# sphinxcontrib-specdomain Documentation
## Release 1.04.02

*Release 1.04.02*

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# Contents

This Python package is an extension for Sphinx (http://sphinx.pocoo.org/), to document SPEC macro source code files. SPEC (http://www.certif.com) is control software for X-Ray Diffraction and Data Acquisition of scientific instruments.

This code extracts useful documentation from SPEC macro source code files.

**home**  http://specdomain.readthedocs.org

**git**  https://github.com/prjemian/specdomain

**PyPI**  https://pypi.python.org/pypi/sphinxcontrib-specdomain

# Contents

# How to use Sphinx to Document SPEC Macro Source Code Files

## How to Download and Install the SPEC support into Sphinx

### use package manager

Use one of these methods to get specdomain from pypi.python.org:

```
pip install -U sphinxcontrib-specdomain
```

or:

```
easy_install -U sphinxcontrib-specdomain
```

### install from source

1. download from the subversion repository
2. install into Python
3. test the installation

**Requires**[1]

- Python 2.7 or greater
- Sphinx 1.1.1 or greater

---

[1] The developer used Python 2.7.2 and Sphinx 1.1.2 while writing this support. Older versions may work but have not been tested.

### Download

Retrieve the support package from our subversion repository:

```
svn co https://subversion.xray.aps.anl.gov/bcdaext/specdomain/trunk/src/specdomain/ /
→tmp/specdomain
```

### Install

Continuing from the download above, use the setup tools to install the package somewhere on your PYTHONPATH (you may need admin rights to install into your Python). This command shows how to install into Python's *site-packages* directory:

```
cd /tmp/specdomain
python setup.py install
```

## How to Create and Configure a Sphinx project to Document SPEC Macros

**Tip:** for more information on this topic, refer to the SPhinx tutorial: http://sphinx.pocoo.org/tutorial.html

### Decide which configuration

**In-source** configuration or **Out-of-source** configuration?

**Tip:** Most likely, you will want to keep the Sphinx documentation files in a separate directory from the SPEC macros. Then again, maybe not.

### In-source configuration

An *in-source* configuration is where the Sphinx `.rst` files are in **the same directory** as the SPEC macro files.

Here is a graphical example:

### Out-of-source configuration

An *out-of-source* configuration is where the Sphinx `.rst` files are in **a separate directory** from the SPEC macro files.

Here is a graphical example:[1]

The source files are located in the *source* directory (child of the build directory):

---

[1] The green check boxes correspond to the status of each item in the version control system.
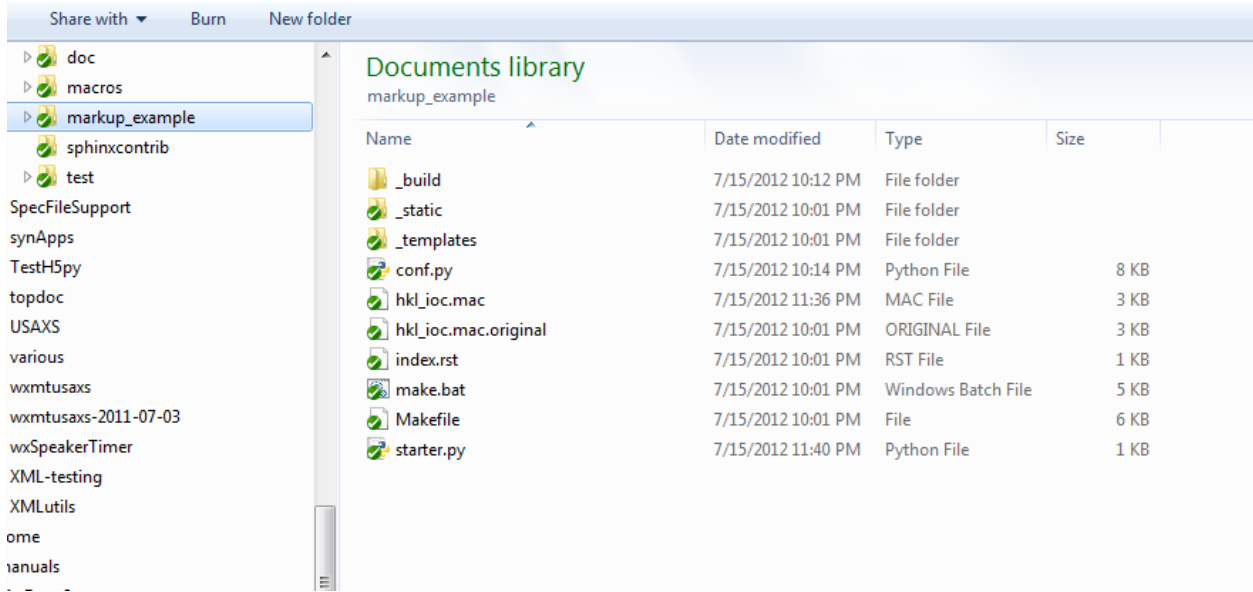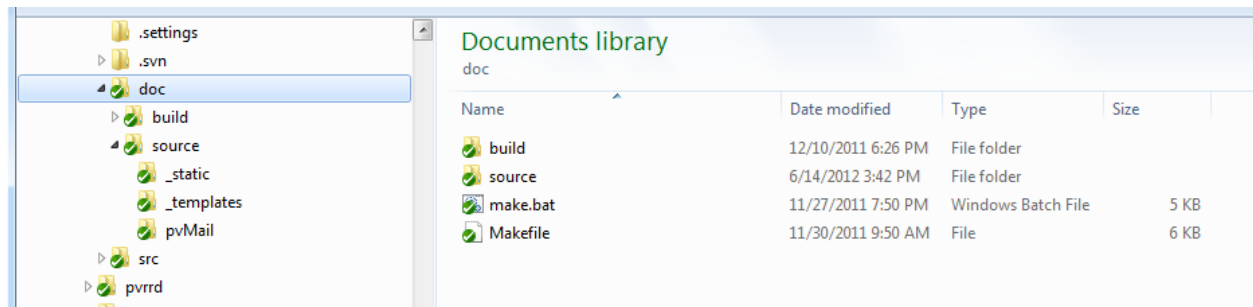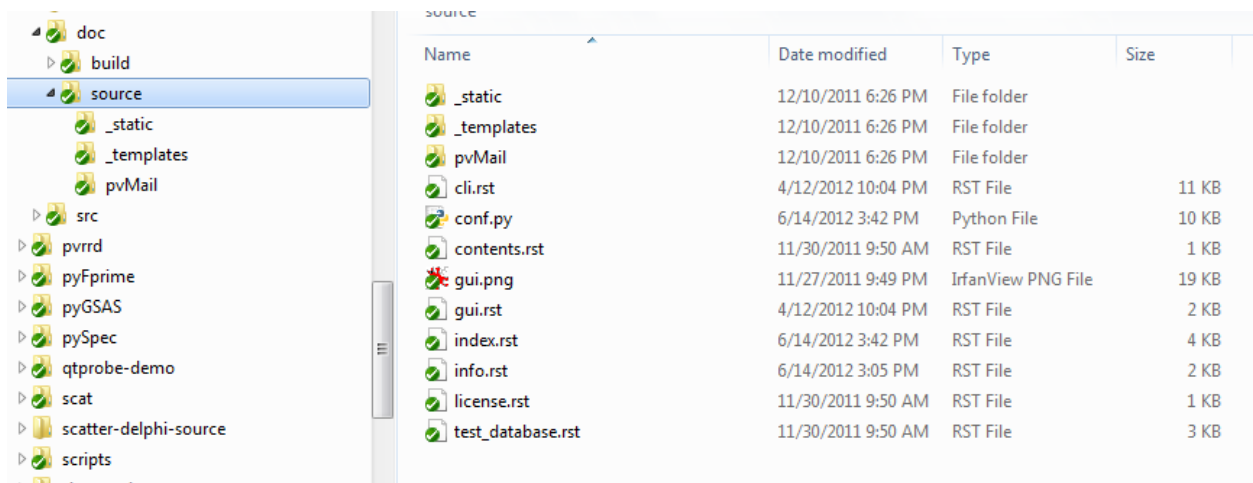
Fig. 1.1: Example directory of an in-source configuration



Fig. 1.2: Example build directory of an out-of-source configuration



Fig. 1.3: Example *source* directory of an out-of-source configuration

> **Caution:** FIXME: these are Python files and project directories. The figure *should* be shown with SPEC macro files out-of-source.

