Dictionary containing key-value fields of the new record

### Returns

- Dictionary of the inserted record

**update** (*query*, *payload*)

Updates a record in the API resource

**Parameters**

- **query** – Dictionary, string or `QueryBuilder` object
- **payload** – Dictionary containing key-value fields of the record to be updated

**Returns**

- Dictionary of the updated record

**delete** (*query*)

Deletes matching record

**Parameters** **query** – Dictionary, string or `QueryBuilder` object

**Returns**

- Dictionary containing information about deletion result

**request** (*method*, *path\_append=None*, *headers=None*, *\*\*kwargs*)

Create a custom request

**Parameters**

- **method** – HTTP method to use
- **path\_append** – (optional) relative to `api_path`
- **headers** – (optional) Dictionary of headers to add or override
- **kwargs** – kwargs to pass along to `requests.Request`

**Returns**

- Response object



**class** pysnow.params\_builder.ParamsBuilder

Provides an interface for setting / getting common ServiceNow sysparms.

**static stringify\_query** (*query*)

Stringifies the query (dict or QueryBuilder) into a ServiceNow-compatible format

**Returns**

- ServiceNow-compatible string-type query

**add\_custom** (*params*)

Adds new custom parameter after making sure it's of type dict.

**Parameters** *params* – Dictionary containing one or more parameters

**custom\_params**

Returns a dictionary of added custom parameters

**display\_value**

Maps to sysparm\_display\_value

**query**

Maps to sysparm\_query

**limit**

Maps to sysparm\_limit

**offset**

Maps to sysparm\_offset

**fields**

Maps to sysparm\_fields

**exclude\_reference\_link**

Maps to sysparm\_exclude\_reference\_link

**suppress\_pagination\_header**

Maps to sysparm\_suppress\_pagination\_header

**as\_dict()**

Constructs query params compatible with `requests.Request`

**Returns**

- Dictionary containing query parameters

**class** pysnow.response.**Response** (*response*, *chunk\_size=2048*)

Takes a `requests.Response` object and performs deserialization and validation.

**Parameters**

- **response** – `request.Response` object
- **chunk\_size** – Read and return up to this size (in bytes) in the stream parser

**all** ()

Returns a chained generator response containing all matching records

**Returns**

- Iterable response

**first** ()

Return the first record or raise an exception if the result doesn't contain any data

**Returns**

- Dictionary containing the first item in the response content

**Raise**

- `NoResults`: If no results were found

**first\_or\_none** ()

Return the first record or `None`

**Returns**

- Dictionary containing the first item or `None`

**one** ()

Return exactly one record or raise an exception.

**Returns**

- Dictionary containing the only item in the response content

**Raise**

- MultipleResults: If more than one records are present in the content
- NoResults: If the result is empty

**one\_or\_none()**

Return at most one record or raise an exception.

**Returns**

- Dictionary containing the matching record or None

**Raise**

- MultipleResults: If more than one records are present in the content

### 12.1 Generic Exceptions

```
class pysnow.exceptions.InvalidUsage
```

### 12.2 Response Exceptions

```
class pysnow.exceptions.ResponseError (error)  
class pysnow.exceptions.MissingResult  
class pysnow.exceptions.UnexpectedResponseFormat  
class pysnow.exceptions.ReportUnavailable  
class pysnow.exceptions.NoResults  
class pysnow.exceptions.MultipleResults
```

### 12.3 OAuthClient Exceptions

```
class pysnow.exceptions.MissingToken  
class pysnow.exceptions.TokenCreateError (error, description, status_code)
```

### 12.4 QueryBuilder Exceptions

```
class pysnow.exceptions.QueryTypeError  
class pysnow.exceptions.QueryMissingField
```

```
class pysnow.exceptions.QueryEmpty  
class pysnow.exceptions.QueryExpressionError  
class pysnow.exceptions.QueryMultipleExpressions
```

### The Client comes in two forms:

- The regular `pysnow.Client` - use if you're authenticating with password credentials or wish to pass an already created session object.
- The `pysnow.OAuthClient` - use if you wish to do OAuth with an OAuth2 enabled ServiceNow instance.

## 13.1 Using `pysnow.Client`

This shows some examples of how to create the `pysnow.Client` using username and password or a custom session object

See the `pysnow.Client` documentation for details.

