NMD: Numerical Metadata library Reference Manual

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Version 2

Abstract

The NMD library offers a convenient storage mechanism for numerical data that is organised in a two-level structure of categories and components. It has routines for creating, deleting, and manipulating metadata objects, as well as routines for output to various formats.

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1 NMD: the Numerical MetaData library

The NMD library serves to store two-level data structures of numerical metadata. While this library was intended to be used with AnaMod in the Salsa project, it can be used on its own. Unlike other libraries in the Salsa project, it does not rely on Petsc.

1.1 General notes

All routines in NMD return an error code of type `NMDErrorCode`. This is zero for success and anything else for failure. Return codes can be caught with `NMD_ERR_RETURN(ierr)` and generate with `NMD_ERR_REPORT(msg)`.

Metadata object manipulation

Metadata category manipulation

Metadata component manipulation

Value handling

Viewing objects

Installing NMD

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2.3

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1.2 history

2.3 changes

- NMDGetValue now returns failure (instead of aborting) if cat/cmp do not exist
- removed occurrences of Petsc's CHKERRQ
- introduced NMDErrorCode
- new files nmdcat.c nmdcmp.c
- NMDGetValue and GetArrayValue now use NMDTruth
- NMDSetValue and NMDSetArrayValue are now analogous: use ampersand for all types of data
- NMDTrue and NMDFalse instead of 1 and 0
- unit tests added

2.3 bug fixes

- NMDGetValue missing case of string value added
- NMDTryGetCategory (and various other Get routines) were able to find non-existing category names. Fixed.
- lots of memory leaks plugged

2.2

- Completely revamped array handling; watch out for prototype changes
- CFLAGS is now NMD_CFLAGS

2 NMD Data Structure Index

2.1 NMD Data Structures

Here are the data structures with brief descriptions:

NMD_intarray_struct iv

NMD_metadata_ v

NMD_metadata_category_ vi

NMD_metadata_item_ viii

NMD_object_ x

NMD_realarray_struct x

NMD_string_ xi

3 NMD File Index

3.1 NMD File List

Here is a list of all files with brief descriptions:

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nmd.c xii

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4 NMD Page Index

4.1 NMD Related Pages

Here is a list of all related documentation pages:

NMD Data Types lv

5 NMD Data Structure Documentation

5.1 NMD_intarray_struct Struct Reference

```
#include <nmd_impl.h>
```

Data Fields

- int length
- int unique
- int * data

5.1.1 Detailed Description

Definition at line 42 of file nmd_impl.h.

5.1.2 Field Documentation

5.1.2.1 int NMD_intarray_struct::length

Definition at line 43 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), NMDCopyItemValues(), and NMDGetArrayValue().

5.1.2.2 int NMD_intarray_struct::unique

Definition at line 43 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), and NMDCopyItemValues().

5.1.2.3 int* NMD_intarray_struct::data

Definition at line 44 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), NMDCopyItemValues(), and NMDGetArrayValue().

The documentation for this struct was generated from the following file:

- nmd_impl.h

5.2 NMD_metadata_ Struct Reference

```
#include <nmd_impl.h>
```

Data Fields

- int cookie
- int alloc

- int ncat
- NMD_metadata_category * cats

5.2.1 Detailed Description

Definition at line 27 of file nmd_impl.h.

5.2.2 Field Documentation

5.2.2.1 int NMD_metadata_::cookie

Definition at line 28 of file nmd_impl.h.

5.2.2.2 int NMD_metadata_::alloc

Definition at line 29 of file nmd_impl.h.

Referenced by NMDCreateObject(), and NMDObjectAllocateNewCategory().

5.2.2.3 int NMD_metadata_::ncat

Definition at line 29 of file nmd_impl.h.

Referenced by NMDCloneObject(), NMDCloneObjectStructure(), NMDDestroyObject(), NMDGetCategories(), NMDObjectAllocateNewCategory(), NMDObjectTryGetCategory(), NMDReportObject(), and NMDViewObject().

5.2.2.4 NMD_metadata_category* NMD_metadata_::cats

Definition at line 30 of file nmd_impl.h.

Referenced by NMDCloneObject(), NMDCloneObjectStructure(), NMDDestroyObject(), NMDGetCategories(), NMDGetCategoryIGetComponents(), NMDObjectAllocateNewCategory(), NMDObjectTryGetCategory(), NMDReportObject(), and NMDViewObject().

The documentation for this struct was generated from the following file:

- nmd_impl.h

5.3 NMD_metadata_category_ Struct Reference

```
#include <nmd_impl.h>
```

Data Fields

- int cookie
- char * name
- int alloc
- int ncmp
- NMD_metadata_item * cmps

5.3.1 Detailed Description

Definition at line 20 of file nmd_impl.h.

5.3.2 Field Documentation

5.3.2.1 int NMD_metadata_category_::cookie

Definition at line 21 of file nmd_impl.h.

Referenced by NMDAllocateCategory().

5.3.2.2 char* NMD_metadata_category_::name

Definition at line 22 of file nmd_impl.h.

Referenced by NMDCategoryGetComponent(), NMDCopyCategory(), NMDGetCategories(), NMDObjectAllocateNewCategory(), and NMDRemoveCategory().

5.3.2.3 int NMD_metadata_category_::alloc

Definition at line 23 of file nmd_impl.h.

Referenced by NMDAllocateCategory(), and NMDCategoryAllocateNewComponent().

5.3.2.4 int NMD_metadata_category_::ncmp

Definition at line 23 of file nmd_impl.h.

Referenced by NMDAllocateCategory(), NMDCategoryAllocateNewComponent(), NMDCategoryTryGetComponent(), NMDCopyCategory(), and NMDGetCategoryIGetComponents().

5.3.2.5 NMD_metadata_item* NMD_metadata_category_::cmps

Definition at line 24 of file nmd_impl.h.

Referenced by NMDAllocateCategory(), NMDCategoryAllocateNewComponent(), NMDCategoryTryGetComponent(), NMDCopyCategory(), NMDDestroyObject(), and NMDGetCategoryIGetComponents().

The documentation for this struct was generated from the following file:

- nmd_impl.h

5.4 NMD_metadata_item_ Struct Reference

`#include <nmd_impl.h>`

Data Fields

- int cookie
- char * name
- NMDDataType t
- NMDTruth set
- int i
- double r
- NMD_intarray_struct * ii
- NMD_realarray_struct * rr
- char * cc

5.4.1 Detailed Description

Definition at line 10 of file nmd_impl.h.

5.4.2 Field Documentation

5.4.2.1 int NMD_metadata_item_::cookie

Definition at line 11 of file nmd_impl.h.

Referenced by NMDAllocateComponent().

5.4.2.2 char* NMD_metadata_item_::name

Definition at line 12 of file nmd_impl.h.

Referenced by NMDCategoryAllocateNewComponent(), NMDComponentDestroy(), and NMDGetCategoryIGetComponents().

5.4.2.3 NMDDataType NMD_metadata_item_::t

Definition at line 12 of file nmd_impl.h.

Referenced by NMDCategoryAllocateNewComponent(), NMDCategoryGetOrCreateComponent(), NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDComponentSetValue(), NMDCopyArrayValue(), NMDCopyItemValues(), NMDGetArrayValue(), NMDGetCategoryIGetComponents(), NMDGetDataType(), NMDGetValue(), and NMDObjectEnsureCategoryComponent().

5.4.2.4 NMDTruth NMD_metadata_item_::set

Definition at line 12 of file nmd_impl.h.

Referenced by NMDAllocateComponent(), NMDCategoryAllocateNewComponent(), NMDComponentSetArrayValue(), NMDComponentSetValue(), NMDCopyArrayValue(), NMDCopyItemValues(), NMDGetArrayValue(), and NMDGetValue().

5.4.2.5 int NMD_metadata_item_::i

Definition at line 13 of file nmd_impl.h.

Referenced by NMDComponentSetValue(), NMDCopyItemValues(), and NMDGetValue().

5.4.2.6 double NMD_metadata_item_::r

Definition at line 14 of file nmd_impl.h.

Referenced by NMDComponentSetValue(), NMDCopyItemValues(), and NMDGetValue().

5.4.2.7 struct NMD_intarray_struct* NMD_metadata_item_::ii [read]

Definition at line 15 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), NMDCopyItemValues(), and NMDGetArrayValue().

5.4.2.8 struct NMD_realarray_struct* NMD_metadata_item_::rr [read]

Definition at line 16 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), NMDCopyItemValues(), and NMDGetArrayValue().

5.4.2.9 char* NMD_metadata_item_::cc

Definition at line 17 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetValue(), NMDCopyItemValues(), and NMDGetValue().

The documentation for this struct was generated from the following file:

- nmd_impl.h

5.5 NMD_object_ Struct Reference

`#include <nmd_impl.h>`

Data Fields

- int cookie

5.5.1 Detailed Description

Definition at line 38 of file nmd_impl.h.

5.5.2 Field Documentation

5.5.2.1 int NMD_object_::cookie

Definition at line 39 of file nmd_impl.h.

The documentation for this struct was generated from the following file:

- nmd_impl.h

5.6 NMD_realarray_struct Struct Reference

`#include <nmd_impl.h>`

Data Fields

- int length
- int unique
- NMDRealtype * data

5.6.1 Detailed Description

Definition at line 47 of file nmd_impl.h.

5.6.2 Field Documentation

5.6.2.1 int NMD_realarray_struct::length

Definition at line 48 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), NMDCopyItemValues(), NMDGetArrayValue(), and NMDReportObject().

5.6.2.2 int NMD_realarray_struct::unique

Definition at line 48 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), and NMDCopyItemValues().

5.6.2.3 NMDRealtype* NMD_realarray_struct::data

Definition at line 49 of file nmd_impl.h.