### Create the Sphinx documentation tree

> **Testing the installation**
>
> These instructions are written to help you test if you have installed *specdomain* correctly. They use an *in-source* configuration.

Make a new sandbox directory to try this out:

```
mkdir /tmp/sandbox
cd /tmp/sandbox
```

Create a Sphinx configuration in this directory by running:

```
sphinx-quickstart
```

Here's the full session:

```
1    jemian@como-ubuntu64:/tmp/sandbox$ sphinx-quickstart
2    Welcome to the Sphinx 1.1.2 quickstart utility.
3
4    Please enter values for the following settings (just press Enter to
5    accept a default value, if one is given in brackets).
6
7    Enter the root path for documentation.
8    > Root path for the documentation [.]:
9
10   You have two options for placing the build directory for Sphinx output.
11   Either, you use a directory "_build" within the root path, or you separate
12   "source" and "build" directories within the root path.
13   > Separate source and build directories (y/N) [n]:
14
15   Inside the root directory, two more directories will be created; "_templates"
16   for custom HTML templates and "_static" for custom stylesheets and other static
17   files. You can enter another prefix (such as ".") to replace the underscore.
18   > Name prefix for templates and static dir [_]:
19
20   The project name will occur in several places in the built documentation.
21   > Project name: sandbox
22   > Author name(s): sandy
23
24   Sphinx has the notion of a "version" and a "release" for the
25   software. Each version can have multiple releases. For example, for
26   Python the version is something like 2.5 or 3.0, while the release is
27   something like 2.5.1 or 3.0a1.  If you don't need this dual structure,
28   just set both to the same value.
29   > Project version: test
30   > Project release [test]:
31
32   The file name suffix for source files. Commonly, this is either ".txt"
33   or ".rst".  Only files with this suffix are considered documents.
```

```
34    > Source file suffix [.rst]:
35
36    One document is special in that it is considered the top node of the
37    "contents tree", that is, it is the root of the hierarchical structure
38    of the documents. Normally, this is "index", but if your "index"
39    document is a custom template, you can also set this to another filename.
40    > Name of your master document (without suffix) [index]:
41
42    Sphinx can also add configuration for epub output:
43    > Do you want to use the epub builder (y/N) [n]:
44
45    Please indicate if you want to use one of the following Sphinx extensions:
46    > autodoc: automatically insert docstrings from modules (y/N) [n]: y
47    > doctest: automatically test code snippets in doctest blocks (y/N) [n]:
48    > intersphinx: link between Sphinx documentation of different projects (y/N) [n]:
49    > todo: write "todo" entries that can be shown or hidden on build (y/N) [n]:
50    > coverage: checks for documentation coverage (y/N) [n]:
51    > pngmath: include math, rendered as PNG images (y/N) [n]:
52    > mathjax: include math, rendered in the browser by MathJax (y/N) [n]:
53    > ifconfig: conditional inclusion of content based on config values (y/N) [n]:
54    > viewcode: include links to the source code of documented Python objects (y/N)␣
  ↪[n]: y
55
56    A Makefile and a Windows command file can be generated for you so that you
57    only have to run e.g. `make html' instead of invoking sphinx-build
58    directly.
59    > Create Makefile? (Y/n) [y]:
60    > Create Windows command file? (Y/n) [y]:
61
62    Creating file ./conf.py.
63    Creating file ./index.rst.
64    Creating file ./Makefile.
65    Creating file ./make.bat.
66
67    Finished: An initial directory structure has been created.
68
69    You should now populate your master file ./index.rst and create other␣
  ↪documentation
70    source files. Use the Makefile to build the docs, like so:
71        make builder
72    where "builder" is one of the supported builders, e.g. html, latex or linkcheck.
73
74    jemian@como-ubuntu64:/tmp/sandbox$
```

In case you missed them, these are the non-default answers supplied:

| prompt | response |
|---|---|
| > Project name: | *sandbox* |
| > Author name(s): | *sandy* |
| > Project version: | *test* |
| > autodoc: automatically insert docstrings from modules (y/N) [n]: | *y* |
| > viewcode: include links to the source code of documented Python objects (y/N) [n]: | *y* |

### Configure: Changes to `conf.py`

Edit the new file *conf.py* and add these two lines to the extensions list after line 28:

```
# this says ${PYTHONPATH)/sphinxcontrib/specdomain.py must be found
extensions.append('sphinxcontrib.specdomain')
```

If you wish, you can also change the *html_theme* from the *default* to *sphinxdoc* or *agogo* or one of the others. Check the Sphinx documentation for the choices. To change the theme, look on line 97 (or thereabouts) and change:

```
html_theme = 'default'
```

to:

```
html_theme = 'sphinxdoc'
```

## How to Build the Documentation from a Sphinx project

Briefly:

```
make html
```

Load the file `index.html` into your browser and examine the results. The file path is different depending if you have an *in-source* or *out-of-source* configuration.

***in-source* path:** `_build/html/index.html`

***out-of-source* path:** `build/html/index.html`

### Test

For our testing purposes, we'll document the *aalength.mac* macro file from the *Install* section. Edit the new file *index.rst* and add this line at line 14. Make sure it lines up at the left in column 1:

```
.. autospecmacro:: ../specdomain/doc/aalength.mac
```

Build the HTML documentation:

```
make html
```

View the documentation using a web browser such as *firefox*:

```
firefox _build/html/index.html &
```

You should see a page that looks like this, if nothing went wrong.

## How to Markup a SPEC Macro File

1. start with SPEC macro file that is not marked up
2. create a Sphinx documentation project
3. apply markup

Fig. 1.4: Documentation of the **aalength.mac** file.

4. test

---

**Tip:** In addition to the Sphinx documentation (http://sphinx.pocoo.org), a good reference how to document your macros can be found here: http://stackoverflow.com/questions/4547849/good-examples-of-python-docstrings-for-sphinx but a Google search for *sphinx python docstrings examples* will turn up a wealth of alternatives.

---

### Basic SPEC Macro file

This example is a SPEC macro file from the APS subversion repository: https://subversion.xray.aps.anl.gov/spec/macros/trunk/common/hkl_ioc.mac because it is simple, brief, does not contain references to other macro files, provides its documentation in SPEC comments, and has not been marked up previously for documentation with Sphinx. Here is the file *hkl_ioc.mac* in its entirety.

```
1  #==============================================================================
2  #***************SPEC macros for the Advanced Photon Source*********************
3  #==============================================================================
4  #
5  # Beamline/Sector: 4ID
6  #
7  # Macro Package: hkl_ioc.mac
8  #
9  # Version: 1.0 (August,2005)
10 #
11 # Description: A user defined calcHKL to write the current HKL postion to a
12 #              soft IOC. It requires spec softioc running.
13 #
```

```
14   # Written by: X. Jiao 08/08/2005
15   #
16   # Modified by:
17   #
18   # User macros: ioc_HKL -> to turn on/off the feature of putting HKL to shared
19   #                         memory.
20   #
21   # Internal macros: ioc_put_HKL -> write HKL to the soft IOC
22   #
23   # Modification history:
24   #
25   #$Log$
26   #Revision 1.3  2006/05/22 20:34:35  jiaox
27   #removed unsed lines in ioc_HKL.
28   #
29   #Revision 1.2  2006/05/11 17:46:31  jiaox
30   #Added CVS Log entry.
31   #
32   #=======================================================================
33
34   #=======================================================================
35   # preload check/setting here
36   #=======================================================================
37
38   cdef("user_save_HKL","","ioc_HKL")
39   cdef("calcHKL","calc(2); user_save_HKL;","ioc_HKL")
40
41   #=======================================================================
42   # global variables defined here
43   #=======================================================================
44   if( unset("SIOC_PV") ) {
45   global SIOC_PV
46   local foo tmp[]
47   SIOC_PREFIX="4id"
48   unix("hostname | cut -f1 -d.",foo)
49   split(foo,tmp,"\n")
50   foo=tmp[0]
51   SIOC_PV = sprintf("%s:%s:spec",SIOC_PREFIX,foo)
52   printf("Spec soft IOC PV(SIOC_PV): %s",SIOC_PV)
53   }
54
55   #=======================================================================
56   # user macros defined here
57   #=======================================================================
58   def ioc_HKL '{
59
60       if($# != 1) { eprint "Usage: ioc_HKL on/off ";exit}
61
62
63       if(("$1" == "on")) {
64           cdef("user_save_HKL","ioc_put_HKL","ioc_HKL","0x20")
65           print "Now put HKL to softioc."
66           exit
67       }
68       if(("$1" == "off")) {
69           cdef("user_save_HKL","","ioc_HKL","delete")
```

```
70          print "Stop put HKL to softioc."
71          exit
72      }
73      eprint "Usage: ioc_HKL on/off "
74  }'
75
76
77  #==============================================================================
78  # internal macros defined here
79  #==============================================================================
80  def ioc_put_HKL '
81      epics_put(sprintf("%s:H",SIOC_PV),H)
82      epics_put(sprintf("%s:K",SIOC_PV),K)
83      epics_put(sprintf("%s:L",SIOC_PV),L)
84      epics_put(sprintf("%s:NPTS",SIOC_PV),NPTS)
85  '
86
87
```

