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# **punx Documentation**

*Release 119.gcf9a70e.dirty*

**Pete R. Jemian**

**Jul 15, 2017**



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Python Utilities for NeXus HDF5 files: validation, structure, hierarchy

- Validation of NeXus NXDL files
- Validation of NeXus HDF5 data files
- Display of NeXus HDF5 data file structure
- Display of NeXus base class hierarchy (stretch goal, graphical output)

NOTE: project is under initial construction

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**URL** <http://punx.readthedocs.io>

**git** <https://github.com/prjemian/punx>

**PyPI** <https://pypi.python.org/pypi/punx>

**TODO list** <https://github.com/prjemian/punx/issues>

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Use these steps to *install* and try the *demo*:

```
1 pip install punx
2 punx demo
```



## 1.1 Project Overview

The **punx** program package is easy to use and has several useful modules. The first module to try is *demo*, which validates and prints the structure of a NeXus HDF5 data file from the NeXus documentation.

### 1.1.1 command line help

```
console> punx -h
punx -h
usage: punx [-h] [-v] {demo,hierarchy,structure,update,validate} ...

Python Utilities for NeXus HDF5 files URL: http://punx.readthedocs.io
v0+unknown

optional arguments:
  -h, --help            show this help message and exit
  -v, --version          show program's version number and exit

subcommands:
  valid subcommands

  {demonstrate,structure,update,validate}
  demonstrate          demonstrate HDF5 file validation
  structure             show structure of HDF5 or NXDL file
  update               update the local cache of NeXus definitions
  validate             validate a NeXus file

http://punx.readthedocs.io
```

## 1.1.2 Subcommands

### User interface: subcommand: demo

The *demo* subcommand is useful to demonstrate HDF5 file validation and to verify correct program operation. It uses an example NeXus HDF5 data file supplied with the *punx* software, the *writer\_1\_3.hdf5* example from the NeXus manual.

### command line help

```
console> punx demo -h
punx demo -h
usage: punx demo [-h]

optional arguments:
  -h, --help  show this help message and exit
```

### Examples

One example of how to use **punx** is shown in the *demo* mode. This can be used directly after installing the python package.

Type this command ...:

```
punx demo
```

... and this output will appear on the console, showing a validation of *writer\_1\_3.hdf5*, an example NeXus HDF5 data file from the NeXus documentation.

```
1 console> punx validate C:\Users\shoun\AppData\Local\Anaconda\lib\site-
2   ↳packages\punx\data\writer_1_3.hdf5
3 Validation findings
4 :file: writer_1_3.hdf5
5 :validation results shown:  COMMENT, ERROR, NOTE, OK, TODO, UNUSED, WARN
6 =====
7   ↳=====
8 address          validation          status comment(s)
9 =====
10  ↳=====
11 /                @NX_class assumed      OK      file root: NXroot
12 /Scan            validItemName          NOTE    relaxed re: [A-Za-z_][\w_]*
13 /Scan@NX_class  @NX_class known       OK      NXentry is known
14 /Scan/data       validItemName-strict   OK      strict re: [a-z_][a-z0-9_]*
15 /Scan/data@NX_class @NX_class known       OK      NXdata is known
16 /Scan/data/counts NXdata@ignoreExtraFields OK      field ignored due to group
17   ↳attribute setting
18 /Scan/data/two_theta NXdata@ignoreExtraFields OK      field ignored due to group
19   ↳attribute setting
20 /Scan/data       NXDL review: NXdata    TODO    validate with NXdata
21   ↳specification (incomplete)
22 /Scan           NXDL review: NXentry   TODO    validate with NXentry
23   ↳specification (incomplete)
24 /              NXDL review: NXroot    TODO    validate with NXroot
25   ↳specification (incomplete)
```



```

18 /Scan/data/counts      NXdata group default plot v3 OK      NXdata@signal = counts
19 /Scan/data/counts      NeXus default plot v3      OK      NeXus data file default
↳plot: /NXentry/NXdata@signal
20 =====
↳=====
21
22 summary statistics
23 =====
24 status  count  description
25 =====
26 OK      8      meets NeXus specification
27 NOTE    1      does not meet NeXus specification, but acceptable
28 WARN    0      does not meet NeXus specification, not generally acceptable
29 ERROR   0      violates NeXus specification
30 TODO    3      validation not implemented yet
31 UNUSED  0      optional NeXus item not used in data file
32 COMMENT 0      comment from the punx source code
33 --      --      --
34 TOTAL   12     --
35 =====
36
37 console> punx structure C:\Users\shoun\AppData\Local\Anaconda\lib\site-
↳packages\punx\data\writer_1_3.hdf5
38 C:\Users\shoun\AppData\Local\Anaconda\lib\site-packages\punx\data\writer_1_3.hdf5 : NeXus data
↳file
39 Scan:NXentry
40   @NX_class = NXentry
41   data:NXdata
42     @NX_class = NXdata
43     @signal = counts
44     @axes = two_theta
45     @two_theta_indices = [0]
46     counts:NX_INT32[31] = [1037, 1318, 1704, '...', 1321]
47     @units = counts
48     two_theta:NX_FLOAT64[31] = [17.926079999999999, 17.925909999999998, 17.
↳925750000000001, '...', 17.92108]
49     @units = degrees

```

## Problems when running the demo

Sometimes, problems happen when running the demo. In this section are some common problems encountered and what was done to resolve them.