Referenced by NMDComponentDestroy(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), NMDCopyItemValues(), NMDGetArrayValue(), and NMDReportObject().

The documentation for this struct was generated from the following file:

- nmd_impl.h

5.7 NMD_string_ Struct Reference

Data Fields

- int cookie
- int n
- char * t

5.7.1 Detailed Description

Definition at line 6 of file nmdutil.c.

5.7.2 Field Documentation

5.7.2.1 int NMD_string_::cookie

Definition at line 7 of file nmdutil.c.

Referenced by NMDStringCreateOfSize().

5.7.2.2 int NMD_string_::n

Definition at line 8 of file nmdutil.c.

Referenced by NMDStringConcat(), and NMDStringCreateOfSize().

5.7.2.3 char* NMD_string_::t

Definition at line 8 of file nmdutil.c.

Referenced by NMDStringConcat(), NMDStringCreate(), NMDStringCreateOfSize(), NMDStringDestroy(), and NMDStringGetString().

The documentation for this struct was generated from the following file:

- nmdutil.c

6 NMD File Documentation

6.1 Make.inc File Reference

6.2 nmd.c File Reference

```
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include "nmd_impl.h"
#include "nmd.h"
```

Defines

- #define CATCHUNK 10
- #define CHKLEN 500
- #define CHKSPACEFOR(ar, arlen, fmt, str) {int nr; memset(scratch,0,CHKLEN); sprintf(scratch,fmt,str); nr=strlen(scratch); if

(write==0) {arlen = arlen+nr+2; } else {int l = strlen(ar); if (l+nr<arlen) {sprintf(ar+l,fmt,str);} else SETERRQ(1,"sprintf would overflow allocated buffer");}}

Functions

- NMDErrorCode NMDCreateObject (NMD_metadata *obj)
- NMDErrorCode NMDDestroyObject (NMD_metadata obj)
- NMDErrorCode NMDCloneObjectStructure (NMD_metadata old, NMD_metadata *ret)
- NMDErrorCode NMDCloneObject (NMD_metadata old, NMD_metadata new)
- NMDErrorCode NMDViewObject (NMD_metadata obj)
- NMDErrorCode NMDReportObject (NMD_metadata obj, NMDTruth arrays, char **rkey, char **rval, char delim)
- NMDErrorCode NMDSetValue (NMD_metadata obj, char *cat, char *cmp, NMDDataType t, void *v)
- NMDErrorCode NMDSetArrayValue (NMD_metadata obj, char *cat, char *cmp, NMDDataType t, void *v, int l)
- NMDErrorCode NMDCopyArrayValue (NMD_metadata obj, char *cat, char *cmp, NMDDataType t, void *v, int l)
- NMDErrorCode NMDGetValue (NMD_metadata obj, char *cat, char *cmp, NMDDataType *t, void *v, NMDTruth *f)
- NMDErrorCode NMDGetArrayValue (NMD_metadata obj, char *cat, char *cmp, NMDDataType *t, void *v, int *len, NMDTruth *f)
- NMDErrorCode NMDGetDataType (NMD_metadata obj, char *cat, char *cmp, NMDDataType *t)
- NMDErrorCode NMDIsArrayType (NMDDataType type, NMDTruth *flg)

Variables

- const char * typenames [ ] = {"invalid","int","real","string","intarray","realarray"}

6.2.1 Define Documentation

6.2.1.1 #define CATCHUNK 10

Definition at line 79 of file nmd.c.

Referenced by NMDCreateObject().

6.2.1.2 #define CHKLEN 500

Referenced by NMDReportObject().

6.2.1.3 #define CHKSPACEFOR(ar, arlen, fmt, str) {int nr; memset(scratch,0,CHKLEN); sprintf(scratch,fmt,str); nr=strlen(scratch); if (write==0) {arlen = arlen+nr+2; } else {int l = strlen(ar); if (l+nr<arlen) {sprintf(ar+l,fmt,str);} else SETERRQ(1,"sprintf would overflow allocated buffer");}}

Referenced by NMDReportObject().

6.2.2 Function Documentation

6.2.2.1 NMDErrorCode NMDCloneObject (NMD_metadata *old*, NMD_metadata *new*)

Given an already created NMD_metadata object, fill it with the data of a template object. See also NMDCloneObjectStructure().

Definition at line 198 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_::ncat, NMDCategoryGetOrCreateComponent(), NMDCopyItemValues(), and NMDObjectGetOrCreateCategory().

Referenced by main().

6.2.2.2 NMDErrorCode NMDCloneObjectStructure (NMD_metadata *old*, NMD_metadata * *ret*)

This routine creates an NMD_metadata object, and fills it in with the categories and components of a template object. Data is not copied; for that, see NMDCloneObject() and NMDCopyCategory().

Definition at line 169 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_::ncat, NMDCreateObject(), and NMDObjectEnsureCategoryComponent().

Referenced by main().

6.2.2.3 NMDErrorCode NMDCopyArrayValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType *t*, void * *v*, int *l*)

Set a metadata array value; the user array is copied.

This call can be used to create categories and components; there is no checking of slight misspellings.

See also Value handling.

Definition at line 461 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_intarray_struct::data, NMD_realarray_struct::data, NMD_metadata_item_::ii, NMD_intarray_-struct::length, NMD_realarray_struct::length, NMD_MALLOC, NMDCategoryGetOrCreateComponent(), NMDInt, NMDIntarray, NMDObjectGetOrCreateCategory(), NMDReal, NMDRealarray, NMDSetValue(), NMDString, NMDTrue, NMD_metadata_item_::rr, NMD_metadata_item_::set, NMD_metadata_item_::t, NMD_intarray_struct::unique, and NMD_realarray_struct::unique.

Referenced by main().

6.2.2.4 NMDErrorCode NMDCreateObject (NMD_metadata * *obj*)

This routine create an NMD_metadata object, and allocates enough space in it for 10 categories of 20 elements each. Currently this can not be reallocated. In the future we want to be a bit more flexible.

Definition at line 96 of file nmd.c.

References NMD_metadata_::alloc, CATCHUNK, CHKMEMQ, NMD_MALLOC, and NMDCOOKIE.

Referenced by main(), and NMDCloneObjectStructure().

6.2.2.5 NMDErrorCode NMDDestroyObject (NMD_metadata *obj*)

Deallocate all the data in a metadata object.

Definition at line 118 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::cmps, NMD_metadata_::ncat, NMD_FREE, and NMD-ComponentDestroy().

Referenced by main().

6.2.2.6 NMDErrorCode NMDGetArrayValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType * *t*, void * *v*, int * *len*, NMDTruth * *f*)

Retrieve a stored value. If no value has been stored under the specified category and component, a zero flag is returned. The flag parameter can be null.

Null pointers can be passed for the datatype or value, for instance to test only for the existence of a set value.

See also Value handling.

Definition at line 575 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_intarray_struct::data, NMD_realarray_struct::data, NMD_metadata_item_::ii, NMD_intarray_-struct::length, NMD_realarray_struct::length, NMDCategoryGetComponent(),

NMDFalse, NMDGetValue(), NMDInt, NMDIntarray, NMDObjectGetCategory(), NMDReal, NMDRealarray, NMDString, NMDTrue, NMD_metadata_item_::rr, NMD_metadata_item_::set, and NMD_metadata_item_::t.

Referenced by main().

6.2.2.7 NMDErrorCode NMDGetDataType (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType * *t*)

Definition at line 663 of file nmd.c.

References CHECKHASNMDCOOKIE, NMDCategoryGetComponent(), NMDObjectGetCategory(), and NMD_metadata_item_::t.

6.2.2.8 NMDErrorCode NMDGetValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType * *t*, void * *v*, NMDTruth * *f*)

Retrieve a stored scalar value. If no value has been stored under the specified category and component, a zero flag is returned. The flag parameter can be null.

Null pointers can be passed for the datatype or value, for instance to test only for the existence of a set value.

See also Value handling.

Definition at line 514 of file nmd.c.

References NMD_metadata_item_::cc, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_item_::i, NMDCategoryTryGetComponent(), NMDFalse, NMDInt, NMDIntarray, NMDObjectTryGetCategory(), NMDReal, NMDRealarray, NMDString, NMDTrue, NMD_metadata_item_::r, NMD_metadata_item_::set, and NMD_metadata_item_::t.

Referenced by main(), NMDGetArrayValue(), and NMDTabReportData().

6.2.2.9 NMDErrorCode NMDIsArrayType (NMDDataType *type*, NMDTruth * *flg*)

Test whether a data type is an array type

Definition at line 680 of file nmd.c.

References NMDFalse, NMDIntarray, NMDRealarray, and NMDTrue.

6.2.2.10 NMDErrorCode NMDReportObject (NMD_metadata *obj*, NMDTruth *arrays*, char ** *rkey*, char ** *rval*, char *delim*)

Generate a delimited representation of a metadata object.

The returned strings are allocated in this routine and it is the user's responsibility to free

them. The system `malloc` routine is used unless it is indicated that the Petsc library is available (see Installing NMD). This determines whether the `free` or `PetscFree` is to be used to free the return strings.

Arguments:

- obj : the metadata object
- rkey : a string containing the names of the metadata items
- rval : the metadata items
- delim : delimiter character used in `rkey` and `rval`
- ar : boolean to indicate whether arrays need to be preresented.

Definition at line 282 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKLEN, CHKSPACEFOR, NMD_realarray_struct::data, NMD_realarray_struct::length, NMD_metadata_::ncat, NMD_MALLOC, NMDInt, NMDReal, NMDRealarray, and NMDString.

Referenced by main().

6.2.2.11 NMDErrorCode NMDSetArrayValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType *t*, void * *v*, int *l*)

Set a metadata value, if it is an array type.