## Create a Sphinx Project

**Tip:** Use an *In-source configuration*

Make a project directory and change directory into it. (On my development system, this directory is called `../markup_example`.) Copy the file above into this directory with the name *hkl_ioc.mac*. Then run:

```
sphinx-quickstart
```

Take most of the defaults. These are the non-defaults for the example project:

| prompt | response |
|---|---|
| > Project name: | *example* |
| > Author name(s): | *SPEC Macro Writer* |
| > Project version: | *1* |
| > autodoc:  automatically insert docstrings from modules (y/N) [n]: | *y* |
| > viewcode:  include links to the source code of documented Python objects (y/N) [n]: | *y* |

Edit the document `index.rst` so it looks like this:

```
.. example documentation master file, created by
   sphinx-quickstart on Sun Jul 15 17:54:46 2012.
   You can adapt this file completely to your liking, but it should at least
   contain the root `toctree` directive.

Welcome to example's documentation!
===================================

.. autospecmacro:: hkl_ioc.mac

Contents:
```

```
.. toctree::
   :maxdepth: 2




Indices and tables
==================


* :ref:`genindex`
* :ref:`modindex`
* :ref:`search`
```

Edit *conf.py* and make these changes:

| change | directions |
|---|---|
| `sys.path.insert(0, os.path.abspath('..'))` | *replace* line 19 |
| `extensions.append( 'sphinxcontrib.specdomain' )` | insert *after* line 28 |

The revised file should look like this file: `../markup_example/conf.py`.

Now, build the documentation by typing:

```
make html
firefox _build/html/index.html &
```

You should expect a page that looks like this figure:

## Apply Markup

**Tip:** We will edit the *hkl_ioc.mac* file now. Before we start applying markup, it's a good idea to make a backup copy of the original:

```
cp hkl_ioc.mac  hkl_ioc.mac.original
```

Here are the steps to consider when converting SPEC comments to reST markup.

1. identify the SPEC comments

2. extended comments (docstrings) #. global docstring #. macro docstring #. others are ignored by Sphinx

3. descriptive comments

## SPEC comments

Obvious as this sounds, it may help someone to see that the SPEC comments are on lines 1-32. It is easy to place this entire block within an extended comment[1] (known hereafter as a *docstring*). Make these additions to lines 1 and 32:

| line | new |
|---|---|
| 1 | `"""#===============================================================================================` |
| 32 | `#======================================================================================="""` |

---

[1] a SPEC *extended comment* is text that is surrounded by three double-quote characters (`"""`), such as:

   """"this triple-quoted text is a docstring"""

In the Python language, this is known as a docstring. But, **unlike Python**, SPEC does not recognize single quotes to mark extended comments. Only use the double quote character.

---

example 1 documentation »

# Welcome to example's documentation!

## SPEC Macro File: hkl_ioc.mac

source code: `hkl_ioc.mac`

**user_save_HKL**
*cdef macro declaration*

**calcHKL**
*cdef macro declaration*

**SIOC_PV**
*global variable declaration*

**ioc_HKL**
*def macro declaration*

**user_save_HKL**
*cdef macro declaration*

**user_save_HKL**
*cdef macro declaration*

## Variable Declarations (hkl_ioc.mac)

| objtype | name | start_line | summary |
|---------|---------|------------|---------|
| global | SIOC_PV | 45 | |

## Macro Declarations (hkl_ioc.mac)

| objtype | name | start_line | end_line | summary |
|---------|---------------|------------|----------|---------|
| cdef | user_save_HKL | 38 | 38 | |
| cdef | calcHKL | 39 | 39 | |
| def | ioc_HKL | 58 | 74 | |
| cdef | user_save_HKL | 64 | 64 | |
| cdef | user_save_HKL | 69 | 69 | |

Contents:

# Indices and tables

- *Index*
- *Module Index*
- *Search Page*

example 1 documentation »

Fig. 1.5: Documentation of the original **hkl_ioc.mac** file.

But this is not enough, as the content will look like a wreck.

---

```
#=======================================================================
#*************SPEC  macros  for  the  Advanced  Photon  Source***********************
#=======================================================================
# # Beamline/Sector: 4ID # # Macro Package: hkl_ioc.mac # # Version: 1.0 (August,2005) #
```

---

... and so forth

So, there is a choice to make. Either:

1. format the comment as literal text (least work)

2. reformat the as reST. (more work, looks better)

## Literal text

To format a SPEC comment as literal text, consider this brief SPEC comment:

```
1  # Summary: This macro scans the sample in a circular mesh.
2  #
3  # Dependencies: It is part of the circular mesh macro package.
```

Its literal text rendition in reST is written:

```
1  """
2  ::
3
4          # Summary: This macro scans the sample in a circular mesh.
5          #
6          # Dependencies: It is part of the circular mesh macro package.
7
8  """
```

which looks like:

---

```
# Summary: This macro scans the sample in a circular mesh.
#
# Dependencies: It is part of the circular mesh macro package.
```

---

Note that the two colons indicate literal text follows. Both the blank line after the colons and the final blank line are required to avoid warnings. And, the entire comment *must be indented* at least one column to the right of the two colons.

## reST markup

In reST, the SPEC comment above might be written as two definition list items[2]:

---

[2] definition list: http://docutils.sourceforge.net/docs/ref/rst/restructuredtext.html#definition-lists

---

```
1  """
2  Summary
3      This macro scans the sample in a circular mesh.
4
5  Dependencies
6      It is part of the circular mesh macro package.
7
8  """
```

which looks like:

---

**Summary** This macro scans the sample in a circular mesh.

**Dependencies** It is part of the circular mesh macro package.

---

(The final blank line is necessary to avoid warnings.)

This markup does not look too complicated until we reach the *Modification history* starting at line 23. The content here might be coded as either literal text (above) or a reST table. Since the table is easy *and* CVS is no longer used to build the revision history, we'll format it as a table.

Consider this SPEC comment:

```
1  #Revision 1.3  2006/05/22 20:34:35  jiaox
2  #removed unsed lines in ioc_HKL.
3  #
4  #Revision 1.2  2006/05/11 17:46:31  jiaox
5  #Added CVS Log entry.
```

It might be put into a table[3] such as:

```
1  ========   ==================   =======   ====================================
2  Revision   date/time            author    remarks
3  ========   ==================   =======   ====================================
4  1.3        2006/05/22 20:34:35  jiaox     removed unsed lines in ioc_HKL.
5  1.2        2006/05/11 17:46:31  jiaox     Added CVS Log entry.
6  ========   ==================   =======   ====================================
```

which looks like:

---

| Revision | date/time | author | remarks |
|----------|-----------|--------|---------|
| 1.3 | 2006/05/22 20:34:35 | jiaox | removed unsed lines in ioc_HKL. |
| 1.2 | 2006/05/11 17:46:31 | jiaox | Added CVS Log entry. |

---

### Global Docstring

The convention is to treat the first docstring in a macro file as the *global docstring*.