### 13.1.1 With username and password

```
s = pysnow.Client(instance='myinstance',
                  user='myusername',
                  password='mypassword')
```

### 13.1.2 With a custom session object

You can pass a custom session object to `pysnow.Client`. In this example password credentials are used, but with SSL verification disabled.

```
s = requests.Session()
s.verify = False
s.auth = requests.auth.HTTPBasicAuth('myusername', 'mypassword')
```

```
sn = pysnow.Client(instance='myinstance', session=s)
```

## 13.2 Using pysnow.OAuthClient

Pysnow provides the `pysnow.OAuthClient` to simplify the process of obtaining initial tokens, refreshing tokens and keeping tokens in sync with your storage.

Should the `pysnow.OAuthClient` not be sufficient for your requirements some reason, you can always create a custom `Requests` compatible OAuth session and pass along to `pysnow.Client()`

Enabling OAuth in ServiceNow is fairly simple but beyond the scope of this document. Details on how to do this can be found in the [official ServiceNow documentation](#).

### 13.2.1 Getting initial tokens

In order to use the `pysnow.OAuthClient` you first need to obtain a new token from ServiceNow. Creating a new token bound to a certain user is easy. Simply call `pysnow.OAuthClient.generate_token()` and keep it in your storage (e.g. in session or database)

```
s = pysnow.OAuthClient(client_id='<client_id_from_servicenow>', client_secret='
↳<client_secret_from_servicenow>', instance='<instance_name>')

if not session['token']:
    # No previous token exists. Generate new.
    session['token'] = s.generate_token('<username>', '<password>')
```

### 13.2.2 Using tokens

Once an initial token has been obtained it will be refreshed automatically upon usage, provided its `refresh_token` hasn't expired.

After a token has been refreshed, the provided `token_updater()` function will be called with the refreshed token as first argument.

```
def updater(new_token):
    print("OAuth token refreshed!")
    session['token'] = new_token

s = pysnow.OAuthClient(client_id='<client_id_from_servicenow>', client_secret='
↳<client_secret_from_servicenow>', token_updater=updater, instance='<instance_name>')
s.set_token(session['token'])
```



# CHAPTER 14

---

## Resources

---

The `pysnow.Resource`, given an API path, offers an interface to all CRUD functionality available in the ServiceNow REST API.

The idea with Resources is to provide a logical, nameable and reusable container-like object.

Example of a resource using the **incident table API** with a doubled **chunk\_size** of 8192 bytes and **sysparm\_display\_value** set to True.

```
incident = client.resource(api_path='/table/incident', chunk_size=8192)
incident.parameters.display_value = True
```



---

## Request parameters

---

Request parameters (sysparms in ServiceNow) are key-values passed in the query string for GET requests. Default parameters can be set on both the `pysnow.Client` and the `pysnow.Resource` using the `parameters` property. Parameters set on **Client** are automatically inherited by **Resource**, but can of course be overridden.

Please see the API documentation for more info on this.

### 15.1 Client object parameters

```
client = pysnow.Client(instance=instance,
                       user=username,
                       password=password)

client.parameters.display_value = False
client.parameters.exclude_reference_link = True
client.parameters.add_custom({'foo': 'bar'})
```

### 15.2 Resource object parameters

```
incident = client.resource(api_path='/custom/api')
incident.parameters.add_custom({'foo': 'bar'})
```



There are three different ways to create queries using the pysnow library.

### 16.1 Key-value

Simple. And sufficient in many cases.

```
content = incident.get(query={'NUMBER': 'INC012345'}).one()
```

### 16.2 Using the query builder

The recommended way to create advanced queries.

See the `pysnow.QueryBuilder()` documentation for details.

```
# Set start and end range
start = datetime(1970, 1, 1)
end = datetime.now() - timedelta(days=20)

# Query incident records with number starting with 'INC0123', created between 1970-01-
↳ 01 and 20 days back in time
qb = (
    pysnow.QueryBuilder()
        .field('number').starts_with('INC0123')
        .AND()
        .field('sys_created_on').between(start, end)
        .AND()
        .field('sys_updated_on').order_descending()
)

iterable_content = incident.get(query=qb).all()
```

## 16.3 SN Pass-through

It's recommended to use the query builder for complex queries, as it offers error handling and a cleaner way of creating queries.

However, you can still use SN pass-through queries should the query builder not satisfy your needs for some reason.

Below is the pass-through equivalent of the QB in the previous example. You decide ;)

```
# Set start and end range
start = datetime(1970, 1, 1)
end = datetime.now() - timedelta(days=20)

# Query incident records with number starting with 'INC0123', created between 1970-01-
↳ 01 and 20 days back in time
iterable_content = incident.get(query='numberSTARTSWITHINC0150^sys_created_
↳ onBETWEENjavascript:gs.dateGenerate("%s")@javascript:gs.dateGenerate("%s")' %
↳ (start, end)).all()
```

The `pysnow.Resource.get()` returns an instance of `pysnow.Response`, which exposes an interface to the various methods available for getting the data you're after.