The arrays are not copied, so the user is responsible for freeing the array. Use NMDCopyArrayValue() to have the array copied; NMD will then free the array when the metadata object is freed.

This call can be used to create categories and components; there is no checking of slight misspellings.

See also Value handling.

Definition at line 438 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryGetOrCreateComponent(), NMDComponentSetArrayValue(), and NMDObjectGetOrCreateCategory().

Referenced by main().

6.2.2.12 NMDErrorCode NMDSetValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType *t*, void * *v*)

Set a metadata value, indexed by category and component name.

The value has to be passed by reference

String values are copied. (Reason: literal strings are treated differently from allocated, and Petsc has its own way of doing strings.)

This call can be used to create categories and components; there is no checking of slight misspellings.

See also Value handling.

Definition at line 412 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryGetOrCreate-Component(), NMDComponentSetValue(), and NMDObjectGetOrCreateCategory().

Referenced by main(), and NMDCopyArrayValue().

6.2.2.13 NMDErrorCode NMDViewObject (NMD_metadata *obj*)

Print out an NMD object.

Currently only int, real, string fields are displayed, others are displayed as "***".

Definition at line 233 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_::ncat, NMDInt, NMDReal, and NMDString.

6.2.3 Variable Documentation

6.2.3.1 const char* typenames[ ] = {"invalid","int","real","string","intarray","realarray"}

Definition at line 76 of file nmd.c.

6.3 nmd.h File Reference

Defines

- #define NMD_H 1
- #define NMDTrue 1
- #define NMDFalse 0
- #define NMDCOOKIE 32897432
- #define CHECKHASNMDCOOKIE(obj) { if (!obj) NMD_ERR_-REPORT("Null object"); if (((NMD_object)(obj)) → cookie!=NMDCOOKIE) NMD_ERR_REPORTi("Object has invalid cookie",((NMD_object)(obj)) → cookie); }
- #define NMD_MALLOC(a, b, c, d)
- #define NMD_FREE(a) {free(a);}

- #define NMD_STRDUP(a, b) b = strdup(a);

Typedefs

- typedef double NMDRealtype
- typedef int NMDTruth
- typedef int NMDErrorCode
- typedef NMD_metadata_item_ * NMD_metadata_item
- typedef NMD_metadata_category_ * NMD_metadata_category
- typedef NMD_metadata_ * NMD_metadata
- typedef NMD_object_ * NMD_object
- typedef NMD_string_ * NMD_string

Enumerations

- enum NMDDataType {
  NMDInvalid, NMDInt, NMDReal, NMDString,
  NMDIntarray, NMDRealarray }

Functions

- NMDErrorCode NMDCreateObject (NMD_metadata *)
- NMDErrorCode NMDDestroyObject (NMD_metadata)
- NMDErrorCode NMDViewObject (NMD_metadata)
- NMDErrorCode NMDBuildObjectStructure (NMD_metadata)
- NMDErrorCode NMDDestroyObjectStructure (NMD_metadata)
- NMDErrorCode NMDCloneObjectStructure (NMD_metadata, NMD_metadata *)
- NMDErrorCode NMDCloneObject (NMD_metadata, NMD_metadata)
- NMDErrorCode NMDReportObject (NMD_metadata, NMDTruth, char **, char **, char)
- NMDErrorCode NMDObjectAllocateNewCategory (NMD_metadata, char *, NMD_metadata_category *)
- NMDErrorCode NMDObjectTryGetCategory (NMD_metadata, char *, NMD_metadata_category *, NMDTruth *)
- NMDErrorCode NMDObjectGetCategory (NMD_metadata, char *, NMD_metadata_category *)
- NMDErrorCode NMDObjectGetOrCreateCategory (NMD_metadata obj, char *cat, NMD_metadata_category *ctg)
- NMDErrorCode NMDRemoveCategory (NMD_metadata, char *cat)
- NMDErrorCode NMDCopyCategory (NMD_metadata_category, NMD_metadata_category)

- NMDErrorCode NMDGetCategories (NMD_metadata, int *, char ***)
- NMDErrorCode NMDCategoryAllocateNewComponent (NMD_metadata_category, char *, NMDDataType, NMD_metadata_item *)
- NMDErrorCode NMDComponentDestroy (NMD_metadata_item)
- NMDErrorCode NMDCategoryCreateComponent (NMD_metadata, char *, char *)
- NMDErrorCode NMDCategoryGetOrCreateComponent (NMD_metadata_category, char *, NMDDataType, NMD_metadata_item *)
- NMDErrorCode NMDCategoryTryGetComponent (NMD_metadata_category, char *, NMD_metadata_item *, NMDTruth *)
- NMDErrorCode NMDObjectHasCategoryComponent (NMD_metadata, char *, char *, NMDTruth *)
- NMDErrorCode NMDObjectEnsureCategoryComponent (NMD_metadata, char *, char *, NMDDataType, NMDTruth *)
- NMDErrorCode NMDCategoryGetComponent (NMD_metadata_category, char *, NMD_metadata_item *)
- NMDErrorCode NMDGetCategoryIGetComponents (NMD_metadata, int, int *, char ***, NMDDataType **)
- NMDErrorCode NMDSetValue (NMD_metadata, char *, char *, NMDDataType, void *)
- NMDErrorCode NMDComponentSetValue (NMD_metadata_item, NMDDataType, void *)
- NMDErrorCode NMDSetArrayValue (NMD_metadata, char *, char *, NMDDataType, void *, int)
- NMDErrorCode NMDComponentSetArrayValue (NMD_metadata_item, NMDDataType, void *, int)
- NMDErrorCode NMDCopyArrayValue (NMD_metadata, char *, char *, NMDDataType, void *, int)
- NMDErrorCode NMDGetValue (NMD_metadata, char *, char *, NMDDataType *, void *, NMDTruth *)
- NMDErrorCode NMDGetArrayValue (NMD_metadata, char *, char *, NMDDataType *, void *, int *, NMDTruth *)
- NMDErrorCode NMDCopyItemValues (NMD_metadata_item, NMD_metadata_item)
- NMDErrorCode NMDGetDataType (NMD_metadata, char *, char *, NMDDataType *t)
- NMDErrorCode NMDIsArrayType (NMDDataType type, NMDTruth *)
- NMDErrorCode NMDStringCreate (char *, NMD_string *)
- NMDErrorCode NMDStringDestroy (NMD_string)
- NMDErrorCode NMDStringGetString (NMD_string str, char **t)
- NMDErrorCode NMDStringConcat (char, NMD_string, char, NMD_string, char, NMD_string *)

Variables

- const char * typenames [ ]

6.3.1 Define Documentation

6.3.1.1 #define CHECKHASNMDCOOKIE(obj) { if (!obj) NMD_ERR_REPORT("Null object"); if (((NMD_object)(obj)) → cookie!=NMDCOOKIE) NMD_ERR_REPORTi("Object has invalid cookie",((NMD_object)(obj)) → cookie); }

Definition at line 39 of file nmd.h.

Referenced by NMDCategoryGetComponent(), NMDCategoryGetOrCreateComponent(), NMDCategoryTryGetComponent(), NMDCloneObject(), NMDCloneObjectStructure(), NMDComponentSetArrayValue(), NMDComponentSetValue(), NMDCopyArrayValue(), NMDCopyCategory(), NMDDestroyObject(), NMDGetArrayValue(), NMDGetCategories(), NMDGetCategoryIGetComponents(), NMDGetDataType(), NMDGetValue(), NMDObjectEnsureCategoryComponent(), NMDObjectGetCategory(), NMDObjectGetOrCreateCategory(), NMDObjectHasCategoryComponent(), NMDObjectTryGetCategory(), NMDRemoveCategory(), NMDReportObject(), NMDSetArrayValue(), NMDSetValue(), NMDStringConcat(), NMDStringDestroy(), NMDStringGetString(), and NMDViewObject().

6.3.1.2 #define NMD_FREE(a) {free(a);}

Definition at line 131 of file nmd.h.

Referenced by main(), NMDComponentDestroy(), NMDDestroyObject(), NMDRemoveCategory(), and NMDStringDestroy().

6.3.1.3 #define NMD_H 1

Definition at line 2 of file nmd.h.

6.3.1.4 #define NMD_MALLOC(a, b, c, d)

Value:

```
{ a = (c*)malloc((b)*sizeof(c));                    \
    if (!a) NMD_ERR_REPORTs("Could not allocate",d); \
    memset(a,0,(b)*sizeof(c)); }
```

Definition at line 127 of file nmd.h.

Referenced by main(), NMDAllocateCategory(), NMDAllocateComponent(), NMDComponentSetArrayValue(), NMDCopyArrayValue(), NMDCopyItemValues(),

NMDCreateObject(), NMDGetCategories(), NMDGetCategoryIGetComponents(), NMDReportObject(), NMDStringCreateOfSize(), and NMDTabReportData().

6.3.1.5 #define NMD_STRDUP(a, b) b = strdup(a);

Definition at line 132 of file nmd.h.

Referenced by NMDCategoryAllocateNewComponent(), NMDComponentSetValue(), NMDCopyItemValues(), NMDObjectAllocateNewCategory(), and NMDRemoveCategory().

6.3.1.6 #define NMDCOOKIE 32897432

Definition at line 38 of file nmd.h.

Referenced by NMDAllocateCategory(), NMDAllocateComponent(), NMDCreateObject(), and NMDStringCreateOfSize().

6.3.1.7 #define NMDFalse 0

Definition at line 24 of file nmd.h.

Referenced by main(), NMDAllocateComponent(), NMDCategoryAllocateNewComponent(), NMDCategoryTryGetComponent(), NMDGetArrayValue(), NMDGetValue(), NMDIsArrayType(), NMDObjectEnsureCategoryComponent(), and NMDObjectTryGetCategory().