With these ideas in mind, here is the markup of the first 32 lines:

---

[3] table: http://sphinx.pocoo.org/rest.html#tables

```
1    """
2    SPEC macros for the Advanced Photon Source
3
4    Beamline/Sector
5            4ID
6
7    Macro Package
8            hkl_ioc.mac
9
10   Version
11           1.0 (August,2005)
12
13   Description
14           A user defined calcHKL to write the current HKL postion to a
15           soft IOC. It requires spec softioc running.
16
17   Written by
18           X. Jiao 08/08/2005
19
20   Modified by:
21
22   User macros
23           ioc_HKL -> to turn on/off the feature of putting HKL to shared
24           memory.
25
26   Internal macros
27           ioc_put_HKL -> write HKL to the soft IOC
28
29   Modification history:
30
31   =======   ==================   =======   ======================================
32   Revision  date/time            author    remarks
33   =======   ==================   =======   ======================================
34   1.3       2006/05/22 20:34:35  jiaox     removed unsed lines in ioc_HKL.
35   1.2       2006/05/11 17:46:31  jiaox     Added CVS Log entry.
36   =======   ==================   =======   ======================================
37   """
```

which (except for the section title which is hard to render in this document) looks like:

---

**Beamline/Sector** 4ID

**Macro Package** hkl_ioc.mac

**Version** 1.0 (August,2005)

**Description** A user defined calcHKL to write the current HKL postion to a soft IOC. It requires spec softioc running.

**Written by**

> 24. Jiao 08/08/2005

Modified by:

**User macros** ioc_HKL -> to turn on/off the feature of putting HKL to shared memory.

**Internal macros** ioc_put_HKL -> write HKL to the soft IOC

Modification history:

| Revision | date/time | author | remarks |
|---|---|---|---|
| 1.3 | 2006/05/22 20:34:35 | jiaox | removed unsed lines in ioc_HKL. |
| 1.2 | 2006/05/11 17:46:31 | jiaox | Added CVS Log entry. |

### Test

Be sure to test your changes as you progress, until you are confident with reST markup. The *make* process is efficient, only rebuilding the documentation from affected .rst souce file changes. Usually, this also considers changes in the .mac files. This command is usually all it takes to rebuild the HTML documentation:

```
make html
```

However, you might wish to make sure changes in the .mac files cause documentation to be rebuilt. It might be easier, although less efficient, to rebuild your HTML documentation each time using this command:

```
make clean html
```

The builds are usually very fast (seconds).

### Docstring markup in each macro definition

Each of the macro definitions can be marked up to provide documentation with the definition. The convention is to supply a short one-line summary first, then additional information as appropriate.

Consider the definition for `ioc_HKL`. A summary of it is given in the first comment section. We'll apply that as the docstring:

```
1  def ioc_HKL '{
2      """to turn on/off the feature of putting HKL to shared memory."""
3
4      if($# != 1) { eprint "Usage: ioc_HKL on/off ";exit}
5
6
7      if(("$1" == "on")) {
8          cdef("user_save_HKL","ioc_put_HKL","ioc_HKL","0x20")
9          print "Now put HKL to softioc."
10         exit
11     }
12     if(("$1" == "off")) {
13         cdef("user_save_HKL","","ioc_HKL","delete")
14         print "Stop put HKL to softioc."
15         exit
16     }
17     eprint "Usage: ioc_HKL on/off "
18 }'
```

Do the same thing for the *ioc_put_HKL* macro definition.

**Document the global variable**

On line 45 (in the original file), there is a global variable declaration: `global SIOC_PV`. The description for this variable has been deduced from its usage in this file with EPICS.[4] It is possible to document `SIOC_PV` using a *Descriptive comments*. Insert the line containing `global SIOC_PV` with this one:

```
global SIOC_PV              ;#: soft IOC PV name
```

The semicolon is used to ensure that the spec command is finished. It might be unnecessary. The descriptive comment can be used *in-line* to define the item on that line.

Similarly, add another *Descriptive comments* to document line 38 (original file) by inserting this line *before* the line that reads `cdef("user_save_HKL","","ioc_HKL")`:

```
#: preload check/setting here
```

Here the descriptive comment appearing on one line will provide a summary for the item defined on the next line only.

**Final Results**

Rebuild the completed `../markup_example/hkl_ioc.mac` documentation with:

```
make html
```

**Note:** Don't be concerned about the warnings of `SEVERE: Duplicate ID: "cdef-user_save_HKL"`. These messages are only informative. This *bug* should be resolved in a future version of `specdomain`.

After refreshing the page in the WWW browser, it should like this:

and the index will look like:

**Note:** It is *planned for the future* to provide options for sorting the output alphabetically and to provide other features.

# Examples

## Simple Example to Document a SPEC Macro File

This example demonstrates how a file with simple reST markup will be documented.:

```
.. autospecmacro:: simple.mac
```

### SPEC Macro File: simple.mac

source code: `simple.mac`

Example SPEC Macro Source code file for demonstration purposes only.

---

[4] EPICS: http://www.aps.anl.gov/epics

index

# Welcome to example's documentation!

## SPEC Macro File: hkl_ioc.mac

source code: hkl_ioc.mac

SPEC macros for the Advanced Photon Source

Beamline/Sector
    4ID

Macro Package
    hkl_ioc.mac

Version
    1.0 (August,2005)

Description
    A user defined calcHKL to write the current HKL postion to a soft IOC. It requires spec softioc running.

Written by
    X. Jiao 08/08/2005

Modified by:

User macros
    ioc_HKL -> to turn on/off the feature of putting HKL to shared memory.

Internal macros
    ioc_put_HKL -> write HKL to the soft IOC

Modification history:

| Revision | date/time | author | remarks |
|---|---|---|---|
| 1.3 | 2006/05/22 20:34:35 | jiaox | removed unsed lines in ioc_HKL. |
| 1.2 | 2006/05/11 17:46:31 | jiaox | Added CVS Log entry. |

**user_save_HKL**
    cdef macro declaration

        preload check/setting here

**calcHKL**
    cdef macro declaration

**SIOC_PV**
    global variable declaration

        soft IOC PV prefix

**ioc_HKL**
    def macro declaration

    to turn on/off the feature of putting HKL to shared memory.

**user_save_HKL ¶**
    cdef macro declaration

**user_save_HKL**
    cdef macro declaration

## Variable Declarations (hkl_ioc.mac)

| objtype | name | start_line | summary |
|---|---|---|---|
| global | SIOC_PV | 52 | soft IOC PV prefix |

## Macro Declarations (hkl_ioc.mac)

| objtype | name | start_line | end_line | summary |
|---|---|---|---|---|
| cdef | user_save_HKL | 44 | 44 | preload check/setting here |
| cdef | calcHKL | 45 | 45 | |
| def | ioc_HKL | 65 | 82 | to turn on/off the feature of putting HKL to shared memory. |
| cdef | user_save_HKL | 72 | 72 | |
| cdef | user_save_HKL | 77 | 77 | |

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# Indices and tables

Fig. 1.6: Documentation of the marked-up **hkl_ioc.mac** file.

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## Quick search

[                    ] Go

Enter search terms or a module,
class or function name.

# Index

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## C

calcHKL

## H

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## I

ioc_HKL

## S

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SPEC chained macro                  ioc_HKL
definition                       SPEC macro file
  calcHKL                          hkl_ioc.mac
  user_save_HKL, [1], [2]
SPEC global variable
  SIOC_PV

## U

user_save_HKL, [1], [2]

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© Copyright 2012, SPEC Macro Writer. Created using Sphinx 1.1.3.

Fig. 1.7: Index of the marked-up **hkl_ioc.mac** file.

```
$Id$
```

This file is used to demonstrate how to document SPEC[1] macro files using Sphinx[2] and restructured text (reST)[3] markup.

Provides:

- `inc1scan`

- `CheckSaveToFile`

## Footnote

---

**example_global**
   *global variable declaration*

   this is an example of a global variable

**A_keV**
   *constant declaration*

   Conversion constant between wavelength (A) and photon energy (keV) ($E\lambda = hc$)

**inc1scan**
   *def macro declaration*

   specify a single motor scan with interval rather than # of intervals

**CheckSaveToFile**
   *def macro declaration*

   Helps prevent user from writing data to */dev/null* by accident.

   This macro will run when SPEC starts and checks if the output is directed into a file or might be ignored (written to */dev/null*). It runs `newsample` if the output might be ignored.

**begin_mac**
   *cdef macro declaration*

   register CheckSaveToFile to run on startup

## Variable Declarations (simple.mac)

| obj-type | name | start_line | summary |
|----------|------|------------|---------|
| global | example_global | 33 | this is an example of a global variable |
| constant | A_keV | 37 | Conversion constant between wavelength (A) and photon energy (keV) ($E\lambda = hc$) |

---

[1] SPEC: http://www.certif.com
[2] Sphinx: http://sphinx.pocoo.org/
[3] reST: http://docutils.sf.net/rst.html

**Macro Declarations (simple.mac)**

| obj-type | name | start_line | end_line | summary |
|---|---|---|---|---|
| def | inc1scan | 39 | 46 | specify a single motor scan with interval rather than # of intervals |
| def | Check-SaveToFile | 48 | 62 | Helps prevent user from writing data to */dev/null* by accident. |
| cdef | begin_mac | 64 | 64 | register CheckSaveToFile to run on startup |

## Example with more extensive reST markup

This example demonstrates how a file more extensive reST markup will be documented.:

```
.. autospecmacro:: bpm.mac
```

**SPEC Macro File: bpm.mac**

source code: `bpm.mac`

Macro support for a beam position monitor.