### Cannot reach GitHub

See *GitHub API rate limit exceeded*

### User interface: subcommand: hierarchy

-tba-

### **User interface: subcommand: structure**

show structure of HDF5 or NXDL file

#### **command line help**

```
console> punx structure -h
punx structure -h
usage: punx structure [-h] [-a] infile

positional arguments:
  infile          HDF5 or NXDL file name

optional arguments:
  -h, --help      show this help message and exit
  -a              Do not print attributes of HDF5 file structure
```

### **Examples**

-tba-

### **User interface: subcommand: update**

**punx** keeps a local copy of the NeXus definition files. The originals of these files are located on GitHub.

+.. caution:: The update process is being refactored, this may not work correctly now

To *update* the local cache of NeXus definitions, run:

```
console> punx update

INFO: get repo info: https://api.github.com/repos/nexusformat/definitions/commits
INFO: git sha: 8eb46e229f900d1e77e37c4b6ee6e0405efe099c
INFO: git iso8601: 2016-06-17T18:05:28Z
INFO: not updating NeXus definitions files
```

This shows the current cache was up to date. Here's an example when the source cache needed to be updated:

```
console> punx update

INFO: get repo info: https://api.github.com/repos/nexusformat/definitions/commits
INFO: git sha: 8eb46e229f900d1e77e37c4b6ee6e0405efe099c
INFO: git iso8601: 2016-06-17T18:05:28Z
INFO: updating NeXus definitions files
INFO: download: https://github.com/nexusformat/definitions/archive/master.zip
INFO: extract ZIP to: C:/Users/Pete/Documents/eclipse/punx/src/punx/cache
```

#### **command line help**

```
console> punx update -h
punx update -h
usage: punx update [-h] [-f]
```

optional arguments:

```
-h, --help  show this help message and exit
-f, --force  force update (if GitHub available)
```

## Examples

-tba-

## Problems

### GitHub API rate limit exceeded

A common problem happens when updating the NXDL definitions from GitHub. Here's what it looks like:

```
$ python ./src/punx/main.py update --force

('INFO:', 'get repo info: https://api.github.com/repos/nexusformat/definitions/commits
↪')

Traceback (most recent call last):

  File "./src/punx/main.py", line 416, in <module>

    main()

  File "./src/punx/main.py", line 412, in main

    args.func(args)

  File "./src/punx/main.py", line 170, in func_update

    cache.update_NXDL_Cache(force_update=args.force)

  File "/home/travis/build/prjemian/punx/src/punx/cache.py", line 257, in update_NXDL_
↪Cache

    info = __get_github_info__()    # check with GitHub first

  File "/home/travis/build/prjemian/punx/src/punx/cache.py", line 246, in __get_
↪github_info__

    punx.GITHUB_NXDL_REPOSITORY)

  File "/home/travis/build/prjemian/punx/src/punx/cache.py", line 228, in_
↪githubMasterInfo

    raise punx.CannotUpdateFromGithubNow(msg)

punx.CannotUpdateFromGithubNow: API rate limit exceeded for nn.nn.nn.nn.
(But here's the good news: Authenticated requests get a higher rate limit.
Check out the documentation for more details.)
```

GitHub imposes a limit on the number of unauthenticated downloads per hour<sup>1</sup>. You can check your rate limit status<sup>2</sup>. Mostly, this means try again later.

A GitHub issue has been raised to resolve this for the **punx** project.<sup>3</sup>

## Validation

### Data File Validation

NeXus HDF5 data files can have significant structure. It can be a challenge to determine that a given file is compliant with any of the rules specified in the *NeXus definitions* (here, we refer to the the applicable NXDL files and NeXus XML Schema in aggregate as the *NeXus definitions*).

The first test for any file to be considered a NeXus data file is whether or not the file is a valid HDF5 file. If the file is not HDF5, it is not a valid NeXus HDF5 data file.

### General

In general, validation of data files proceeds through several steps:

1. is file HDF5?
2. does file contain one or more **NXentry**<sup>1</sup> groups?
3. test the *NeXus definitions* against the file
4. Does the file define a default plot in each **NXdata** group?
5. Does the file define a path to the default plot?
6. Is the file a NeXus HDF5 data file?

### Is file HDF5?

This is a simple test and is handled by a library routine *h5py*.