---

**Note:** All get-methods uses an incremental stream parser when fetching data.

---

### 17.1 Multiple records

The `pysnow.Response.all()` returns a generator iterator, which is iterated on in chunks of 8192 bytes by default.

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Define a resource, here we'll use the incident table API
incident = c.resource(api_path='/table/incident')

# Query for incidents with state 1
response = incident.get(query={'state': 1})

# Iterate over the result and print out `sys_id` of the matching records.
for record in response.all():
    print(record['sys_id'])
```

## 17.2 First record

The `pysnow.Response.first()` returns the first record in a result containing one or more records. An exception is raised if the result doesn't contain any records.

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Define a resource, here we'll use the incident table API
incident = c.resource(api_path='/table/incident')

# Query for incidents with state 3
response = incident.get(query={'state': 3})

# Print out the first match
print(response.first())
```

## 17.3 First or none

The `pysnow.Response.first_or_none()` returns the first record in a result containing one or more records. None is returned if the result doesn't contain any records.

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Define a resource, here we'll use the incident table API
incident = c.resource(api_path='/table/incident')

# Query for incidents with state 3
response = incident.get(query={'state': 3})

# Print out the first match, or `None`
print(response.first_or_none())
```

## 17.4 Exactly one

The `pysnow.Response.one()` returns exactly one record. An exception is raised if the result is empty or contains multiple records.

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Define a resource, here we'll use the incident table API
incident = c.resource(api_path='/table/incident')

# Query for incident with number INC012345
```



```
response = incident.get(query={'number': 'INC012345'})

# Print out the matching record
print(response.one())
```

## 17.5 One or none

The `pysnow.Response.one_or_none()` returns one record, or `None` if no matching records were found. An exception is raised if the result contains multiple records

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Create a new resource for the incident table API
incident = c.resource(api_path='/table/incident')

# Query for incident with number INC012345
response = incident.get(query={'number': 'INC012345'})

# Print out the matching record, or `None` if no matches were found.
print(response.one_or_none())
```



---

## Creating a new record

---

The `Client.resource.create()` takes a dictionary payload with key-values of the record to be created.

**Note:** This method calls `pysnow.Resource.one()` if the record was created successfully, returning a dictionary of the created record.

---

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Define a resource, here we'll use the incident table API
incident = c.resource(api_path='/table/incident')

# Set the payload
new_record = {
    'short_description': 'Pysnow created incident',
    'description': 'This is awesome'
}

# Create a new incident record
result = incident.create(payload=new_record)
```



## CHAPTER 19

---

### Updating a record

---

The `Client.resource.update()` takes a **payload** and **query** to perform an update.

---

**Note:** This method returns the updated record (dict) if the operation was successful. Refer to `Client.resource.custom()` if you want a **Response** object back.

---

---

**Note:** Updating multiple records is **not supported**.

---

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Define a resource, here we'll use the incident table API
incident = c.resource(api_path='/table/incident')

update = {'short_description': 'New short description', 'state': 5}

# Update 'short_description' and 'state' for 'INC012345'
updated_record = incident.update(query={'number': 'INC012345'}, payload=update)

# Print out the updated record
print(updated_record)
```



## CHAPTER 20

---

### Deleting a record

---

Deletes the queried record and returns the result (dict).

---

**Note:** Deletion of multiple records is **not supported**.

---

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Define a resource, here we'll use the incident table API
incident = c.resource(api_path='/table/incident')

# Delete incident with number 'INC012345'
result = incident.delete(query={'number': 'INC012345'})
```





---

## Using the OAuthClient

---

Example showing how tokens can be obtained, stored and refreshed using the OAuthClient.