**Purpose** Macro support for a beam position monitor. The BPM has a serial interface. This support uses the EPICS generic serial record as a communications channel.

**Dependencies**

> **These macros require:**
>
> > **EPICS** Experimental Physics and Industrial Control System, http://www.aps.anl.gov/epics
> >
> > **EPICS support for XBPM** The EPICS support for the X-ray Beam Position Monitor (XBPM) is needed to interface between the RS-232 connection on the XBPM and the EPICS IOC using an octal232 IP card. The software support consists of an EPICS generic serial record, an EPICS database, and a state notation language sequence program.
> >
> > **EPICS PV support prefix** The support prefix is `ioc:xbpm` (configurable in `XBPM_PREFIX`)

Usage:

```
qdo /epics/clients/spec/macros/bpm.mac
```

**GX_FACTOR**
> *constant declaration*
>
> > X-axis calibration, mm/unit

**GY_FACTOR**
> *constant declaration*
>
> > Y-axis calibration, mm/unit

**XBPM_PREFIX**
> *constant declaration*
>
> > EPICS support prefix

**BPM_read_diode**(u'chan',)
> *def( ) macro function declaration*

read current value from the named BPM channel

> **param character chan**  channel letter (a, b, c, or d)

example:

```
value = BPM_read_diode("b")
```

**BPM_set_defaults**
> *def macro declaration*

>> Set (or reset) proper default values on the XBPM.

>> Also, measure the dark signals at each amplifier gain scale (*range*) for each photodiode by calling `BPM_setAllDarkSignals`. This process takes about one minute. The software does not check to make sure that the beam is **off** so you should be sure that the shutter is closed during the time you run this macro. When finished, set the amplifier gain back to the value it had as this macro was started.

**BPM_setDarkSignal**(u'range',)
> *def() macro function declaration*

>> measure and set the dark signal on each channel for the given amplifier range

>> **param int range**  $0 <= range <= 5$

>> Measure and set the dark signal for each photodiode amplifier at the selected amplifier gain scale (*range*). Report the findings as a spec comment.

| range | gain |
|-------|---------|
| 0 | 350 nA |
| 1 | 700 nA |
| 2 | 1400 nA |
| 3 | 7 uA |
| 4 | 70 uA |
| 5 | 700 uA |

**BPM_setAllDarkSignals**
> *def macro declaration*

>> measure and set the dark current for all amplifier ranges

## Variable Declarations (bpm.mac)

| objtype | name | start_line | summary |
|---------|------|-----------|---------|
| constant | GX_FACTOR | 30 | X-axis calibration, mm/unit |
| constant | GY_FACTOR | 31 | Y-axis calibration, mm/unit |
| constant | XBPM_PREFIX | 32 | EPICS support prefix |

## Macro Declarations (bpm.mac)

| obj-type | name | start_line | end_line | summary |
|----------|------|-----------|----------|---------|
| def | BPM_set_defaults | 48 | 92 | Set (or reset) proper default values on the XBPM. |
| def | BPM_setAllDarkSignals | 153 | 161 | measure and set the dark current for all amplifier ranges |

### Function Macro Declarations (bpm.mac)

| objtype | name | start_line | end_line | args | summary |
|---|---|---|---|---|---|
| function def | BPM_read_diode | 34 | 46 | chan | read current value from the named BPM channel |
| function def | BPM_setDarkSignal | 94 | 151 | range | measure and set the dark signal on each channel for the given amplifier range |

## Example with no reST markup

This example demonstrates how a file with no particular markup will be documented.:

```
.. autospecmacro:: aalength.mac
```

### SPEC Macro File: aalength.mac

source code: `aalength.mac`

**strjoin**(u's,delimiter',)
> *def() macro function declaration*

### Function Macro Declarations (aalength.mac)

| objtype | name | start_line | end_line | args | summary |
|---|---|---|---|---|---|
| function def | strjoin | 21 | 27 | s,delimiter | |

# SPEC Documentation Conventions

This document lays out several conventions for documenting SPEC macro source code files. The aim of these conventions is to to help provide consistency for the "look and feel" of the resulting documentation. However, these conventions are by no means strict requirements.

## Documentation in comment blocks

Inline source documentation resides inside comment blocks within the SPEC macro files. It is important to note, however, that not every comment in the source code is part of the documentation. Rather, the comments containing the documentation need to be placed in a certain context, depending on the scope of the documentations. In analogy to the python language, we will refer to these documentation comments as *docstrings*, even though there are some differences concerning how they are implemented.

### Comments in SPEC

There are two ways to mark a comment in SPEC. The usual identifier is the #-sign preceding a comment:

```
# This is a single comment line

my_val = 2.0  # This is an in-line comment
```

A less well-known identifier to designate multi-line comments is the use of triple double-quotes (`"""`), which were introduced specifically with docstrings in mind[1]:

```
"""
This is an extended comment in SPEC.

Note that it can span multiple lines and contain several paragraphs.

"""
```

> **Warning:**
>
> **Do not use the single-quote characters (`'`) to mark an extended comment!** In the Python language, a docstring can be included either in triple double-quotes (`"""`) or in triple single-quotes (`'''`). But, **unlike Python**, SPEC does not recognize single quotes to mark extended comments. Only use the double quote character for SPEC files.

### Extended comments

The first extended comment in a "section" should contain the docstring. Any other extended comments will be ignored and not processed during the documentation creation (this setting could be changed with an optional switch.) In this context, a *section* refers to a particular "code object", which might be the global scope of a .mac file or a macro definition block, for example.

The first paragraph of the docstring should be a concise summary line, followed by a blank line. This summary will be parsed in a special way to be included as a description of the code object in summary tables, indices, etc. If the first paragraph starts with a colon (`:`), no summary text will be assumed.

Following the summary, a more elaborate description of the code object may be given.

For macro definitions (`def,  rdef`), the docstring should immediately follow the declaration line and be indented to the same level as the code contained within the definition. It is also recommended to insert a blank line between the last paragraph in a multi-line docstring and its closing quotes, placing the closing quotes on a line by themselves:

```
def my_macro_def '{
  """
  This is the summary line.

  And here is some more elaborate discussion of the functionality, which may
  again extend over several lines or paragraphs, and contain all the required
  reST and Sphinx markup.

  """

  my_var = 1.0

  # do some more stuff...

}'
```

Finally, it is recommended to use the extended comment syntax with triple-quotes only for docstrings, even though it is a valid syntax to include longer blocks of comments about the code itself. To avoid confusion between the two types of comments, non-documentation comments should be included by preceding each line with the #-sign:

---

[1] SPEC extended comments for docstrings: http://www.certif.com/spec_help/chg5_01.html

```
"""
This is my docstring.

"""

# Here, I write down some
# comments about how
# exactly my code works:
#
# Increment x by 1 for each registered photon

if(hit) x+=1
```

## Descriptive comments

> **Caution:** This is new convention, yet it does not violate any SPEC rules. It *is* awfully useful!

Descriptive comments are a new construct which can be used to document items that cannot contain extended comments (triple-quoted strings) themselves, such as variable declarations or *rdef* or *cdef* macro declarations. (They can also be used to document one-line *def* macros!) They appear either as comments in the same line after the declaration (in-line) or as a comment-only line immediately preceding the declaration (one-liner). Descriptive comments are marked by a preceding `#:`, which lets them appear like normal SPEC comments, but the colon triggers the parser to process the docstring.

Like the summary lines in extended comments, these descriptive comments are used as descriptions in summary tables, etc.

**Examples**:

Descriptive comment that documents **TTH**, a global variable declaration:

```
global TTH     #: two-theta, the scattering angle
```

Descriptive comment that documents **ccdset_shutter**, an *rdef* declaration:

```
#: clear the ccd shutter handler
rdef ccdset_shutter ''
```

Descriptive comment that documents **do_nothing**(), a *function def* declaration:

```
def do_nothing() ''        #: this macro does do anything
```

## Hidden objects

*Hidden* objects begin with at least one underline character, such as `_hidden`. This includes macros and variables. These should be optional in the documentation.