### Test *NeXus definitions* against the data file

The *NeXus definitions* provide specifications for what should be found in a NeXus data file and where it should be found. Some items are optional and some items may be repeated.

In NeXus data files, the structure is defined by adding *NX\_class* attributes to each of the groups. This structure must match what is defined in the NXDL file for that group.

TODO: groups must be either one of the defined base classes (or contributed definitions but this is rare)

---

<sup>1</sup> “The rate limit allows you to make up to 60 requests per hour, associated with your IP address”, <https://developer.github.com/v3/#rate-limiting>

<sup>2</sup> Status of GitHub API Rate Limit: [https://developer.github.com/v3/rate\\_limit/](https://developer.github.com/v3/rate_limit/)

<sup>3</sup> *update: cannot download NXDL files from GitHub #64*, <https://github.com/prjemian/punx/issues/64>

<sup>1</sup> [http://download.nexusformat.org/doc/html/classes/base\\_classes/NXentry.html](http://download.nexusformat.org/doc/html/classes/base_classes/NXentry.html)

## Test each NXentry group against the NeXus definitions

In a NeXus data file, there are one more more **NXentry** groups. Validation proceeds by walking through each of the group that define a *NX\_class* attribute using the matching base class or contributed definition.

NeXus application definitions are a special case of **NXentry** (or **NXsubentry**) group. If a group's *NX\_class* attribute has the value *NXentry* or *NXsubentry*, then group must contain a *definition* field. The value of this *definition* field gives the name of the application definition to which this group (and all its subgroups) must comply.

Base classes are the building blocks of the NeXus structure. Application definitions differ from **NXentry** and **NXsubentry** in one important aspect: content specified in an application definition is *required*, by default. In base classes, content is *optional* by default. Contributed definitions include propositions from the community for NeXus base classes or application definitions, as well as other NXDL files for long-term archival by NeXus. Consider the contributed definitions as either in incubation or a special case not for general use.

## Details

–tba–

## Parsing the XML Schema

The XML Schema defines the constructs of the NXDL language, the various enumerations, and the default values when the constructs are used in base classes or application definitions.

## Parsing the NXDL files

–tba–

## Application Definitions

–tba–

## NXDL File Validation

NXDL files must adhere to the specifications of the NeXus XML Schema, as defined in *nxdl.xsd* and *nxdlTypes.xsd*.

<b>Caution:</b> TODO: citation needed
---------------------------------------

Any NXDL file may be validated using the Linux command line tool `xmllint`. Such as:

```
user@host ~ $ xmllint --noout --schema nxdl.xsd base_classes/NXentry.nxdl.xml
base_classes/NXentry.nxdl.xml validates
```

*Validation* is the process of comparing an object with a standard. An important aspect of validation is the report of each aspect tested and whether or not it complies with the standard. This is a useful and necessary step when composing NeXus HDF5 data files or software that will read NeXus data files and when building NeXus Definition Language (NXDL) files.

In NeXus, three basic types of object can be validated:

- *HDF5 data files* must comply with the specifications set forth in the applicable NeXus base classes, application definitions, and contributed definitions.
- *NeXus NXDL files* must comply with the XML Schema files *nxdl.xsd* and *nxdlTypes.xsd*.
- **XML Schema files** must comply with the rules defined by the WWW3 consortium. TODO: citation needed.

### User interface: subcommand: validate

validate a NeXus file

### command line help

```
1 usage: punx validate [-h] [--report REPORT] [-l [LOGFILE]] [-i INTEREST]
2                       infile
3
4 positional arguments:
5   infile                HDF5 or NXDL file name
6
7 optional arguments:
8   -h, --help            show this help message and exit
9   --report REPORT       select which validation findings to report, choices:
10                        COMMENT, ERROR, NOTE, OK, TODO, UNUSED, WARN
11   -l [LOGFILE], --logfile [LOGFILE]
12                        log output to file (default: no log file)
13   -i INTEREST, --interest INTEREST
14                        logging interest level (1 - 50), default=1 (Level 1)
```

The **REPORT** findings are as presented in the table above for each validation step.

The logging **INTEREST** levels are for output from the program,

### Examples

–tba–

**punx** uses a subcommand structure to provide several different modules under one identifiable program. These are invoked using commands of the form:

```
punx <subcommand> <other parameters>
```

where *<subcommand>* is chosen from this table:

subcommand	brief description
<i>demonstrate</i>	demonstrate HDF5 file validation
<i>hierarchy</i>	show NeXus base class hierarch
<i>structure</i>	show structure of HDF5 or NXDL file
<i>update</i>	update the local cache of NeXus definitions
<i>validate</i>	validate a NeXus file

and the *<other parameters>* are described by the help for each subcommand:

```
punx <subcommand> -h
```