In this example a basic dictionary is used as store, which offers no persistence, meaning that `OAuthClient.generate_token` will be called every time this code executes, which introduces an overhead. The store here could be a database table, file, session or whatever you want.

```
import pysnow

store = {'token': None}

# Takes care of refreshing the token storage if needed
def updater(new_token):
    print("OAuth token refreshed!")
    store['token'] = new_token

# Create the OAuthClient with the ServiceNow provided `client_id` and `client_secret`,
↪ and a `token_updater`
# function which takes care of refreshing local token storage.
s = pysnow.OAuthClient(client_id='<client_id_from_servicenow>', client_secret='
↪<client_secret_from_servicenow>',
                       token_updater=updater, instance='<instance_name>')

if not store['token']:
    # No previous token exists. Generate new.
    store['token'] = s.generate_token('<username>', '<password>')

# Set the access / refresh tokens
s.set_token(store['token'])

# We should now be good to go. Let's define a `Resource` for the incident API.
incident_resource = s.resource(api_path='/table/incident')

# Fetch the first record in the response
record = incident_resource.get(query={}).first()
```

```
# Print it  
print(record)
```

---

## Using the QueryBuilder

---

Example showing how the QueryBuilder can be used to construct a query using the Python datetime library.

```
import pysnow
from datetime import datetime, timedelta

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

today = datetime.today()
sixty_days_ago = today - timedelta(days=60)

# Query incident records with number starting with 'INC0123', created between 60 days_
↪ago and today.
qb = (
    pysnow.QueryBuilder()
    .field('number').starts_with('INC0123')
    .AND()
    .field('sys_created_on').between(sixty_days_ago, today)
)

incident = c.resource(api_path='/table/incident')

response = incident.get(query=qb)

# Iterate over the matching records and print out number
for record in response.all():
    print(record['number'])
```



---

### Attaching a file

---

Shows how to upload a binary file specified in the request body, providing information about the attachment using the `pysnow.ParamsBuilder` API exposed in `Resource.parameters`.

**Note:** The attachment API (`/api/now/attachment/file`), as with all ServiceNow APIs that doesn't conform with the standard REST principles, requires you to use `Client.resource.request()` and create a custom request.

---

```
import pysnow

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# Create a resource
attachment = c.resource(api_path='/attachment/file')

# Provide the required information about the attachment
attachment.parameters.add_custom({
    'table_name': 'incident',
    'table_sys_id': '<incident_sys_id>',
    'file_name': 'attachment.txt'
})

# Set the payload
data = open('/tmp/attachment.txt', 'rb').read()

# Override the content-type header
headers = { "Content-Type": "text/plain" }

# Fire off the request
attachment.request(method='POST', data=data, headers=headers)
```



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## Using threaded queries

---

This is an example of multiple threads doing simple fetches.

**Note:** This example uses `concurrent.futures` and expects you to be familiar with `pysnow.Resource.get()`.

---

```
import concurrent.futures
import pysnow

def just_print(client, query):
    # Run the query
    response = client.get(query=query)

    # Iterate over the result and print out `sys_id` and `state` of the matching_
    ↪records.
    for record in response.all():
        print(record['sys_id'], record['state'])

# Create client object
c = pysnow.Client(instance='myinstance', user='myusername', password='mypassword')

# list of simple items to query
queries = ({'api': '/table/incident', 'q': {'state': 1}}, {'api': '/table/incident',
    ↪'q': {'state': 3}})

# build taskqueue
with concurrent.futures.ThreadPoolExecutor(max_workers=4) as taskpool:
    for query in queries:
        connection = c.resource(api_path=query['api'])
        taskpool.submit(just_print, connection, query['q'])
```





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## Session with auto-retry

---

You might run into issues if you're creating too many requests against the ServiceNow API. Fortunately, the `requests` library enables users to create their own transport adapter with a retry mechanism from the `urllib3` library.

**You can read more about transport adapters and the retry mechanism here:**

- <http://docs.python-requests.org/en/master/user/advanced/#transport-adapters>
- <https://urllib3.readthedocs.io/en/latest/reference/urllib3.util.html#module-urllib3.util.retry>

This example shows how to automatically retry on an error for about 2 seconds and then fall back to the default error handling.

```
import requests
import pysnow

from requests.adapters import HTTPAdapter
from requests.packages.urllib3.util.retry import Retry

s = requests.Session()
s.auth = requests.auth.HTTPBasicAuth('<username>', '<password>')

# set auto retry for about 2 seconds on some common errors
adapter = HTTPAdapter(
    max_retries=Retry(
        total=3,
        backoff_factor=0.3,
        status_forcelist=(401, 408, 429, 431, 500, 502, 503, 504, 511)
    )
)

s.mount('https://', adapter)

sn = pysnow.Client(instance='<instance>', session=s)
```



**p**

`pysnow.client`, 13  
`pysnow.exceptions`, 25  
`pysnow.oauth_client`, 15  
`pysnow.params_builder`, 21  
`pysnow.query_builder`, 17  
`pysnow.resource`, 19  
`pysnow.response`, 23