*Anonymous* objects begin with at least two underline characters, such as `___anon`. This includes macros and variables. These should not be documented unless specifically requested and only then if hidden objects are documented.

### Undeclared variables

Undeclared variables (those with no formal global, local, constant, or array declaration) will not be documented. At least for now.

### Parameter descriptions

Use the same syntax as parameter declarations for Python modules. Here is an example SPEC macro with reST markup:

```
def my_comment '{
        """
        Make a comment

        USAGE::

          > my_comment "AR aligned to 15.14063 degrees"

        ARGUMENTS:

          :param str text: message to be printed

        """

        qcomment "%s" $1
}'
```

which documentation looks like this:

**my_comment**

> Make a comment
>
> USAGE:

```
> my_comment "AR aligned to 15.14063 degrees"``
```

> ARGUMENTS:
>
> > **param str text**  message to be printed
> >
> > **arg float x**  some number to be processed
> >
> > **arg y**  another number (without type)
>
> RETURNS:
>
> > **Returns str comment**  the comment

**demo_cdef_more**['<<< cdef argument list not handled yet >>>']

> This is my punch line!
>
> > **param str demo_cdef_more**  name of chained macro
> >
> > **param str spec_code**  SPEC code to be executed (usually a single macro name)
> >
> > **param str key**  name of this part of the chained macro
> >
> > **param flags**  see **SPEC** documentation for details
> >
> > **param str not_here**  something is missing...

> **rtype** none

---

# SPEC Documentation Style Guide

Some interesting and applicable words from the Google Style Guide:

> BE CONSISTENT.
>
> If you're editing code, take a few minutes to look at the code around you and determine its style. If they use spaces around all their arithmetic operators, you should too. If their comments have little boxes of hash marks around them, make your comments have little boxes of hash marks around them too.
>
> The point of having style guidelines is to have a common vocabulary of coding so people can concentrate on what you're saying rather than on how you're saying it. We present global style rules here so people know the vocabulary, but local style is also important. If code you add to a file looks drastically different from the existing code around it, it throws readers out of their rhythm when they go to read it. Avoid this.

With these words in mind, this SPEC Documentation Style Guide documents the conventions set forth to use for SPEC macros at the APS.

## The concept of docstrings

In-line source documentation resides inside comment blocks directly within the SPEC macro files. In analogy to the python language, we will refer to these documentation comments as *docstrings*. These docstrings are processed by the specdomain package for the Sphinx documentation creator to produce user or reference manual in a variety of formats (html, pdf, man-pages, text files, etc.)

The following section sets forth some formatting conventions for SPEC docstrings.

## One-line docstrings

There are two distinct scenarios where one-line docstrings are appropriate or even necessary:

1. Obvious cases (where one line is completely sufficient to describe the code).

2. Descriptive comments, that are used to document code objects (variables, one-line `rdef` or `def` declarations, or `` `cdef `` definitions) which cannot contain extended docstrings.

    **Obvious cases** Obvious cases are those where the macro or macro function definition is so clear that no elaborate explanation is necessary. For example, the following macro function definition can probably be documented in a one-liner:

    ```
    def sind(x) '{
      """ Return the sine of x, where x is given in degrees."""

      return sin(x*PI/180)
    }'
    ```

    One-liners need to be enclosed in triple double-quotes (`"""`) which are placed on the same line as the docstring. A single space between the opening quotes and the docstring is optional. A blank line after the docstring helps to visually separate it from the actual code.

---

**Descriptive comments** Descriptive comments are a new a construct which can be used to document items that cannot contain extended comments (triple-quoted strings) themselves, such as variable declarations, one-line `def` or `rdef` declarations, or `cdef` definitions. They appear either as comments in the same line after the declaration (in-line) or as a comment-only line immediately preceding the declaration (one-liner). Descriptive comments are marked by a preceding `#:`, which lets them appear like normal SPEC comments, but the colon triggers the parser to process the docstring:

```
global TTH            #: The scattering angle two-theta [float].

#: Clear the ccd shutter handler
rdef ccdset_shutter ''

def do_nothing() ''   #: This macro does not do anything.
```

### Multi-line docstrings

Multi-line docstrings are surrounded by a pair of triple double-quotes (`"""`), which should be placed on a line by themselves. For macro definitions, the opening quotes should appear on the next line immediately below the macro definition. It is recommended to insert a blank line between the last paragraph in a multi-line docstring and its closing quotes, followed by another blank line before the next code item begins.

The entire docstring is indented the same as the quotes at its first line. Docstrings inside macro declarations should be indented from the definition statement by the same level as the code contained in the definition.

Multi-line docstrings consist of a summary line just like a one-line docstring, followed by a blank line and then a more elaborate description. The summary line will be used by the specdomain indexing and summary tools. It is therefore important to make the summary lines very clear and concise. They should always be written as complete sentences, starting with a capital letter and ending with a period.

## Documentation of code objects

We will refer to certain types or components of the SPEC macro code as *code objects*. These may include:

- Macro files
- Macro definitions (`def`, `rdef`, `cdef`)
- Variables (global, local, etc.)
- Entire collections of macro files

Each type of these code objects requires certain information to be included in the documentation. The following sections should help to ensure that all the required information is included and will appear in a consistent format.

### File headers

The macro file header docstring provides information about the macro file as a whole (in the python world, this might be called a *module*).

As with any docstring, the first item should be a concise summary line of what the macro file provides and which could be used in summary tables, indexes, etc.

This is followed by sections about the detailed functionality, setup and configuration instructions, file information, and so on. The full power of Sphinx and ReST markup is available at this level, so sections can be broken up in subsections and subsubsections, tables may be included as well as figures or mathematical formulas.

The following information should be included, and the below layout may aid in supplying a complete set of information. Note that this can always be changed to meet the particular requirements of individual macro files:

**Description (top-level header):** A more elaborate description of the functionality provided in the macro file. Include any number of subsections and subsubsections.

**Notes (top-level header):** Any additional notes or comments about the file or its usage.

**Installation (top-level header):** Information on how to set up the macro functionality. This includes, if applicable, the following subsections (second level headers):

> **Configuration:** Prerequisites in the SPEC configuration. For example, the configuration of dedicated counters may be necessary in order to use the macros.
>
> **Setup:** The steps necessary to set up the macro functionality. For example, loading the macro file (`qdo`) and running the `macro_init` function.
>
> **Dependencies:** List all the dependencies on other macros, hardware, software, EPICS channels, etc.
>
> **Impact:** Describe the impact that the use of the macro may have. For example, list all the changes made to other `cdef` macro definitions by this macro file.

**File Information (top-level header):** All the information about the macro file itself, like authors, license, version, etc.

> It is recommended to build up this section as a definition list. The headings for each item are CAPITALIZED and end with a colon. The content under each of these items should be indented one level. This results in a more lightweight layout, and prevents cluttering the tables of content with too many subsections.
>
> The following items should be included, preferably in this order:
>
> - AUTHOR(S):
> - CREATION DATE:
> - COPYRIGHT:
> - LICENSE:
> - VERSION:
> - CHANGE LOG:
> - TO DO:
> - KNOWN BUGS:
>
> See the example below for more details on each of these items.

