



# NeXus Validation

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- NeXus Application Definitions define standards
- How can I check if my file fulfills the requirements of an application definition?
- How can I check if additional fields match NeXus base class fields?
- —> `cnxvalidate`

# What do you need?

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- cnxvalidate from: <https://github.com/nexusformat/cnxvalidate>
  - Written in ANSII-C against the HDF5, XML2 libraries
  - Needs to be compiled
  - Comes with a test suite
- A copy of the NeXus application definitions from: <https://github.com/nexusformat/definitions>
  - Checking out the right version takes care of application definition versioning

- `nxvalidate -l <appdefdir> <nexusfile>`
  - Locates application definition in NXentry/ NXsubentries
  - Recursively compares the file with the application definition
  - Complains about conflicts

- -a <appdef>
- -p <path in NeXus file>
- -t, all output
- -d, trace what nxvalidate does
- -b, warn about additional base class fields found
- -u, warn about fields and groups NeXus does not know about
- -o, warn about optional fields missing
- -e, more whitespace in output
- -r, check file level attributes
- -x, validate depends\_on chains

# What does nxvalidate test?

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- The file structure
- That all required groups and fields from the application definition are present
- That additional and optional fields conform to base classes
- That dimensions, number types and units match the application definition
- That attributes required by the application definition are present and well formed
- That attributes in general follow NeXus standards
- Verifies that depends\_on fields are well formed
- That NeXus links point to valid data items
- A lot more, read the source code :-)

- As all software it has bugs... , report on github
- It does not check all group attribute data
- When using string arrays in the axes attribute, not checked
- Units attributes are checked against the application definitions but not against general validity.

```
baer:20223344 konnecke$ ~/src/cnxvalidate/build/nxvalidate -l ~/src/nexus_definitions hrpt2022n000040.hdf
message="Missing required global HDF5_Version attribute" sev=error dataPath=/ dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Required group missing" nxdlPath=/NXentry/NXinstrument/NXdetector sev=error dataPath=/entry1/HRPT da
taFile=hrpt2022n000040.hdf
2 errors and 26 warnings found when validating hrpt2022n000040.hdf
baer:20223344 konnecke$
baer:20223344 konnecke$
baer:20223344 konnecke$ ~/src/cnxvalidate/build/nxvalidate -l ~/src/nexus_definitions -buo hrpt2022n000040.hdf
message="Missing required global HDF5_Version attribute" sev=error dataPath=/ dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Required group missing" nxdlPath=/NXentry/NXinstrument/NXdetector sev=error dataPath=/entry1/HRPT da
taFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown group HRPT-CERCA-Detector of class NXpsd found" nxdlPath=/NXentry/NXinstrument sev=warnundef
dataPath=/entry1/HRPT/HRPT-CERCA-Detector dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Additional base class group Kollimator1 of type NXcollimator found" nxdlPath=/NXentry/NXinstrument s
ev=warnbase dataPath=/entry1/HRPT/Kollimator1 dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Additional base class group Monochromator of type NXmonochromator found" nxdlPath=/NXentry/NXinstrum
ent sev=warnbase dataPath=/entry1/HRPT/Monochromator dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown group beam_reduction of class NXslit found" nxdlPath=/NXentry/NXinstrument sev=warnundef dat
aPath=/entry1/HRPT/beam_reduction dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown group exit_slit of class NXslit found" nxdlPath=/NXentry/NXinstrument sev=warnundef dataPath
=/entry1/HRPT/exit_slit dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown dataset sample_changer_position found" nxdlPath=/NXentry/NXsample sev=warnundef dataPath=/en
try1/sample/sample_changer_position dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown dataset sample_mur found" nxdlPath=/NXentry/NXsample sev=warnundef dataPath=/entry1/sample/s
ample_mur dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown dataset sample_name found" nxdlPath=/NXentry/NXsample sev=warnundef dataPath=/entry1/sample/
sample_name dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown dataset sample_rotation_state found" nxdlPath=/NXentry/NXsample sev=warnundef dataPath=/entr
y1/sample/sample_rotation_state dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Unknown dataset sample_table_rotation found" nxdlPath=/NXentry/NXsample sev=warnundef dataPath=/entr
y1/sample/sample_table_rotation dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Additional base class dataset temperature found" nxdlPath=/NXentry/NXsample sev=warnbase dataPath=/e
ntry1/sample/temperature dataFile=hrpt2022n000040.hdf
definition=Nxmonopd.nxdl.xml message="Additional base class group temperature_log of type NXlog found" nxdlPath=/NXentry/NXsample sev=warn
base dataPath=/entry1/sample/temperature_log dataFile=hrpt2022n000040.hdf
```



1. Include `<nxvalidate.h>`
  2. Create a reporting function
  3. Create a validation context
  4. Validate
  5. Delete validation context
- See `nxvmain.c` as an example

- More fine grained than application definitions
- Use features field in NXentry, NXsubentry to enumerate features supported by the entry
- Write and register code to test for the feature
- See: <https://github.com/nexusformat/features>
- Not official yet but you may ask for it...

- NeXus has a powerful validation tool in the form of `cnxvalidate`.
- <https://github.com/nexusformat/cnxvalidate>
- Questions, comments, virtual rotten tomatoes.....