Example:

```
console> punx validate -h
punx validate -h
usage: punx validate [-h] [--report REPORT] [-l [LOGFILE]] [-i INTEREST]
                    infile

positional arguments:
  infile                HDF5 or NXDL file name

optional arguments:
  -h, --help            show this help message and exit
  --report REPORT       select which validation findings to report, choices:
                        COMMENT, ERROR, NOTE, OK, TODO, UNUSED, WARN
  -l [LOGFILE], --logfile [LOGFILE]
                        log output to file (default: no log file)
  -i INTEREST, --interest INTEREST
                        logging interest level (1 - 50), default=20 (INFO)
```

**Tip:** Subcommands may be abbreviated.

It is only necessary to use the first two (or more) characters of any subcommand enough that the abbreviation is unique. Such as: `demonstrate` can be abbreviated to `demo` or even `de`.

## 1.2 Installation

Released versions of punx are available on [PyPI](#).

If you have `pip` installed, then you can install:

```
$ pip install punx
```

The latest development versions of punx can be downloaded from the [GitHub repository](#) listed above:

```
$ cd /some/directory
$ git clone http://github.com/prjemian/punx.git
```

To install in the standard Python location:

```
$ cd punx
$ pip install .
# -or-
$ python setup.py install
```

To install in user's home directory:

```
$ python setup.py install --user
```

To install in an alternate location:

```
$ python setup.py install --prefix=/path/to/installation/dir
```

## 1.2.1 Updating

**pip** If you have installed previously with *pip*:

```
$ pip install -U --no-deps punx
```

**git** assuming you have cloned as shown above:

```
$ cd /some/directory/punx
$ git pull
$ pip install -U --no-deps .
```

## 1.2.2 Required Packages

Package	URL
h5py	<a href="http://www.h5py.org">http://www.h5py.org</a>
lxml	<a href="http://lxml.de">http://lxml.de</a>
numpy	<a href="http://numpy.scipy.org">http://numpy.scipy.org</a>
PyGithub	<a href="https://github.com/PyGithub/PyGithub">https://github.com/PyGithub/PyGithub</a>
PyQt4	<a href="https://riverbankcomputing.com/software/pyqt/intro">https://riverbankcomputing.com/software/pyqt/intro</a>
requests	<a href="http://docs.python-requests.org">http://docs.python-requests.org</a>

## 1.2.3 Optional Packages

Package	URL
pyRestTable	<a href="http://pyresttable.readthedocs.io">http://pyresttable.readthedocs.io</a>

The *pyRestTable* package is only used for various reports. If using the package as a library and developing your own custom reporting, this package is not required.

## 1.3 Change History

### 1.3.1 Production

–none–

### 1.3.2 Development

**0.1.9** 2017-07-09 – last tag before major refactor (#72), no changes here since 2017-03-31

**0.1.8** 2017-03-12 – package .json file in the cache file sets

**0.1.7** 2017-03-11 – NeXus def 3.2 bundled into repo now

**0.1.4** 2016-12-09 – validation reports sorted by HDF5 address

**0.1.3** 2016-12-07 – Py2 & Py3: passes all unit tests

**0.1.2** 2016-11-21 – unit tests added for reports

**0.0.9** 2016-06-29 – retry failed https requests to GitHub and cleanup a QString



- 0.0.8** 2016-06-29 – refactor update procedure
- 0.0.7** 2016-06-27 – add “report” arguments to “demo” subcommand
- 0.0.6** 2016-06-22 – resolved some UnicodeDecodeError exceptions
- 0.0.5** 2016-06-20 – added subcommand shortcuts and logging
- 0.0.4** 2016-06-17 – work-in-progress to test installation with remote user
- 0.0.3** 2016-06-11 – basic UI established, **demo** command added
- 0.0.2** 2016-06-11 – basic UI established
- 0.0.1** 2016-06-10 – basic functions
- started** 2016-05-20 – initial project creation

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## 1.5 Cache : cache\_manager

Hierarchy:

- *punx.nxdl\_manager*
- *punx.schema\_manager*
- *punx.cache\_manager*
- *punx.github\_handler*

### 1.5.1 source code documentation

manages the NXDL cache directories of this project

A key component necessary to validate both NeXus data files and NXDL class files is a current set of the NXDL definitions.

There are two cache directories:

- the source cache
- the user cache

Within each of these cache directories, there may be one or more subdirectories, each containing the NeXus definitions subdirectories and files (\*.xml, \*.xsl, & \*.xsd) of a specific branch, release, tag, or commit hash from the NeXus definitions repository.

**source cache** contains default set of NeXus NXDL files

**user cache** contains additional set(s) of NeXus NXDL files, installed by user

The *cache\_manager* calls the *github\_handler* and is called by *schema\_manager* and *nxdl\_manager*.