6.3.1.8 #define NMDTrue 1

Definition at line 23 of file nmd.h.

Referenced by main(), NMDCategoryTryGetComponent(), NMDComponentSetArrayValue(), NMDComponentSetValue(), NMDCopyArrayValue(), NMDGetArrayValue(), NMDGetValue(), NMDIsArrayType(), NMDObjectEnsureCategoryComponent(), and NMDObjectTryGetCategory().

6.3.2 Typedef Documentation

6.3.2.1 typedef struct NMD_metadata_* NMD_metadata

Definition at line 35 of file nmd.h.

6.3.2.2 typedef struct NMD_metadata_category_* NMD_metadata_category

Definition at line 34 of file nmd.h.

6.3.2.3 typedef struct NMD_metadata_item_* NMD_metadata_item

Definition at line 33 of file nmd.h.

6.3.2.4 typedef struct NMD_object_* NMD_object

Definition at line 36 of file nmd.h.

6.3.2.5 typedef struct NMD_string_* NMD_string

Definition at line 106 of file nmd.h.

6.3.2.6 typedef int NMDErrorCode

Definition at line 25 of file nmd.h.

6.3.2.7 typedef double NMDRealtype

Definition at line 21 of file nmd.h.

6.3.2.8 typedef int NMDTruth

Definition at line 22 of file nmd.h.

6.3.3 Enumeration Type Documentation

6.3.3.1 enum NMDDataType

Enumerator:

NMDInvalid
NMDInt
NMDReal
NMDString
NMDIntarray
NMDRealarray

Definition at line 28 of file nmd.h.

6.3.4 Function Documentation

6.3.4.1 NMDErrorCode NMDBuildObjectStructure (NMD_metadata)

6.3.4.2 NMDErrorCode NMDCategoryAllocateNewComponent (NMD_metadata_category *cat*, char * *cmp*, NMDDataType *type*, NMD_metadata_item * *rcpt*)

Create a new component by name in an existing category object. If a component pointer is supplied, the new component object is returned, but this pointer is allowed to be NULL.

Definition at line 41 of file nmdcmp.c.

References NMD_metadata_category_::alloc, CHKMEMQ, NMD_metadata_category_::cmps, NMD_metadata_item_::name, NMD_metadata_category_::ncmp, NMD_STRDUP, NMDAllocateComponent(), NMDFalse, NMD_metadata_item_::set, and NMD_metadata_item_::t.

Referenced by main(), NMDCategoryGetOrCreateComponent(), and NMDObjectEnsureCategoryComponent().

6.3.4.3 NMDErrorCode NMDCategoryCreateComponent (NMD_metadata, char *, char *)

6.3.4.4 NMDErrorCode NMDCategoryGetComponent (NMD_metadata_category *cat*, char * *cmp*, NMD_metadata_item * *cpt*)

Test whether a metadata category has a certain component. The component has to exist.

Definition at line 202 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::name, and NMDCategoryTryGetComponent().

Referenced by NMDGetArrayValue(), and NMDGetDataType().

6.3.4.5 NMDErrorCode NMDCategoryGetOrCreateComponent (NMD_metadata_category *cat*, char * *cmp*, NMDDataType *type*, NMD_metadata_item * *cpt*)

Retrieve a component, creating it if it doesn't already exist.

Definition at line 108 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryAllocateNewComponent(), NMDCategoryTryGetComponent(), and NMD_metadata_item_::t.

Referenced by main(), NMDCloneObject(), NMDCopyArrayValue(), NMDCopyCategory(), NMDSetArrayValue(), and NMDSetValue().

6.3.4.6 NMDErrorCode NMDCategoryTryGetComponent (NMD_metadata_category *cat*, char * *cmp*, NMD_metadata_item * *rcpt*, NMDTruth * *f*)

Test whether a metadata category has a certain component.

Definition at line 178 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, NMD_metadata_category_::cmps, NMD_metadata_category_::ncmp, NMDFalse, and NMDTrue.

Referenced by main(), NMDCategoryGetComponent(), NMDCategoryGetOrCreateComponent(), NMDGetValue(), NMDObjectEnsureCategoryComponent(), and NMDObjectHasCategoryComponent().

6.3.4.7 NMDErrorCode NMDCloneObject (NMD_metadata *old*, NMD_metadata *new*)

Given an already created NMD_metadata object, fill it with the data of a template object. See also NMDCloneObjectStructure().

Definition at line 198 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_::ncat, NMDCategoryGetOrCreateComponent(), NMDCopyItemValues(), and NMDObjectGetOrCreateCategory().

Referenced by main().

6.3.4.8 NMDErrorCode NMDCloneObjectStructure (NMD_metadata *old*, NMD_metadata * *ret*)

This routine creates an NMD_metadata object, and fills it in with the categories and components of a template object. Data is not copied; for that, see NMDCloneObject() and NMDCopyCategory().

Definition at line 169 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_::ncat, NMDCreateObject(), and NMDObjectEnsureCategoryComponent().

Referenced by main().

6.3.4.9 NMDErrorCode NMDComponentDestroy (NMD_metadata_item)

Definition at line 72 of file nmdcmp.c.

References NMD_metadata_item_::cc, NMD_intarray_struct::data, NMD_realarray_struct::data, NMD_metadata_item_::ii, NMD_intarray_struct::length, NMD_realarray_struct::length, NMD_metadata_item_::name, NMD_FREE, NMDIntarray, NMDRealarray, NMDString, NMD_metadata_item_::rr, NMD_metadata_item_::t, NMD_intarray_struct::unique, and NMD_realarray_struct::unique.

Referenced by NMDDestroyObject().

6.3.4.10 NMDErrorCode NMDComponentSetArrayValue (NMD_metadata_item, NMDDataType, void *, int)

Definition at line 265 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, NMD_intarray_struct::data, NMD_realarray_struct::data, NMD_metadata_item_::ii, NMD_intarray_struct::length, NMD_realarray_struct::length, NMD_MALLOC, NMDComponentSetValue(), NMDInt, NMDIntarray, NMDReal, NMDRealarray, NMDString, NMDTrue, NMD_metadata_item_::rr, NMD_metadata_item_::set, NMD_metadata_item_::t, NMD_intarray_struct::unique, and NMD_realarray_struct::unique.

Referenced by NMDSetArrayValue().

6.3.4.11 NMDErrorCode NMDComponentSetValue (NMD_metadata_item, NMDDataType, void *)

Definition at line 246 of file nmdcmp.c.

References NMD_metadata_item_::cc, CHECKHASNMDCOOKIE, NMD_metadata_item_::i, NMD_STRDUP, NMDInt, NMDIntarray, NMDReal, NMDRealarray, NMDString, NMDTrue, NMD_metadata_item_::r, NMD_metadata_item_::set, and NMD_metadata_item_::t.

Referenced by NMDComponentSetArrayValue(), and NMDSetValue().

6.3.4.12 NMDErrorCode NMDCopyArrayValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType *t*, void * *v*, int *l*)

Set a metadata array value; the user array is copied.

This call can be used to create categories and components; there is no checking of slight misspellings.

See also Value handling.

Definition at line 461 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_realarray_struct::data, NMD_intarray_struct::data, NMD_metadata_item_::ii, NMD_realarray_struct::length, NMD_intarray_struct::length, NMD_MALLOC, NMDCategoryGetOrCreateComponent(), NMDInt, NMDIntarray, NMDObjectGetOrCreateCategory(), NMDReal, NMDRealarray, NMDSetValue(), NMDString, NMDTrue, NMD_metadata_item_::rr, NMD_metadata_item_::set, NMD_metadata_item_::t, NMD_realarray_struct::unique, and NMD_intarray_struct::unique.

Referenced by main().

6.3.4.13 NMDErrorCode NMDCopyCategory (NMD_metadata_category *incat*, NMD_metadata_category *outcat*)

Copy category data from one metadata structure into another. This assumes that the category already exists in the target; see for instance NMDHasCategory(), NMDCloneObject(), NMDCloneObjectStructure().

Definition at line 180 of file nmdcat.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::cmps, NMD_metadata_category_::name, NMD_metadata_category_::ncmp, NMDCategoryGetOrCreateComponent(), and NMDCopyItemValues().

6.3.4.14 NMDErrorCode NMDCopyItemValues (NMD_metadata_item *src*, NMD_metadata_item *tar*)

Copy data between two item structures. If the original has unique data, so does the clone.

Definition at line 301 of file nmdcmp.c.

References NMD_metadata_item_::cc, CHKMEMQ, NMD_intarray_struct::data, NMD_realarray_struct::data, NMD_metadata_item_::i, NMD_metadata_item_::ii, NMD_intarray_struct::length, NMD_realarray_struct::length, NMD_MALLOC, NMD_STRDUP, NMDInt, NMDIntarray, NMDReal, NMDRealarray, NMDString, NMD_metadata_item_::r, NMD_metadata_item_::rr, NMD_metadata_item_::set, NMD_metadata_item_::t, NMD_intarray_struct::unique, and NMD_realarray_struct::unique.

Referenced by NMDCloneObject(), and NMDCopyCategory().

6.3.4.15 NMDErrorCode NMDCreateObject (NMD_metadata * *obj*)

This routine create an NMD_metadata object, and allocates enough space in it for 10 categories of 20 elements each. Currently this can not be reallocated. In the future we want to be a bit more flexible.

Definition at line 96 of file nmd.c.

References NMD_metadata_::alloc, CATCHUNK, CHKMEMQ, NMD_MALLOC, and NMDCOOKIE.

Referenced by main(), and NMDCloneObjectStructure().

6.3.4.16 NMDErrorCode NMDDestroyObject (NMD_metadata *obj*)

Deallocate all the data in a metadata object.