### Example of a file header docstring

```
"""
Summary line: a concise sentence about what this macro file provides.

Description
===========
A more detailed description of the macro file and the functionality that the
library of macro definitions it contains provides.

Note(s)
=======
Any special notes about the macro file, its usage, or its history can go here.
```

```
Installation
============
Describe, as applicable, the installation procedure, necessary changes in the
SPEC configuration, dependencies, and impact on chained macro definitions
(``cdef``) or redefinitions (``rdef``). The sections below give hypothetical
examples of what the content may look like.

Configuration
-------------
For this macro to work, the SPEC configuration may need to be modified. The
following counters are required:

        ========  ============  ==============  =======================
        Counter   Mnemonic      Type            Description
        ========  ============  ==============  =======================
        mycount1  mcnt1         None            My first counter
        mycount2  mcnt2         Macro counter   My second counter
        ========  ============  ==============  =======================

Setup
-----
With the above configuration change, simply load the macro file
``template.mac`` and run :spec:def:`template_setup`::

        > qdo template.mac
        > template_setup

Dependencies
------------
This macro depends on the following macro files and macros:

* filter.mac

        - :spec:def:`filter_trans`
        - :spec:def:`filter_get_trans()`

* bpm.mac

        - :spec:def:`bpm_get_pos`

Impact
------
The following chained macro definitions are affected by template.mac:

* :spec:def:`user_precount`:  Adding :spec:def:`template_precount`
* :spec:def:`user_getcounts`: Adding :spec:def:`template_getcounts`
        to the end ``(0x20)``

File information
================

AUTHOR(S):

        * A.B. Sample (AS, asamp), asamp@aps.anl.gov, Argonne National Laboratory

CREATION DATE:

        YYYY-MM-DD
```

```
COPYRIGHT:

        .. automatically retrieve the current year:
        .. |current_year| date:: %Y

        Copyright (c) 2010-|current_year|, UChicago Argonne, LLC
        Operator of Argonne National Laboratory
        All Rights Reserved

        APS SPEC macros

LICENSE::

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        represents that its use would not infringe privately owned rights.

        ****************************************************************************

VERSION::
```

```
        $Revision$
        $Date$
        $Author$
        $URL$

CHANGE LOG:

        YYYY-MM-DD (AS):

        - created first version of this macro.
        - tested on a dummy SPEC version not connected to a diffractometer.

        YYYY-MM-DD (AS):

        - added a new macro definition: :spec:def:`new_macro` to display the status.

TO DO:

        - List all the TODO items

KNOWN BUGS:

        - List all the known bugs and limitations

"""
```

## Macro definition docstrings

The docstring for a macro or macro function definition should summarize its behavior and document its arguments, return value(s), side effects, and restrictions on when it can be called (all if applicable). A docstring should give enough information to write a call to the function without reading the function's code. A docstring should describe the function's calling syntax and its semantics, not its implementation.

Certain aspects of a macro definition should be documented in special sections, listed below. Since Sphinx does not generally allow for the presence of any types of formal headings inside the code object docstrings, the docstring should be build up as a ReST definition list (see example below). The section titles are all CAPITALIZED for improved visibility and end with a colon. The contents for each section are indented by two spaces with respect to the section title.

## Sections

The following sections should be included in the macro docstring after the summary line, in the below order, if applicable:

**DESCRIPTION:** A more elaborate description of the macro's functionality.

**USAGE:** The syntax for calling the macro. This should contain all possible variants of the macro call. Argument names are enclosed in angle brackets (<>) to indicate that they should be replaced by actual values in the macro call. Optional arguments are additionally enclosed in square brackets ([]). The actual USAGE syntax should appear as pre-formatted text, and each input line should start with a ">"-symbol to represent the SPEC command line prompt:

```
USAGE::
```

```
> my_macro <pos1> [<pos2>]
> <return_value> = my_function(<input_value>)
```

**ARGUMENTS:** All the arguments to a function or macro call should be listed in the form of a ReST field list. The argument name is enclosed between colons (`:`), followed by the description, which can span several (indented) lines. It is useful to specify also the type of the argument in square brackets (`[]`).

If a macro call has both mandatory and optional arguments, list them in separate lists:

```
Required arguments:
  :pos1:    Target position for motor [float].

Optional arguments:
  :timeout: The wait-time before giving up on serial port communication in
    seconds [float].
```

Note that a number of python projects use a special kind of argument definition list which is processed by Sphinx to include more information, for example, the type of an argument. Other projects, however, actively discourage its use or prefer the above style for simplicity. The syntax is as follows:

```
:param str motor_name: name of motor to use.
```

This syntax is perfectly acceptable also for SPEC documentation, however it arguably results in harder to read in-line documentation and is often not rendered very neatly in the final Sphinx output. Use this at your own discretion.

**EXAMPLE:** A short example, illustrating the usage of the macro. As in the case of the USAGE section, the syntax should appear as pre-formatted text, and each input line should start with the ">"-symbol to represent the SPEC command line prompt. Short explanation lines can be inserted as indented comment lines:

```
EXAMPLE::

  > set_temperatures 23.5 50.0
      # sets the two container temperatures to 23.5 and 50.0 degrees.
```

**NOTE(S):** Additional notes on the macro usage.

**SEE ALSO:** A list of other macros or documentation items to refer to for further information. If possible, these should be dynamically linked using the corresponding Sphinx specdomain roles:

```
SEE ALSO:
  * :spec:def:`my_other_macro`
  * http://spec.examples.com/example3.html
```

Using the definition list syntax, other sections may be included, as necessary or appropriate for the particular macro.

### Example of a macro definition docstring

```
"""
Concise summary line.

USAGE::

        > my_move <motor> <position> [<sleep_time>]

ARGUMENTS:
```

```
        Required arguments:
                :motor:    The motor to be moved [str].
                :position: The position to move the motor to [float].

        Optional arguments:
                :sleep_time: Settling time after the move has finished [float].

EXAMPLE::

        > my_move del 23.2346 0.3
                        # move del to 23.2346 and wait for 0.3 seconds after move␣
→finishes.

NOTE:
        Indicate any side effects, restrictions or other usage notes here.

SEE ALSO:
        * :spec:def:`my_move2`
        * :spec:global:`MOVE_FLAG`
        * http://www.certif.com/spec_help/prdef.html

"""
```

This results in the following:

> Concise summary line.
>
> USAGE:

```
> my_move <motor> <position> [<sleep_time>]
```

> ARGUMENTS:
>
> > **Required arguments:**
> >
> > > **motor**  The motor to be moved [str].
> > >
> > > **position**  The position to move the motor to [float].
> >
> > **Optional arguments:**
> >
> > > **sleep_time**  Settling time after the move has finished [float].
>
> EXAMPLE:

```
> my_move del 23.2346 0.3
                # move del to 23.2346 and wait for 0.3 seconds after move␣
→finishes.
```

> **NOTE:**  Indicate any side effects, restrictions or other usage notes here.
>
> **SEE ALSO:**
>
> > - my_move2
> >
> > - MOVE_FLAG
> >
> > - http://www.certif.com/spec_help/prdef.html

### One-line docstrings

As mentioned previously, one-line docstrings (also called *descriptive comments*) can be used to document code objects that cannot contain extended docstrings.

One-line docstrings begin with a capital letter and end with a period.

### Variables

Docstrings for variables provide a short description of the variable. It is also recommended to specify the type of the variable in square brackets (`[]`). For example:

```
global TTH      #: The scattering angle two-theta [float].
local _ind      #: List index of the active reflection [int].

#: Associate array with orientation reflection HKL-indices & angles [float].
global ORIENTATION_REFLECTIONS
```

### Macro definitions

One-line docstrings for macro definitions contain a short description of the purpose for the (re-)definition. For example:

```
#: Define the ccd shutter handler
rdef ccdset_shutter '_ccdset_shutter'

#: remove ccd_getcounts from user_getcounts
cdef("user_getcounts", "", "ccd_key", "delete")
```

### Macro collection docstrings

As of now, there is no standard yet for documenting entire collections of macros, as, for example, those collected in particular directories of the SVN source code repository.

The documentation for such a collection should be in the form of normal ReST files (`*.rst`), residing in the same directory with the macro collection. There is no way of automatically including this information in the global documents yet, so it will need to be added manually somewhere in the documentation tree (at least in the global `index.rst` file or some other file that is included from the global scope).

# Documenting SPEC Code

## Documenting SPEC File Directories

**.. autospecdir::** path

> **Param str path** path (absolute or relative to the .rst file) to an accessible directory with SPEC macro files

```
.. autospecdir:: /home/user/spec.d/macros
```

**Note:** options planned for future versions:

---

- document all subdirectories of *path*

- match files by a pattern (? glob *v.* re ?)

## Documenting SPEC Files

**.. autospecmacro::** filename

> **Param str filename** name (with optional path) of the SPEC macro file. The path component can be relative or absolute. If relative, the path is relative to the *.rst* file.

Document the contents of a SPEC macro source code file, including extended comments, *def*, *rdef*, and *cdef* macro declarations and changes, and *local*, *global*, and *constant* variable declarations.

```
.. autospecmacro:: sixc.mac
```

---

**Note:** options planned for future versions:

> - standard documentation pattern
>
> - include all extended comments
>
> - ignore hidden objects[1]
>
> - ignore anonymous objects[2]

## SPEC Extended Comments

**Do not use the single-quote character to mark an extended comment.**

In the Python language, a triple-quoted string is known as a docstring. But, **unlike Python**, SPEC does not recognize single quotes to mark extended comments. Only use the double quote character for SPEC files.