#### Public interface

<i>CacheManager</i> ()	manager both source and user caches
------------------------	-------------------------------------

#### Internal interface

<i>get_short_sha</i> (full_sha)	return the first few unique characters of the git commit hash (SHA)
<i>read_json_file</i> (filename)	read a structured object from the JSON file <i>file_name</i>
<i>write_json_file</i> (filename, obj)	write the structured <i>obj</i> to the JSON file <i>file_name</i>
<i>extract_from_download</i> (grr, path)	download & extract NXDL files from <i>grr</i> into a subdirectory of <i>path</i>
<i>table_of_caches</i> ()	return a pyRestTable table describing all known file sets in both source and user caches
<i>Base_Cache</i>	provides comon methods to get the QSettings path and file name
<i>SourceCache</i> ()	manage the source directory cache of NXDL files
<i>UserCache</i> ()	manage the user directory cache of NXDL files
<i>NXDL_File_Set</i>	describe a single set of NXDL files

**class** `punx.cache_manager.Base_Cache`  
 provides comon methods to get the QSettings path and file name

<code>find_all_file_sets()</code>	index all NXDL file sets in this cache
<code>fileName()</code>	full path of the QSettings file
<code>path()</code>	directory containing the QSettings file
<code>cleanup()</code>	removes any temporary directories

**cleanup ()**  
 removes any temporary directories

**fileName ()**  
 full path of the QSettings file

**find\_all\_file\_sets ()**  
 index all NXDL file sets in this cache

**path ()**  
 directory containing the QSettings file

**class** `punx.cache_manager.CacheManager`  
 manager both source and user caches

<code>install_NXDL_file_set(grr[, user_cache, ...])</code>	using <i>ref</i> as a name, get the se of NXDL files from the NeXus GitHub
<code>select_NXDL_file_set([ref])</code>	return the named <code>self.default_file_set</code> instance or raise <code>KeyError</code> exception if unknown
<code>find_all_file_sets()</code>	index all NXDL file sets in both source and user caches, return a dictionary
<code>cleanup()</code>	removes any temporary directories

**cleanup ()**  
 removes any temporary directories

**find\_all\_file\_sets ()**  
 index all NXDL file sets in both source and user caches, return a dictionary

**install\_NXDL\_file\_set (grr, user\_cache=True, ref=None, force=False)**  
 using *ref* as a name, get the se of NXDL files from the NeXus GitHub

**Parameters**

- **grr** (*obj*) – instance of `GitHub_Repository_Reference`
- **user\_cache** (*bool*) – `True`: use user cache, “`False`“: use source cache (default)
- **ref** (*str*) – name to use when requesting from GitHub, (*master*, commit hash such as *abc1234*, branch name, release name such as *v3.2*, or tag name)
- **force** (*bool*) – update if installed is not the same SHA

**select\_NXDL\_file\_set (ref=None)**  
 return the named `self.default_file_set` instance or raise `KeyError` exception if unknown

**table\_of\_caches ()**  
 return a `pyRestTable` table describing all known file sets in both source and user caches

**Returns obj** instance of `pyRestTable.Table` with all known file sets

**Example:**

```

=====
↪-----
NXDL file set type      cache  date & time          commit  path
=====
↪-----
v3.2          tag      source 2017-01-18 23:12:44 e888dac /home/user/punx/src/
↪punx/cache/v3.2
NXroot-1.0    tag      user   2016-10-24 14:58:10 e0ad63d /home/user/.config/
↪punx/NXroot-1.0
master        branch  user   2016-12-20 18:30:29 85d056f /home/user/.config/
↪punx/master
Schema-3.3    release user   2017-05-02 12:33:19 4aa4215 /home/user/.config/
↪punx/Schema-3.3
a4fd52d       commit  user   2016-11-19 01:07:45 a4fd52d /home/user/.config/
↪punx/a4fd52d
=====
↪-----

```

**class** `punx.cache_manager.NXDL_File_Set`  
describe a single set of NXDL files

**class** `punx.cache_manager.SourceCache`  
manage the source directory cache of NXDL files

**class** `punx.cache_manager.UserCache`  
manage the user directory cache of NXDL files

`punx.cache_manager.extract_from_download(grr, path)`  
download & extract NXDL files from `grr` into a subdirectory of `path`

**USAGE:**

```

grr = github_handler.GitHub_Repository_Reference()
grr.connect_repo()
if grr.request_info() is not None:
    extract_from_download(grr, cache_directory)

```

`punx.cache_manager.get_short_sha(full_sha)`  
return the first few unique characters of the git commit hash (SHA)

`punx.cache_manager.read_json_file(filename)`  
read a structured object from the JSON file `file_name`

See <https://docs.python.org/3.5/library/json.html#json.loads>

`punx.cache_manager.table_of_caches()`  
return a `pyRestTable` table describing all known file sets in both source and user caches