Definition at line 118 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::cmps, NMD_metadata_::ncat, NMD_FREE, and NMDComponentDestroy().

Referenced by main().

6.3.4.17 NMDErrorCode NMDDestroyObjectStructure (NMD_metadata)

6.3.4.18 NMDErrorCode NMDGetArrayValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType * *t*, void * *v*, int * *len*, NMDTruth * *f*)

Retrieve a stored value. If no value has been stored under the specified category and component, a zero flag is returned. The flag parameter can be null.

Null pointers can be passed for the datatype or value, for instance to test only for the existence of a set value.

See also Value handling.

Definition at line 575 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_realarray_-struct::data, NMD_intarray_struct::data, NMD_metadata_item_::ii, NMD_realarray_-struct::length, NMD_intarray_struct::length, NMDCategoryGetComponent(), NMDFalse, NMDGetValue(), NMDInt, NMDIntarray, NMDObjectGetCategory(), NMDReal, NMDRealarray, NMDString, NMDTrue, NMD_metadata_item_::rr, NMD_metadata_item_::set, and NMD_metadata_item_::t.

Referenced by main().

6.3.4.19 NMDErrorCode NMDGetCategories (NMD_metadata *obj*, int * *ncat*, char *** *cats*)

Get the number of categories and their names. Both arguments can be NULL. The names array is allocated; the user needs to free it. The names themselves are pointers to the strings in the metadata object, so they do not need to be freed.

Definition at line 137 of file nmdcat.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::name, NMD_metadata_::ncat, and NMD_MALLOC.

Referenced by main(), and NMDTabReportData().

6.3.4.20 NMDErrorCode NMDGetCategoryIGetComponents (NMD_metadata *obj*, int *icat*, int * *ncmp*, char *** *cmps*, NMDDataType ** *typs*)

For a given category, get the number of components and their names.

All output arguments can be NULL. The names array is allocated; the user needs to free it. The names themselves are pointers to the strings in the metadata object, so they do not need to be freed. The types array is also allocated and needs to be freed.

Definition at line 223 of file nmdcmp.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, NMD_metadata_-category_::cmps, NMD_metadata_item_::name, NMD_metadata_category_::ncmp, NMD_MALLOC, and NMD_metadata_item_::t.

6.3.4.21 NMDErrorCode NMDGetDataType (NMD_metadata, char *, char *, NMDDataType * *t*)

Definition at line 663 of file nmd.c.

References CHECKHASNMDCOOKIE, NMDCategoryGetComponent(), NMDObjectGetCategory(), and NMD_metadata_item_::t.

6.3.4.22 NMDErrorCode NMDGetValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType * *t*, void * *v*, NMDTruth * *f*)

Retrieve a stored scalar value. If no value has been stored under the specified category and component, a zero flag is returned. The flag parameter can be null.

Null pointers can be passed for the datatype or value, for instance to test only for the existence of a set value.

See also Value handling.

Definition at line 514 of file nmd.c.

References NMD_metadata_item_::cc, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_item_::i, NMDCategoryTryGetComponent(), NMDFalse, NMDInt, NMDIntarray, NMDObjectTryGetCategory(), NMDReal, NMDRealarray, NMD-String, NMDTrue, NMD_metadata_item_::r, NMD_metadata_item_::set, and NMD_-metadata_item_::t.

Referenced by main(), NMDGetArrayValue(), and NMDTabReportData().

6.3.4.23 NMDErrorCode NMDIsArrayType (NMDDataType *type*, NMDTruth * *flg*)

Test whether a data type is an array type

Definition at line 680 of file nmd.c.

References NMDFalse, NMDIntarray, NMDRealarray, and NMDTrue.

6.3.4.24 NMDErrorCode NMDObjectAllocateNewCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *rctg*)

Allocate a category in a metadata object. There is no testing whether the category name is already in use.

If a category pointer is supplied, the category is returned, but this pointer is allowed to be null.

Definition at line 84 of file nmdcat.c.

References NMD_metadata_::alloc, NMD_metadata_::cats, CHKMEMQ, NMD_metadata_category_::name, NMD_metadata_::ncat, NMD_STRDUP, and NMDAllocateCategory().

Referenced by main(), NMDObjectEnsureCategoryComponent(), and NMDObjectGetOrCreateCategory().

6.3.4.25 NMDErrorCode NMDObjectEnsureCategoryComponent (NMD_metadata, char *, char *, NMDDataType, NMDTruth *)

Definition at line 134 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryAllocateNewComponent(), NMDCategoryTryGetComponent(), NMDFalse, NMDObjectAllocateNewCategory(), NMDObjectTryGetCategory(), NMDTrue, and NMD_metadata_item_::t.

Referenced by main(), and NMDCloneObjectStructure().

6.3.4.26 NMDErrorCode NMDObjectGetCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *ctg*)

Retrieve a category from a metadata object. The category has to exist.

Definition at line 49 of file nmdcat.c.

References CHECKHASNMDCOOKIE, and NMDObjectTryGetCategory().

Referenced by NMDGetArrayValue(), NMDGetDataType(), and NMDRemoveCategory().

6.3.4.27 NMDErrorCode NMDObjectGetOrCreateCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *ctg*)

Retrieve a category from a metadata object, or create it if it doesn't exist yet.

Definition at line 118 of file nmdcat.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDObjectAllocateNewCategory(), and NMDObjectTryGetCategory().

Referenced by NMDCloneObject(), NMDCopyArrayValue(), NMDSetArrayValue(), and NMDSetValue().

6.3.4.28 NMDErrorCode NMDObjectHasCategoryComponent (NMD_metadata, char *, char *, NMDTruth *)

Definition at line 161 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryTryGetComponent(), and NMDObjectTryGetCategory().

Referenced by main().

6.3.4.29 NMDErrorCode NMDObjectTryGetCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *rctg*, NMDTruth * *f*)

Test whether a metadata object has a certain category, if so yield up its pointer.

The category pointer parameter can be null, in which case only existence is tested.

Definition at line 29 of file nmdcat.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, NMD_metadata_::ncat, NMDFalse, and NMDTrue.

Referenced by main(), NMDGetValue(), NMDObjectEnsureCategoryComponent(), NMDObjectGetCategory(), NMDObjectGetOrCreateCategory(), and NMDObjectHasCategoryComponent().

6.3.4.30 NMDErrorCode NMDRemoveCategory (NMD_metadata, char * *cat*)

Definition at line 160 of file nmdcat.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::name, NMD_FREE, NMD_STRDUP, and NMDObjectGetCategory().

Referenced by main().

6.3.4.31 NMDErrorCode NMDReportObject (NMD_metadata *obj*, NMDTruth *arrays*, char ** *rkey*, char ** *rval*, char *delim*)

Generate a delimited representation of a metadata object.

The returned strings are allocated in this routine and it is the user's responsibility to free them. The system `malloc` routine is used unless it is indicated that the Petsc library is available (see Installing NMD). This determines whether the `free` or `PetscFree` is to be used to free the return strings.

Arguments:

- obj : the metadata object
- rkey : a string containing the names of the metadata items
- rval : the metadata items
- delim : delimiter character used in `rkey` and `rval`
- ar : boolean to indicate whether arrays need to be preresented.

Definition at line 282 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKLEN, CHKSPACEFOR, NMD_realarray_struct::data, NMD_realarray_struct::length, NMD_metadata_::ncat, NMD_MALLOC, NMDInt, NMDReal, NMDRealarray, and NMDString.

Referenced by main().

6.3.4.32 NMDErrorCode NMDSetArrayValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType *t*, void * *v*, int *l*)

Set a metadata value, if it is an array type.

The arrays are not copied, so the user is responsible for freeing the array. Use NMDCopyArrayValue() to have the array copied; NMD will then free the array when the metadata object is freed.

This call can be used to create categories and components; there is no checking of slight misspellings.

See also Value handling.

Definition at line 438 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryGetOrCreateComponent(), NMDComponentSetArrayValue(), and NMDObjectGetOrCreateCategory().

Referenced by main().

6.3.4.33 NMDErrorCode NMDSetValue (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType *t*, void * *v*)

Set a metadata value, indexed by category and component name.

The value has to be passed by reference

String values are copied. (Reason: literal strings are treated differently from allocated, and Petsc has its own way of doing strings.)

This call can be used to create categories and components; there is no checking of slight misspellings.

See also Value handling.

Definition at line 412 of file nmd.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryGetOrCreateComponent(), NMDComponentSetValue(), and NMDObjectGetOrCreateCategory().

Referenced by main(), and NMDCopyArrayValue().

6.3.4.34 NMDErrorCode NMDStringConcat (char, NMD_string, char, NMD_string, char, NMD_string *)

Definition at line 57 of file nmdutil.c.

References CHECKHASNMDCOOKIE, NMD_string_::n, NMDStringCreateOfSize(), and NMD_string_::t.

6.3.4.35 NMDErrorCode NMDStringCreate (char *, NMD_string *)

Definition at line 25 of file nmdutil.c.

References NMDStringCreateOfSize(), and NMD_string_::t.

6.3.4.36 NMDErrorCode NMDStringDestroy (NMD_string)

Definition at line 37 of file nmdutil.c.

References CHECKHASNMDCOOKIE, NMD_FREE, and NMD_string_::t.

6.3.4.37 NMDErrorCode NMDStringGetString (NMD_string *str*, char ** *t*)

Definition at line 47 of file nmdutil.c.

References CHECKHASNMDCOOKIE, and NMD_string_::t.

6.3.4.38 NMDErrorCode NMDViewObject (NMD_metadata *obj*)

Print out an NMD object.

Currently only int, real, string fields are displayed, others are displayed as `"***"`.