Since 2002, SPEC has provided an *extended comment* block.[3] Such a block begins and ends with three double-quotes, such as:

```
"""This is an extended comment"""
```

Here, the extended comment block should be formatted according to the conventions of restructured text[4]. There is also a *recommended convention* for using extended comments in SPEC macro files.

## Describing SPEC objects

The following *directives* refer to objects in SPEC macro source code files and create index entries and identifiers:

---

[1] *hidden* objects begin with one underline character, such as _hidden
[2] *anonymous* objects begin with at least two underline characters, such as __anon
[3] SPEC extended comments: http://www.certif.com/spec_help/chg5_01.html
[4] restructured text: http://docutils.sf.net/rst.html

**.. spec:def::**
   Declare the name of a SPEC def macro.

| ReST code | Displays like |
|-----------|---------------|
| .. spec:def:: demo_def | **demo_def** |

**.. spec:rdef::**
   Declare the name of a SPEC rdef run-time-defined macro.

| ReST code | Displays like |
|-----------|---------------|
| .. spec:rdef:: demo_rdef | **demo_rdef** |

**.. spec:cdef::**
   Declare the name of a SPEC cdef chained macro.

| ReST code | Displays like |
|-----------|---------------|
| .. spec:cdef:: cdef("demo_cdef") | **demo_cdef**['<<< cdef argument list not handled ye |

More elaborate example showing how to call a chained macro and also describe the arguments:

```
.. spec:cdef:: cdef("demo_cdef_more", "spec_code", "key", flags)

    :param str demo_cdef_more: name of chained macro
    :param str spec_code: SPEC code to be executed (usually a single macro name)
    :param str key: name of this part of the chained macro
    :param flags: see http://www.certif.com/spec_help/funcs.html
    :rtype: none

    This text is ignored (for now).
```

Displays like:

**demo_cdef_more**['<<< cdef argument list not handled yet >>>']

      **Parameters**

- **demo_cdef_more** (*str*) – name of chained macro

- **spec_code** (*str*) – SPEC code to be executed (usually a single macro name)

- **key** (*str*) – name of this part of the chained macro

- **flags** – see **SPEC** documentation for details

      **Return type** none

**.. spec:global::**
   Declare the name of a SPEC global variable.

| ReST code | Displays like |
|-----------|---------------|
| .. spec:**global**:: demo_global | **demo_global** |

**.. spec:local::**
   Declare the name of a SPEC local variable.

---

| ReST code | Displays like |
|---|---|
| `.. spec:local:: demo_local` | **demo_local** |

**.. spec:constant::**
    Declare the name of a SPEC constant.

| ReST code | Displays like |
|---|---|
| `.. spec:constant:: demo_const` | **demo_const** |

## Cross-referencing SPEC objects

The following *roles* refer to objects in SPEC macro source code files and are possibly hyperlinked if a matching identifier is found:

**:spec:def:**
    Reference a SPEC macro definition by name. (Do not include the argument list.)

```
An example ``def`` macro: :spec:def:`demo_def`
```

An example def macro: demo_def

**:spec:rdef:**
    Reference a SPEC run-time macro definition by name. (Do not include the argument list.)

```
An example ``rdef`` macro: :spec:rdef:`demo_rdef`
```

An example rdef macro: demo_rdef

**:spec:cdef:**
    Reference a SPEC chained macro definition by name. (Do not include the argument list.)

```
An example ``cdef`` macro: :spec:cdef:`cdef("demo_cdef")`
An example ``cdef`` macro: :spec:cdef:`cdef("demo_cdef_more")`.
```

An example cdef macro: cdef("demo_cdef"). An example cdef macro: cdef("demo_cdef_more").

**:spec:global:**
    Reference a global-scope variable.

```
An example ``global`` variable: :spec:global:`demo_global`
```

An example global variable: demo_global

**:spec:local:**
    Reference a local-scope variable.

```
An example ``local`` variable: :spec:local:`demo_local`
```

An example local variable: demo_local

**:spec:constant:**
    Reference a local-scope variable.

```
An example ``local`` variable: :spec:constant:`demo_constant`
```

An example `local` variable: `demo_constant`

## Undeclared Variables

Undeclared variables (those with no formal global, local, constant, or array declaration) will not be documented. At least for now.

---

# Other matters

## Downloads

**home**  http://specdomain.readthedocs.org

**svn trunk**  https://subversion.xray.aps.anl.gov/bcdaext/specdomain/trunk/src/specdomain/

**svn source releases**

- https://subversion.xray.aps.anl.gov/bcdaext/specdomain/tags/src/

**PyPI**  http://pypi.python.org/sphinxcontrib-specdomain

## Objectives

1. Document SPEC macro source code files

1. macro definitions (def, rdef, and cdef)

2. function definitions

3. global variable definitions

4. local variable definitions

5. array variable definitions

6. constant definitions

7. ReST-formatted comments (usually contain API or usage info)

8. optional source code highlighting

2. Build cross-referenced WWW site and PDF documentation

3. Provide a test file for development.

4. Provide useful examples in documentation.

## TO-DO List

- move this list to the **TRAC** site: https://subversion.xray.aps.anl.gov/trac/bcdaext/wiki/SpecDomain

- add support to document SPEC array declarations

- improve the display of directives for variables and macros

- make the Index look better

- provide links from each macro to its source code

- provide for the directive options indicated in the source code

- resolve the items marked *FIXME:* in the source code

- resolve the items marked *TODO:* in the source code

- identify and document undeclared variables in the global scope

- support the :summary: role to explicitly declare a summary

- cdef argument list not handled yet

- Option to index all symbols in a macro file

- allow section headings inside macro declaration docstrings

- create a role (or example using a ref) to refer to a macro file from the documentation

- produce a custom module index with links and summary lines

## Known bugs

- move this list to the **TRAC** site: https://subversion.xray.aps.anl.gov/trac/bcdaext/wiki/SpecDomain

- Duplicate ID warnings, for now, ignore them, the warning will be resolved in a future revision

- roles should link to directives, see *example.mac* to illustrate the problem

- fix the signature recognition for roles

- fix the signature handling for roles and directives

- the out-of-source example PNG shows a Python project, should be a SPEC project

## Changelog

This file describes user-visible changes between the extension versions. Refer to the TRAC site for details on the tickets noting *specdomain* in the title. (https://subversion.xray.aps.anl.gov/trac/bcdaext/report/1?sort=ticket&asc=1)

### Version 1.04.01 (2014-03-10)

- refs #63, #66: fixes download role of macro source code, now available on PyPI as **sphinxcontrib-specdomain**

### Version 1.03 (2012-10-01)

- fixes #33: style guide has been changed to use the YYYY-MM-DD date format
- fixes #35: corrected detection of single-line rdef functions
- fixes #36: updated LICENSE text
- fixes #37: function rdef with empty arg list classified incorrectly

### Version 1.02 (2012-09-09)

- contributions to documentation by Christian Schlepuetz

### Version 1.01 (2012-08-15)

- refs #13: autospecdir: show a bullet list for each file at the top of the page (alternative to separate pages for each macro file)
- fixed #14: "duplicate ID warnings" resolved
- fixes #31: documentation copyright should match LICENSE file
- fixed #32: descriptive comments also for *def* definitions

### Version 1.0 (2012-07-16)

- Initial release.

## License

```
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4
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6
7
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45
46   ******************************************************************************
```

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Cross-reference:

- genindex
- search

# References

## Sphinx documentation

**The Sphinx website:**

- **The Sphinx home page** http://sphinx.pocoo.org/index.html
- **The Sphinx documentation page** http://sphinx.pocoo.org/contents.html
- **Sphinx markup constructs** http://sphinx.pocoo.org/markup/index.html

**Other helpful links:**

- **Sphinx example and quickstart of pypi:** http://packages.python.org/an_example_pypi_project/sphinx.html
- **Another overview of Sphinx commands:** http://docs.geoserver.org/trunk/en/docguide/sphinx.html

## reStructuredText documentation

- **reStructuredText home page** http://docutils.sourceforge.net/rst.html

- **reStructuredText quick reference** http://docutils.sourceforge.net/docs/user/rst/quickref.html
- **reStructuredText cheat sheet** http://docutils.sourceforge.net/docs/user/rst/cheatsheet.txt
- **reStructuredText directives** http://docutils.sourceforge.net/docs/ref/rst/directives.html

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