**Returns obj** instance of `pyRestTable.Table` with all known file sets

**Example:**

```

=====
↪-----
NXDL file set type      cache  date & time          commit  path
=====
↪-----
v3.2          tag      source 2017-01-18 23:12:44 e888dac /home/user/punx/src/punx/
↪cache/v3.2
NXroot-1.0    tag      user   2016-10-24 14:58:10 e0ad63d /home/user/.config/punx/
↪NXroot-1.0

```

```

master      branch  user    2016-12-20 18:30:29 85d056f /home/user/.config/punx/
↔master
Schema-3.3  release user    2017-05-02 12:33:19 4aa4215 /home/user/.config/punx/
↔Schema-3.3
a4fd52d    commit  user    2016-11-19 01:07:45 a4fd52d /home/user/.config/punx/
↔a4fd52d
=====
↔=====
    
```

`punx.cache_manager.write_json_file(filename, obj)`  
 write the structured `obj` to the JSON file `file_name`

See <https://docs.python.org/3.5/library/json.html#json.dumps>

## 1.6 GitHub : github\_handler

The `github_handler` module handles all communications with the NeXus GitHub repository.

If the user has provided GitHub credentials (username and password) in a `__github_creds__.txt` file in the source code directory, then the access will be through the Github Basic Authentication interface. This is helpful since the GitHub API Rate Limit allows for only a few downloads through the API per hour if using unauthenticated access.

### 1.6.1 source code documentation

manages the communications with GitHub

---

<code>GitHub_Repository_Reference()</code>	all information necessary to describe and download a repository branch, release, tag, or SHA hash
--	---

---

USAGE:

```

grr = punx.github_handler.GitHub_Repository_Reference()
grr.connect_repo()
if grr.request_info(u'v3.2') is not None:
    d = grr.download()
    
```

**class** `punx.github_handler.GitHub_Repository_Reference`  
 all information necessary to describe and download a repository branch, release, tag, or SHA hash

ROUTINES

---

<code>connect_repo([repo_name])</code>	connect with the GitHub repository
<code>request_info([ref])</code>	request download information about <code>ref</code>
<code>download()</code>	download the NXDL definitions described by <code>ref</code>

---

See <https://github.com/PyGithub/PyGithub/tree/master/github>

**connect\_repo** (*repo\_name=None*)  
 connect with the GitHub repository

**Parameters** `repo_name` (*str*) – name of repository in <https://github.com/nexusformat> (default: *definitions*)



**Returns bool** True if using GitHub credentials

**download()**

download the NXDL definitions described by `ref`

**get\_branch** (*ref=u'master'*)

learn the download information about the named branch

**Parameters** **ref** (*str*) – name of branch in repository

**get\_commit** (*ref=u'a4fd52d'*)

learn the download information about the referenced commit

**Parameters** **ref** (*str*) – name of SHA hash, first unique characters are sufficient, usually 7 or less

**get\_release** (*ref=u'v3.3'*)

learn the download information about the named release

**Parameters** **ref** (*str*) – name of release in repository

**get\_tag** (*ref=u'Schema-3.3'*)

learn the download information about the named tag

**Parameters** **ref** (*str*) – name of tag in repository

**request\_info** (*ref=None*)

request download information about `ref`

**Parameters** **ref** (*str*) – name of branch, release, tag, or SHA hash (default: `v3.2`)

download URLs

- base: <https://github.com>
- master: <https://github.com/nexusformat/definitions/archive/master.zip>
- branch (www\_page\_486): [https://github.com/nexusformat/definitions/archive/www\\_page\\_486.zip](https://github.com/nexusformat/definitions/archive/www_page_486.zip)
- hash (83ce630): <https://github.com/nexusformat/definitions/archive/83ce630.zip>
- release (v3.2): see hash `c0b9500`
- tag (NXcanSAS-1.0): see hash `83ce630`

`punx.github_handler.get_BasicAuth_credentials` (*creds\_file\_name=None*)

get the Github Basic Authentication credentials from a local file

GitHub requests can use *Basic Authentication* if the credentials (username and password) are provided in the local file `__github_creds__.txt` which is placed in the same directory as this file. The credentials file is not placed under version control since it has GitHub credentials. If found, the file is parsed for `username` `password` as shown below. Be sure to make the file readable only by the user and not others.

## 1.7 NXDL Manager : `nxdl_manager`

### 1.7.1 source code documentation

Load and/or document the structure of a NeXus NXDL class specification

The `nxdl_manager` calls the `schema_manager` and is called by `__tba__`.