Definition at line 233 of file nmd.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_::ncat, NMDInt, NMDReal, and NMDString.

6.3.5 Variable Documentation

6.3.5.1 const char* typenames[ ]

Definition at line 76 of file nmd.c.

6.4 nmd5.c File Reference

```
#include <stdlib.h>
#include <stdio.h>
```

```
#include <string.h>
#include "nmd_impl.h"
#include "nmd.h"
```

6.5 nmd_impl.h File Reference

```
#include "nmd.h"
```

Data Structures

- struct NMD_metadata_item_
- struct NMD_metadata_category_
- struct NMD_metadata_
- struct NMD_object_
- struct NMD_intarray_struct
- struct NMD_realarray_struct

Defines

- #define NMD_IMPL_H 1
- #define CHKMEMQ

6.5.1 Define Documentation

6.5.1.1 #define CHKMEMQ

Definition at line 7 of file nmd_impl.h.

Referenced by NMDAllocateCategory(), NMDAllocateComponent(), NMDCategoryAllocateNewComponent(), NMDCategoryGetComponent(), NMDCategoryGetOrCreateComponent(), NMDCloneObject(), NMDCloneObjectStructure(), NMDCopyArrayValue(), NMDCopyCategory(), NMDCopyItemValues(), NMDCreateObject(), NMDDestroyObject(), NMDGetArrayValue(), NMDGetCategories(), NMDGetValue(), NMDObjectAllocateNewCategory(), NMDObjectEnsureCategoryComponent(), NMDObjectGetOrCreateCategory(), NMDObjectHasCategoryComponent(), NMDRemoveCategory(), NMDSetArrayValue(), NMDSetValue(), and NMDViewObject().

6.5.1.2 #define NMD_IMPL_H 1

Definition at line 2 of file nmd_impl.h.

6.6 nmdcat.c File Reference

```
#include <stdlib.h>
#include "string.h"
#include "nmd.h"
#include "nmd_impl.h"
```

Defines

- #define CMPCHUNK 30

Functions

- NMDErrorCode NMDObjectTryGetCategory (NMD_metadata obj, char *cat, NMD_metadata_category *rctg, NMDTruth *f)
- NMDErrorCode NMDObjectGetCategory (NMD_metadata obj, char *cat, NMD_metadata_category *ctg)
- static NMDErrorCode NMDAllocateCategory (NMD_metadata_category *rcat)
- NMDErrorCode NMDObjectAllocateNewCategory (NMD_metadata obj, char *cat, NMD_metadata_category *rctg)
- NMDErrorCode NMDObjectGetOrCreateCategory (NMD_metadata obj, char *cat, NMD_metadata_category *ctg)
- NMDErrorCode NMDGetCategories (NMD_metadata obj, int *ncat, char ***cats)
- NMDErrorCode NMDRemoveCategory (NMD_metadata obj, char *cat)
- NMDErrorCode NMDCopyCategory (NMD_metadata_category incat, NMD_metadata_category outcat)

6.6.1 Define Documentation

6.6.1.1 #define CMPCHUNK 30

Definition at line 6 of file nmdcat.c.

Referenced by NMDAllocateCategory().

6.6.2 Function Documentation

6.6.2.1 static NMDErrorCode NMDAllocateCategory (NMD_metadata_category * *rcat*) [static]

This is an internal routine that merely allocates the data structure for storing a category.

Definition at line 63 of file nmdcat.c.

References NMD_metadata_category_::alloc, CHKMEMQ, CMPCHUNK, NMD_metadata_category_::cmps, NMD_metadata_category_::cookie, NMD_metadata_category_::ncmp, NMD_MALLOC, and NMDCOOKIE.

Referenced by NMDObjectAllocateNewCategory().

6.6.2.2 NMDErrorCode NMDCopyCategory (NMD_metadata_category *incat*, NMD_metadata_category *outcat*)

Copy category data from one metadata structure into another. This assumes that the category already exists in the target; see for instance NMDHasCategory(), NMDCloneObject(), NMDCloneObjectStructure().

Definition at line 180 of file nmdcat.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::cmps, NMD_metadata_category_::name, NMD_metadata_category_::ncmp, NMDCategoryGetOrCreateComponent(), and NMDCopyItemValues().

6.6.2.3 NMDErrorCode NMDGetCategories (NMD_metadata *obj*, int * *ncat*, char *** *cats*)

Get the number of categories and their names. Both arguments can be NULL. The names array is allocated; the user needs to free it. The names themselves are pointers to the strings in the metadata object, so they do not need to be freed.

Definition at line 137 of file nmdcat.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::name, NMD_metadata_::ncat, and NMD_MALLOC.

Referenced by main(), and NMDTabReportData().

6.6.2.4 NMDErrorCode NMDObjectAllocateNewCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *rctg*)

Allocate a category in a metadata object. There is no testing whether the category name is already in use.

If a category pointer is supplied, the category is returned, but this pointer is allowed to be null.

Definition at line 84 of file nmdcat.c.

References NMD_metadata_::alloc, NMD_metadata_::cats, CHKMEMQ, NMD_metadata_category_::name, NMD_metadata_::ncat, NMD_STRDUP, and NMDAllocateCategory().

Referenced by main(), NMDObjectEnsureCategoryComponent(), and NMDObjectGetOrCreateCategory().

6.6.2.5 NMDErrorCode NMDObjectGetCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *ctg*)

Retrieve a category from a metadata object. The category has to exist.

Definition at line 49 of file nmdcat.c.

References CHECKHASNMDCOOKIE, and NMDObjectTryGetCategory().

Referenced by NMDGetArrayValue(), NMDGetDataType(), and NMDRemoveCategory().

6.6.2.6 NMDErrorCode NMDObjectGetOrCreateCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *ctg*)

Retrieve a category from a metadata object, or create it if it doesn't exist yet.

Definition at line 118 of file nmdcat.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDObjectAllocateNewCategory(), and NMDObjectTryGetCategory().

Referenced by NMDCloneObject(), NMDCopyArrayValue(), NMDSetArrayValue(), and NMDSetValue().

6.6.2.7 NMDErrorCode NMDObjectTryGetCategory (NMD_metadata *obj*, char * *cat*, NMD_metadata_category * *rctg*, NMDTruth * *f*)

Test whether a metadata object has a certain category, if so yield up its pointer.

The category pointer parameter can be null, in which case only existence is tested.

Definition at line 29 of file nmdcat.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, NMD_metadata_::ncat, NMDFalse, and NMDTrue.

Referenced by main(), NMDGetValue(), NMDObjectEnsureCategoryComponent(), NMDObjectGetCategory(), NMDObjectGetOrCreateCategory(), and NMDObjectHasCategoryComponent().

6.6.2.8 NMDErrorCode NMDRemoveCategory (NMD_metadata *obj*, char * *cat*)

Definition at line 160 of file nmdcat.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_::name, NMD_FREE, NMD_STRDUP, and NMDObjectGetCategory().

Referenced by main().