**A**

`add_custom()` (pysnow.params\_builder.ParamsBuilder method), 21  
`all()` (pysnow.response.Response method), 23  
`AND()` (pysnow.query\_builder.QueryBuilder method), 18  
`as_dict()` (pysnow.params\_builder.ParamsBuilder method), 21

**B**

`between()` (pysnow.query\_builder.QueryBuilder method), 18

**C**

`Client` (class in pysnow.client), 13  
`contains()` (pysnow.query\_builder.QueryBuilder method), 17  
`create()` (pysnow.resource.Resource method), 19  
`custom_params` (pysnow.params\_builder.ParamsBuilder attribute), 21

**D**

`delete()` (pysnow.resource.Resource method), 20  
`display_value` (pysnow.params\_builder.ParamsBuilder attribute), 21

**E**

`ends_with()` (pysnow.query\_builder.QueryBuilder method), 17  
`equals()` (pysnow.query\_builder.QueryBuilder method), 17  
`exclude_reference_link` (pysnow.params\_builder.ParamsBuilder attribute), 21

**F**

`field()` (pysnow.query\_builder.QueryBuilder method), 17  
`fields` (pysnow.params\_builder.ParamsBuilder attribute), 21  
`first()` (pysnow.response.Response method), 23

`first_or_none()` (pysnow.response.Response method), 23

**G**

`generate_token()` (pysnow.oauth\_client.OAuthClient method), 15  
`get()` (pysnow.resource.Resource method), 19  
`greater_than()` (pysnow.query\_builder.QueryBuilder method), 18

**I**

`InvalidUsage` (class in pysnow.exceptions), 25  
`is_empty()` (pysnow.query\_builder.QueryBuilder method), 17

**L**

`less_than()` (pysnow.query\_builder.QueryBuilder method), 18  
`limit` (pysnow.params\_builder.ParamsBuilder attribute), 21

**M**

`MissingResult` (class in pysnow.exceptions), 25  
`MissingToken` (class in pysnow.exceptions), 25  
`MultipleResults` (class in pysnow.exceptions), 25

**N**

`NoResults` (class in pysnow.exceptions), 25  
`not_contains()` (pysnow.query\_builder.QueryBuilder method), 17  
`not_equals()` (pysnow.query\_builder.QueryBuilder method), 18  
`NQ()` (pysnow.query\_builder.QueryBuilder method), 18

**O**

`OAuthClient` (class in pysnow.oauth\_client), 15  
`offset` (pysnow.params\_builder.ParamsBuilder attribute), 21  
`one()` (pysnow.response.Response method), 23  
`one_or_none()` (pysnow.response.Response method), 24

OR() (pysnow.query\_builder.QueryBuilder method), 18  
order\_ascending() (pysnow.query\_builder.QueryBuilder method), 17  
order\_descending() (pysnow.query\_builder.QueryBuilder method), 17  
update() (pysnow.resource.Resource method), 20

## P

ParamsBuilder (class in pysnow.params\_builder), 21  
pysnow.client (module), 13  
pysnow.exceptions (module), 25  
pysnow.oauth\_client (module), 15  
pysnow.params\_builder (module), 21  
pysnow.query\_builder (module), 17  
pysnow.resource (module), 19  
pysnow.response (module), 23

## Q

query (pysnow.params\_builder.ParamsBuilder attribute), 21  
QueryBuilder (class in pysnow.query\_builder), 17  
QueryEmpty (class in pysnow.exceptions), 25  
QueryExpressionError (class in pysnow.exceptions), 26  
QueryMissingField (class in pysnow.exceptions), 25  
QueryMultipleExpressions (class in pysnow.exceptions), 26  
QueryTypeError (class in pysnow.exceptions), 25

## R

ReportUnavailable (class in pysnow.exceptions), 25  
request() (pysnow.resource.Resource method), 20  
Resource (class in pysnow.resource), 19  
resource() (pysnow.client.Client method), 13  
resource() (pysnow.oauth\_client.OAuthClient method), 15  
Response (class in pysnow.response), 23  
ResponseError (class in pysnow.exceptions), 25

## S

set\_token() (pysnow.oauth\_client.OAuthClient method), 15  
starts\_with() (pysnow.query\_builder.QueryBuilder method), 17  
stringify\_query() (pysnow.params\_builder.ParamsBuilder static method), 21  
suppress\_pagination\_header (pysnow.params\_builder.ParamsBuilder attribute), 21

## T

TokenCreateError (class in pysnow.exceptions), 25

## U

UnexpectedResponseFormat (class in pysnow.exceptions), 25