**class** `punx.nxdl_manager.NXDL_Manager` (*file\_set=None*)

the NXDL classes found in `nxdl_dir`

**class** `punx.nxdl_manager.NXDL__Mixin` (*nxdl\_definition*, \*args, \*\*kws)  
 base class for each NXDL structure

**assign\_defaults** ()  
 set default values for required components now

**parse\_nxdl\_xml** (\*args, \*\*kwargs)  
 parse the XML node and assemble NXDL structure

**class** `punx.nxdl_manager.NXDL__attribute` (*nxdl\_definition*, *nxdl\_defaults=None*, \*args, \*\*kws)  
 contents of a *attribute* structure (XML element) in a NXDL XML file

**parse\_nxdl\_xml** (*xml\_node*)  
 parse the XML content

**class** `punx.nxdl_manager.NXDL__definition` (*nxdl\_manager=None*, \*args, \*\*kws)  
 contents of a *definition* element in a NXDL XML file

**Parameters** **path** (*str*) – absolute path to NXDL definitions directory (has nxdl.xsd)

**parse\_nxdl\_xml** ()  
 parse the XML content

**set\_file** (*fname*)  
 self.category: base\_classes | applications | contributed\_definitions

**class** `punx.nxdl_manager.NXDL__dim` (*nxdl\_definition*, *nxdl\_defaults=None*, \*args, \*\*kws)  
 contents of a *dim* structure (XML element) in a NXDL XML file

**parse\_nxdl\_xml** (*xml\_node*)  
 parse the XML content

**class** `punx.nxdl_manager.NXDL__dimensions` (*nxdl\_definition*, *nxdl\_defaults=None*, \*args, \*\*kws)  
 contents of a *dimensions* structure (XML element) in a NXDL XML file

**parse\_nxdl\_xml** (*xml\_node*)  
 parse the XML content

**class** `punx.nxdl_manager.NXDL__field` (*nxdl\_definition*, *nxdl\_defaults=None*, \*args, \*\*kws)  
 contents of a *field* structure (XML element) in a NXDL XML file

**parse\_nxdl\_xml** (*xml\_node*)  
 parse the XML content

**class** `punx.nxdl_manager.NXDL__group` (*nxdl\_definition*, *nxdl\_defaults=None*, \*args, \*\*kws)  
 contents of a *group* structure (XML element) in a NXDL XML file

**parse\_nxdl\_xml** (*xml\_node*)  
 parse the XML content

**class** `punx.nxdl_manager.NXDL__link` (*nxdl\_definition*, *nxdl\_defaults=None*, \*args, \*\*kws)  
 contents of a *link* structure (XML element) in a NXDL XML file

example from NXmonopd:

```
<link name="polar_angle" target="/NXentry/NXinstrument/NXdetector/polar_angle">
  <doc>Link to polar angle in /NXentry/NXinstrument/NXdetector</doc>
</link>
<link name="data" target="/NXentry/NXinstrument/NXdetector/data">
  <doc>Link to data in /NXentry/NXinstrument/NXdetector</doc>
</link>
```

**parse\_nxdml\_xml** (*xml\_node*)  
 parse the XML content

**class** `punx.nxdml_manager.NXDL__symbols` (*nxdml\_definition*, *nxdml\_defaults=None*, *\*args*, *\*\*kwds*)  
 contents of a *symbols* structure (XML element) in a NXDL XML file

example from NXcrystal:

```
<symbols>
  <doc>These symbols will be used below to coordinate dimensions with the same_
  ↪lengths.</doc>
  <symbol name="n_comp"><doc>number of different unit cells to be described</doc>
  ↪</symbol>
  <symbol name="i"><doc>number of wavelengths</doc></symbol>
</symbols>
```

**parse\_nxdml\_xml** (*symbols\_node*)  
 parse the XML content

`punx.nxdml_manager.get_NXDL_file_list` (*nxdml\_dir*)  
 return a list of all NXDL files in the *nxdml\_dir*

The list is sorted by NXDL category (*base\_classes*, *applications*, *contributed\_definitions*) and then alphabetically within each category.

`punx.nxdml_manager.validate_xml_tree` (*xml\_tree*)  
 validate an NXDL XML file against the NeXus NXDL XML Schema file

**Parameters** *xml\_file\_name* (*str*) – name of XML file

## 1.8 Manage the XML Schema files : `schema_manager`

-tba-

### 1.8.1 source code documentation

manages the XML Schema of this project

The *schema\_manager* calls the *cache\_manager* and is called by *nxdml\_manager*.