6.7 nmdcmp.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "nmd.h"
#include "nmd_impl.h"
```

Functions

- static NMDErrorCode NMDAllocateComponent (NMD_metadata_item *rcmp)
- NMDErrorCode NMDCategoryAllocateNewComponent (NMD_metadata_category cat, char *cmp, NMDDataType type, NMD_metadata_item *rcpt)
- NMDErrorCode NMDComponentDestroy (NMD_metadata_item cmp)
- NMDErrorCode NMDCategoryGetOrCreateComponent (NMD_metadata_category cat, char *cmp, NMDDataType type, NMD_metadata_item *cpt)
- NMDErrorCode NMDObjectEnsureCategoryComponent (NMD_metadata obj, char *cat, char *cmp, NMDDataType type, NMDTruth *new)
- NMDErrorCode NMDObjectHasCategoryComponent (NMD_metadata obj, char *cat, char *cmp, NMDTruth *f)
- NMDErrorCode NMDCategoryTryGetComponent (NMD_metadata_category cat, char *cmp, NMD_metadata_item *rcpt, NMDTruth *f)
- NMDErrorCode NMDCategoryGetComponent (NMD_metadata_category cat, char *cmp, NMD_metadata_item *cpt)
- NMDErrorCode NMDGetCategoryIGetComponents (NMD_metadata obj, int icat, int *ncmp, char ***cmps, NMDDataType **typs)
- NMDErrorCode NMDComponentSetValue (NMD_metadata_item cpt, NMDDataType t, void *v)
- NMDErrorCode NMDComponentSetArrayValue (NMD_metadata_item cpt, NMDDataType t, void *v, int l)
- PetscErrorCode NMDCopyItemValues (NMD_metadata_item src, NMD_metadata_item tar)

6.7.1 Function Documentation

6.7.1.1 static NMDErrorCode NMDAllocateComponent (NMD_metadata_item * *rcmp*) [static]

An internal routine that only allocates the component data structure

Definition at line 24 of file nmdcmp.c.

References CHKMEMQ, NMD_metadata_item_::cookie, NMD_MALLOC, NMD-COOKIE, NMDFalse, and NMD_metadata_item_::set.

Referenced by NMDCategoryAllocateNewComponent().

6.7.1.2 NMDErrorCode NMDCategoryAllocateNewComponent (NMD_-metadata_category *cat*, char * *cmp*, NMDDataType *type*, NMD_metadata_item * *rcpt*)

Create a new component by name in an existing category object. If a component pointer is supplied, the new component object is returned, but this pointer is allowed to be NULL.

Definition at line 41 of file nmdcmp.c.

References NMD_metadata_category_::alloc, CHKMEMQ, NMD_metadata_-category_::cmps, NMD_metadata_item_::name, NMD_metadata_category_::ncmp, NMD_STRDUP, NMDAllocateComponent(), NMDFalse, NMD_metadata_item_::set, and NMD_metadata_item_::t.

Referenced by main(), NMDCategoryGetOrCreateComponent(), and NMDObjectEn-sureCategoryComponent().

6.7.1.3 NMDErrorCode NMDCategoryGetComponent (NMD_metadata_-category *cat*, char * *cmp*, NMD_metadata_item * *cpt*)

Test whether a metadata category has a certain component. The component has to exist.

Definition at line 202 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMD_metadata_category_-::name, and NMDCategoryTryGetComponent().

Referenced by NMDGetArrayValue(), and NMDGetDataType().

6.7.1.4 NMDErrorCode NMDCategoryGetOrCreateComponent (NMD_-metadata_category *cat*, char * *cmp*, NMDDataType *type*, NMD_metadata_item * *cpt*)

Retrieve a component, creating it if it doesn't already exist.

Definition at line 108 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryAllocateNew-Component(), NMDCategoryTryGetComponent(), and NMD_metadata_item_::t.

Referenced by main(), NMDCloneObject(), NMDCopyArrayValue(), NMDCopyCat-egory(), NMDSetArrayValue(), and NMDSetValue().

6.7.1.5 NMDErrorCode NMDCategoryTryGetComponent (NMD_metadata_-category *cat*, char * *cmp*, NMD_metadata_item * *rcpt*, NMDTruth * *f*)

Test whether a metadata category has a certain component.

Definition at line 178 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, NMD_metadata_category_::cmps, NMD_-metadata_category_::ncmp, NMDFalse, and NMDTrue.

Referenced by main(), NMDCategoryGetComponent(), NMDCategoryGetOrCreate-Component(), NMDGetValue(), NMDObjectEnsureCategoryComponent(), and NM-DObjectHasCategoryComponent().

6.7.1.6 NMDErrorCode NMDComponentDestroy (NMD_metadata_item *cmp*)

Definition at line 72 of file nmdcmp.c.

References NMD_metadata_item_::cc, NMD_realarray_struct::data, NMD_intarray_-struct::data, NMD_metadata_item_::ii, NMD_realarray_struct::length, NMD_-intarray_struct::length, NMD_metadata_item_::name, NMD_FREE, NMDIntarray, NMDRealarray, NMDString, NMD_metadata_item_::rr, NMD_metadata_item_::t, NMD_realarray_struct::unique, and NMD_intarray_struct::unique.

Referenced by NMDDestroyObject().

6.7.1.7 NMDErrorCode NMDComponentSetArrayValue (NMD_metadata_-item *cpt*, NMDDataType *t*, void * *v*, int *l*)

Definition at line 265 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, NMD_realarray_struct::data, NMD_-intarray_struct::data, NMD_metadata_item_::ii, NMD_realarray_struct::length, NMD_intarray_struct::length, NMD_MALLOC, NMDComponentSetValue(), NMDInt, NMDIntarray, NMDReal, NMDRealarray, NMDString, NMDTrue, NMD_metadata_item_::rr, NMD_metadata_item_::set, NMD_metadata_item_::t, NMD_realarray_struct::unique, and NMD_intarray_struct::unique.

Referenced by NMDSetArrayValue().

6.7.1.8 NMDErrorCode NMDComponentSetValue (NMD_metadata_item *cpt*, NMDDataType *t*, void * *v*)

Definition at line 246 of file nmdcmp.c.

References NMD_metadata_item_::cc, CHECKHASNMDCOOKIE, NMD_-metadata_item_::i, NMD_STRDUP, NMDInt, NMDIntarray, NMDReal, NMDRealar-ray, NMDString, NMDTrue, NMD_metadata_item_::r, NMD_metadata_item_::set, and NMD_metadata_item_::t.

Referenced by NMDComponentSetArrayValue(), and NMDSetValue().

6.7.1.9 PetscErrorCode NMDCopyItemValues (NMD_metadata_item *src*, NMD_metadata_item *tar*)

Copy data between two item structures. If the original has unique data, so does the clone.

Definition at line 301 of file nmdcmp.c.

References NMD_metadata_item_::cc, CHKMEMQ, NMD_realarray_struct::data, NMD_intarray_struct::data, NMD_metadata_item_::i, NMD_metadata_item_::ii, NMD_realarray_struct::length, NMD_intarray_struct::length, NMD_MALLOC, NMD_STRDUP, NMDInt, NMDIntarray, NMDReal, NMDRealarray, NMDString, NMD_metadata_item_::r, NMD_metadata_item_::rr, NMD_metadata_item_::set, NMD_metadata_item_::t, NMD_realarray_struct::unique, and NMD_intarray_struct::unique.

Referenced by NMDCloneObject(), and NMDCopyCategory().

6.7.1.10 NMDErrorCode NMDGetCategoryIGetComponents (NMD_metadata *obj*, int *icat*, int * *ncmp*, char *** *cmps*, NMDDataType ** *typs*)

For a given category, get the number of components and their names.

All output arguments can be NULL. The names array is allocated; the user needs to free it. The names themselves are pointers to the strings in the metadata object, so they do not need to be freed. The types array is also allocated and needs to be freed.

Definition at line 223 of file nmdcmp.c.

References NMD_metadata_::cats, CHECKHASNMDCOOKIE, NMD_metadata_category_::cmps, NMD_metadata_item_::name, NMD_metadata_category_::ncmp, NMD_MALLOC, and NMD_metadata_item_::t.

6.7.1.11 NMDErrorCode NMDObjectEnsureCategoryComponent (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDDataType *type*, NMDTruth * *new*)

Definition at line 134 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryAllocateNewComponent(), NMDCategoryTryGetComponent(), NMDFalse, NMDObjectAllocateNewCategory(), NMDObjectTryGetCategory(), NMDTrue, and NMD_metadata_item_::t.

Referenced by main(), and NMDCloneObjectStructure().

6.7.1.12 NMDErrorCode NMDObjectHasCategoryComponent (NMD_metadata *obj*, char * *cat*, char * *cmp*, NMDTruth * *f*)

Definition at line 161 of file nmdcmp.c.

References CHECKHASNMDCOOKIE, CHKMEMQ, NMDCategoryTryGetComponent(), and NMDObjectTryGetCategory().

Referenced by main().

6.8 nmdreport.c File Reference

```
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include "nmd.h"
```

Functions

- int NMDTabReportData (NMD_metadata nmd, char **rkey, char **rval, int separator)

6.8.1 Function Documentation

6.8.1.1 int NMDTabReportData (NMD_metadata *nmd*, char ** *rkey*, char ** *rval*, int *separator*)

Definition at line 8 of file nmdreport.c.

References NMD_MALLOC, NMDGetCategories(), NMDGetValue(), NMDIntarray, and NMDRealarray.

6.9 nmdtest.c File Reference

```
#include <stdlib.h>
#include <stdio.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.9.1 Function Documentation

6.9.1.1 int main (int *argc*, char ** *argv*)

Definition at line 5 of file nmdtest.c.

References NMDCreateObject(), NMDGetValue(), NMDInt, NMDReal, and NMDSetValue().

6.10 nmdutil.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
#include "nmd_impl.h"
#include "string.h"
```

Data Structures

- struct NMD_string_

Functions

- static NMDErrorCode NMDStringCreateOfSize (int n, NMD_string *r_str)
- NMDErrorCode NMDStringCreate (char *txt, NMD_string *r_str)
- NMDErrorCode NMDStringDestroy (NMD_string str)
- NMDErrorCode NMDStringGetString (NMD_string str, char **t)
- NMDErrorCode NMDStringConcat (char s1, NMD_string str1, char s2, NMD_string str2, char s3, NMD_string *r_str)

6.10.1 Function Documentation

6.10.1.1 NMDErrorCode NMDStringConcat (char *s1*, NMD_string *str1*, char *s2*, NMD_string *str2*, char *s3*, NMD_string * *r_str*)

Definition at line 57 of file nmdutil.c.

References CHECKHASNMDCOOKIE, NMD_string_::n, NMDStringCreateOfSize(), and NMD_string_::t.

6.10.1.2 NMDErrorCode NMDStringCreate (char * *txt*, NMD_string * *r_str*)

Definition at line 25 of file nmdutil.c.

References NMDStringCreateOfSize(), and NMD_string_::t.

6.10.1.3 static NMDErrorCode NMDStringCreateOfSize (int *n*, NMD_string * *r_str*) [static]

Definition at line 13 of file nmdutil.c.

References NMD_string_::cookie, NMD_string_::n, NMD_MALLOC, NMD-COOKIE, and NMD_string_::t.

Referenced by NMDStringConcat(), and NMDStringCreate().

6.10.1.4 NMDErrorCode NMDStringDestroy (NMD_string *str*)

Definition at line 37 of file nmdutil.c.

References CHECKHASNMDCOOKIE, NMD_FREE, and NMD_string_::t.

6.10.1.5 NMDErrorCode NMDStringGetString (NMD_string *str*, char ** *t*)

Definition at line 47 of file nmdutil.c.

References CHECKHASNMDCOOKIE, and NMD_string_::t.

6.11 u1.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.11.1 Function Documentation

6.11.1.1 int main (int *argc*, char ** *argv*)

Test setting and getting values

Definition at line 5 of file u1.c.

References NMDCreateObject(), and NMDDestroyObject().

6.12 u10.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.12.1 Function Documentation

6.12.1.1 int main (int *argc*, char ** *argv*)

Test setting and getting of array values

Definition at line 5 of file u10.c.

References NMD_FREE, NMD_MALLOC, NMDCreateObject(), NMDDestroyObject(), NMDGetArrayValue(), NMDIntarray, NMDRealarray, and NMDSetArrayValue().

6.13 u11.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.13.1 Function Documentation

6.13.1.1 int main (int *argc*, char ** *argv*)

Test setting and getting of array values with internal copy

Definition at line 5 of file u11.c.

References NMD_FREE, NMD_MALLOC, NMDCopyArrayValue(), NMDCreateObject(), NMDDestroyObject(), NMDGetArrayValue(), and NMDIntarray.

6.14 u12.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.14.1 Function Documentation

6.14.1.1 int main (int *argc*, char ** *argv*)

Stress test

Definition at line 6 of file u12.c.

References NMDCreateObject(), NMDDestroyObject(), NMDGetValue(), NMDInt, and NMDSetValue().

6.15 u13.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "nmd.h"
```

Defines

- #define ILEN 4
- #define RLEN 6

Functions

- int main (int argc, char **argv)

6.15.1 Define Documentation

6.15.1.1 #define ILEN 4

Referenced by main().