Public

<code>SchemaManager</code> ( <i>[path]</i> )	describes the XML Schema for the NeXus NXDL definitions files
<code>Schema_Root</code> ( <i>element_node</i> [], <i>obj_name</i> , ...)	root element of the <i>nxdml.xsd</i> file
<code>Schema_Attribute</code> ( <i>xml_obj</i> [], <i>obj_name</i> , ...)	xs:attribute element
<code>Schema_Element</code> ( <i>xml_obj</i> [], <i>obj_name</i> , <i>ns_dict</i> , ...)	xs:element
<code>Schema_Type</code> ( <i>ref</i> [], <i>tag</i> , <i>schema_root</i> )	a named NXDL structure type (such as <i>groupGroup</i> )
<code>get_default_schema_manager</code> ()	internal: convenience function
<code>raise_error</code> ( <i>node</i> , <i>text</i> , <i>obj</i> )	standard <i>ValueError</i> exception handling
<code>strip_ns</code> ( <i>ref</i> )	strip the namespace prefix from <i>ref</i>

Internal

<code>_Mixin(xml_obj[, obj_name, ns_dict, schema_root])</code>	common code for NXDL Rules classes below
<code>_GroupParsing</code>	internal: avoid a known recursion of group in a group
<code>_Recursion(obj_name)</code>	internal: an element used in recursion, such as child group of group

**class** `punx.schema_manager.SchemaManager` (*path=None*)  
 describes the XML Schema for the NeXus NXDL definitions files

**parse\_nxdlTypes** ()  
 get the allowed data types and unit types from nxdlTypes.xsd

**parse\_nxdl\_patterns** ()  
 get regexp patterns for validItemName, validNXClassName, & validTargetName from nxdl.xsd

**class** `punx.schema_manager.Schema_Attribute` (*xml\_obj, obj\_name=None, ns\_dict=None, schema\_root=None*)  
 xs:attribute element

**Parameters**

- **xml\_obj** (*lxml.etree.Element*) – XML element
- **obj\_name** (*str*) – optional, default taken from `xml_obj`
- **ns\_dict** (*dict*) – optional, default taken from `NAMESPACE_DICT`
- **schema\_root** (*obj*) – optional, instance of `lxml.etree._Element`

**class** `punx.schema_manager.Schema_Element` (*xml\_obj, obj\_name=None, ns\_dict=None, schema\_root=None*)  
 xs:element

**Parameters**

- **xml\_obj** (*lxml.etree.Element*) – XML element
- **obj\_name** (*str*) – optional, default taken from `xml_obj`
- **ns\_dict** (*dict*) – optional, default taken from `NAMESPACE_DICT`
- **schema\_root** (*obj*) – optional, instance of `lxml.etree._Element`

See <http://download.nexusformat.org/doc/html/nxdl.html>

See [http://download.nexusformat.org/doc/html/nxdl\\_desc.html#nxdl-elements](http://download.nexusformat.org/doc/html/nxdl_desc.html#nxdl-elements)

**class** `punx.schema_manager.Schema_Root` (*element\_node, obj\_name=None, ns\_dict=None, schema\_root=None, schema\_manager=None*)  
 root element of the nxdl.xsd file

**Parameters**

- **xml\_obj** (*lxml.etree.Element*) – XML element
- **obj\_name** (*str*) – optional, default taken from `xml_obj`
- **ns\_dict** (*dict*) – optional, default taken from `NAMESPACE_DICT`
- **schema\_root** (*obj*) – optional, instance of `lxml.etree._Element`

**parse\_sequence** (*seq\_node*)  
 parse the sequence used in the root element

**class** `punx.schema_manager.Schema_Type` (*ref, tag='\*', schema\_root=None*)  
 a named NXDL structure type (such as groupGroup)

**Parameters**

- **ref** (*str*) – name of NXDL structure type (such as groupGroup)
- **tag** (*str*) – XML Schema element tag, such as complexType (default=“\*“)
- **schema\_root** (*obj*) – optional, instance of lxml.etree.\_Element

See <http://download.nexusformat.org/doc/html/nxdl.html>

See [http://download.nexusformat.org/doc/html/nxdl\\_desc.html#nxdl-data-types-internal](http://download.nexusformat.org/doc/html/nxdl_desc.html#nxdl-data-types-internal)

**parse\_sequence** (*node*)

**class** `punx.schema_manager.Schema_nxdlType` (*xml\_obj, ns\_dict=None, schema\_root=None*)  
 one of the types defined in the file *nxdlTypes.xsd*

**class** `punx.schema_manager.Schema_pattern`  
 describe the regular expression patterns ofr names of NeXus things

`punx.schema_manager.get_default_schema_manager` ()  
 internal: convenience function

`punx.schema_manager.raise_error` (*node, text, obj*)  
 standard *ValueError* exception handling

**Parameters**

- **node** (*obj*) – instance of
- **text** (*str*) – label for *obj*
- **obj** (*str*) – value

`punx.schema_manager.strip_ns` (*ref*)  
 strip the namespace prefix from *ref*

**Parameters** **ref** (*str*) – one word, colon delimited string, such as *nx:groupGroup*

**Returns** **str** the part to the right of the last colon

## 1.9 Source Code

<i>nxdl_manager</i>	Load and/or document the structure of a NeXus NXDL class specification
<i>schema_manager</i>	manages the XML Schema of this project
<i>cache_manager</i>	manages the NXDL cache directories of this project
<i>github_handler</i>	manages the communications with GitHub

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