6.15.1.2 #define RLEN 6

Referenced by main().

6.15.2 Function Documentation

6.15.2.1 int main (int *argc*, char ** *argv*)

Object reporting

Definition at line 6 of file u13.c.

References ILEN, NMD_FREE, NMD_MALLOC, NMDCreateObject(), NMDDestroyObject(), NMDFalse, NMDInt, NMDIntarray, NMDReal, NMDRealarray, NMDReportObject(), NMDSetArrayValue(), NMDSetValue(), NMDTrue, and RLEN.

6.16 u14.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.16.1 Function Documentation

6.16.1.1 int main (int *argc*, char ** *argv*)

Object cloning with scalars

Definition at line 6 of file u14.c.

References NMD_FREE, NMDCloneObject(), NMDCreateObject(), NMDDestroyObject(), NMDFalse, NMDInt, NMDReal, NMDReportObject(), and NMDSetValue().

6.17 u15.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "nmd.h"
```

Defines

- #define ILEN 4
- #define RLEN 6

Functions

- int main (int argc, char **argv)

6.17.1 Define Documentation

6.17.1.1 #define ILEN 4

6.17.1.2 #define RLEN 6

6.17.2 Function Documentation

6.17.2.1 int main (int *argc*, char ** *argv*)

Object cloning including arrays

Definition at line 6 of file u15.c.

References ILEN, NMD_FREE, NMD_MALLOC, NMDCloneObject(), NMDCreateObject(), NMDDestroyObject(), NMDFalse, NMDInt, NMDIntarray, NMDReal, NMDRealarray, NMDReportObject(), NMDSetArrayValue(), NMDSetValue(), NMDTrue, and RLEN.

6.18 u16.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.18.1 Function Documentation

6.18.1.1 int main (int *argc*, char ** *argv*)

Object cloning and reporting in the presence of place holder empty components

Definition at line 7 of file u16.c.

References NMD_FREE, NMDCloneObject(), NMDCreateObject(), NMDDestroyObject(), NMDFalse, NMDInt, NMDObjectEnsureCategoryComponent(), NMDReal, NMDReportObject(), and NMDSetValue().

6.19 u17.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.19.1 Function Documentation

6.19.1.1 int main (int *argc*, char ** *argv*)

Test hdf5 dumping of scalar values

Definition at line 5 of file u17.c.

References NMDCreateObject(), NMDDestroyObject(), NMDGetValue(), NMDInt, NMDReal, and NMDSetValue().

6.20 u18.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "string.h"
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.20.1 Function Documentation

6.20.1.1 int main (int *argc*, char ** *argv*)

Object reporting

Definition at line 7 of file u18.c.

References NMD_FREE, NMDCreateObject(), NMDDestroyObject(), NMDFalse, NMDInt, NMDReportObject(), and NMDSetValue().

6.21 u19.c File Reference

```
#include <stdlib.h>
#include "memory.h"
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.21.1 Function Documentation

6.21.1.1 int main (int *argc*, char ** *argv*)

Object structure cloning

Definition at line 6 of file u19.c.

References NMD_FREE, NMDCloneObjectStructure(), NMDCreateObject(), NMDDestroyObject(), NMDFalse, NMDGetValue(), NMDInt, NMDReportObject(), and NMDSetValue().

6.22 u2.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.22.1 Function Documentation

6.22.1.1 int main (int *argc*, char ** *argv*)

Test different ways of creating a category

Definition at line 5 of file u2.c.

References NMD_FREE, NMDCreateObject(), NMDDestroyObject(), NMDGetCategories(), NMDObjectAllocateNewCategory(), and NMDObjectTryGetCategory().

6.23 u3.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.23.1 Function Documentation

6.23.1.1 int main (int *argc*, char ** *argv*)

Test removal of a category

Definition at line 5 of file u3.c.

References NMD_FREE, NMDCreateObject(), NMDDestroyObject(), NMDGetCategories(), NMDObjectAllocateNewCategory(), NMDObjectTryGetCategory(), and NMDRemoveCategory().

6.24 u4.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.24.1 Function Documentation

6.24.1.1 int main (int *argc*, char ** *argv*)

Test creation of components

Definition at line 5 of file u4.c.

References NMDCategoryAllocateNewComponent(), NMDCreateObject(), NMDDestroyObject(), NMDInt, NMDIntarray, NMDObjectAllocateNewCategory(), NMDObjectTryGetCategory(), NMDReal, NMDRealarray, and NMDString.

6.25 u5.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.25.1 Function Documentation

6.25.1.1 int main (int *argc*, char ** *argv*)

Test GetOrCreate components

Definition at line 5 of file u5.c.

References NMDCategoryAllocateNewComponent(), NMDCategoryGetOrCreateComponent(), NMDCreateObject(), NMDDestroyObject(), NMDInt, NMDObjectAllocateNewCategory(), NMDReal, and NMDString.

6.26 u6.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.26.1 Function Documentation

6.26.1.1 int main (int *argc*, char ** *argv*)

Test existence tests of components

Definition at line 5 of file u6.c.

References NMDCategoryAllocateNewComponent(), NMDCategoryTryGetComponent(), NMDCreateObject(), NMDDestroyObject(), NMDInt, NMDIntarray, NMDObjectAllocateNewCategory(), NMDObjectHasCategoryComponent(), NMDObjectTryGetCategory(), NMDReal, NMDRealarray, and NMDString.

6.27 u7.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.27.1 Function Documentation

6.27.1.1 int main (int *argc*, char ** *argv*)

Test setting and getting of scalar values

Definition at line 5 of file u7.c.

References NMDCreateObject(), NMDDestroyObject(), NMDGetValue(), NMDInt, and NMDSetValue().

6.28 u8.c File Reference

```
#include <stdlib.h>
#include "string.h"
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.28.1 Function Documentation

6.28.1.1 int main (int *argc*, char ** *argv*)

Test setting and getting of array values

Definition at line 6 of file u8.c.

References NMDCreateObject(), NMDDestroyObject(), NMDGetValue(), NMDSetValue(), and NMDString.

6.29 u9.c File Reference

```
#include <stdlib.h>
#include "nmd.h"
```

Functions

- int main (int argc, char **argv)

6.29.1 Function Documentation

6.29.1.1 int main (int *argc*, char ** *argv*)

Test setting and getting of array values

Definition at line 5 of file u9.c.

References NMD_FREE, NMD_MALLOC, NMDCreateObject(), NMDDestroyObject(), NMDGetArrayValue(), NMDIntarray, NMDRealarray, and NMDSetArrayValue().

7 NMD Page Documentation

7.1 Installing NMD

Installing NMD takes the following steps:

- edit the Make.inc file for:
  - compiler options, and settings for your `ar` and `ranlib` program
  - add `"-DNMD_HAVE_PETSC"` to the compile line if you are using NMD with Petsc (see NMDReportObject())
  - `NMD_LIB_DIR` is the location where the library will be installed
- do `"make install"` to generate the binaries

7.2 Metadata object manipulation

Top level functions for manipulation metadata objects.

See NMDCreateObject(), NMDDestroyObject(), NMDBuildObjectStructure(), NMDCloneObject(), NMDCloneObjectStructure(), NMDViewObject()

7.3 Viewing objects

NMDViewObject() gives informal output; NMDReportObject() can be used for database records and such.

7.4 Value handling

NMD handles scalar and array values slightly differently. For scalar values use NMDSetValue() and NMDGetValue(); for array values use NMDSetArrayValue(), NMDGetArrayValue(), NMDCopyArrayValue(). The array routines take an extra parameter denoting the length of the array.

Note that scalar values have to be passed by reference:

```
int i,*ii;
NMDSetValue(nmd,....,&i);         // use an ampersand here
NMDSetValue(nmd,....,ii,length); // no ampersand needed here!
NMDGetValue(nmd,....,&i);
NMDGetValue(nmd,....,&ii,&length);
```

Furthermore, see NMDCopyItemValues(), NMDGetDataType(), NMDIsArrayType().

7.5 NMD Data Types

Most NMD datatypes have two different definitions, depending on whether Petsc is used or not.

NMDTruth is only used for success parameters in routines such as NMDGetValue(). It has possible values NMDTrue and NMDFalse.

7.6 Metadata category manipulation

A metadata object contains a number of categories, each containing multiple component which store the actual metadata. Here are the routines for manipulation the categories.

See NMDObjectTryGetCategory(), NMDObjectGetCategory(), NMDAllocateCategory(), NMDObjectAllocateNewCategory(), NMDObjectGetOrCreateCategory(), NMDRemoveCategory(), NMDGetCategories(), NMDCopyCategory().

7.7 Metadata component manipulation

Categories have components, much like metadata objects have categories. Most of the component functions work on a metadata object, and specify both category and component name.

See NMDCategoryAllocateNewComponent(), NMDCategoryGetOrCreateComponent(), NMDObjectHasCategoryComponent(), NMDCategoryTryGetComponent(), NMDCategoryGetComponent(), NMDGetCategoryIGetComponents()

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