



Obsolete IDL Features



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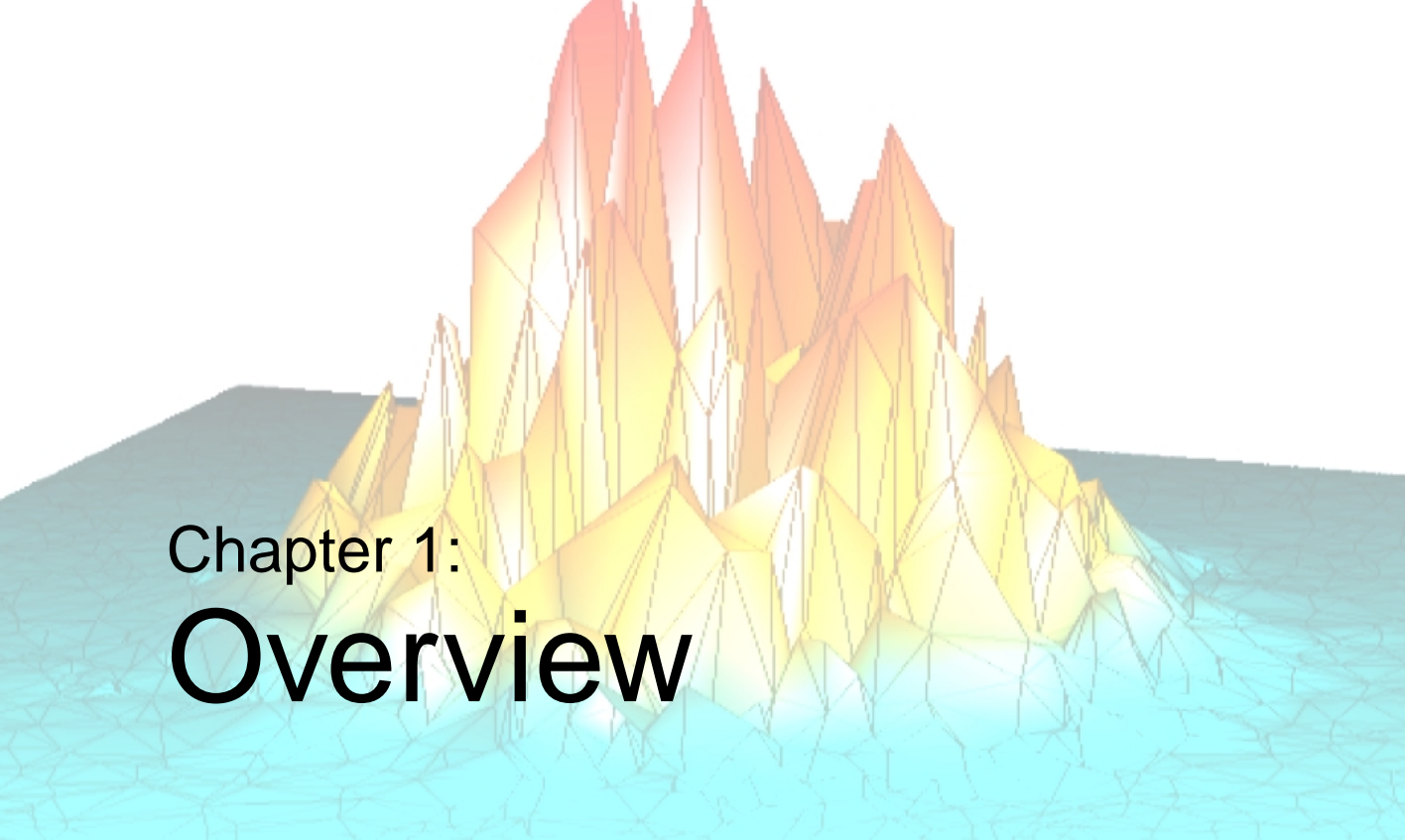


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Chapter 1: Overview

This chapter discusses the following topics:

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Backwards Compatibility

Research Systems strongly recommends that you not use obsolete routines when writing new IDL code. As IDL continues to evolve, the likelihood that obsolete routines will no longer function as expected increases. While we will continue to make every effort to ensure that obsolete routines shipped with IDL function, in a small number of cases this may not be possible.

IDL Internal Routines

Routines that are built into the IDL executable—routines *not* written in the IDL language—will either continue to be included in the executable until the scheduled removal release or will be re-implemented in the IDL language. In the latter case, obsolete routines may run slower than the original version. Note that obsolete routines that have been re-implemented in the IDL language may also be scheduled for eventual removal.

Routines Written in IDL

Routines written in the IDL language (`.pro` files) are contained in the obsolete subdirectory of the `lib` directory of the IDL distribution. As long as a given obsolete routine is included in this subdirectory, it will continue to function as always.

Detecting Use of Obsolete Features

You can search for usage of obsolete routines, system variables, and syntax by setting the fields of the `!WARN` system variable. Setting `!WARN` causes IDL to print informational messages to the command log or console window when it encounters references to obsolete features. See [!WARN](#) in the *IDL Reference Guide* for details.

Documentation for Older Obsolete Routines

Routines that became obsolete in IDL version 4.0 or earlier are not documented in this book or in the IDL Online Help. However, if the routine is written in the IDL language, you can inspect the documentation header of the `.pro` file, or use the [DOC_LIBRARY](#) routine. The `.pro` files for obsolete routines are located in the `obsolete` subdirectory of the `lib` directory of the IDL distribution.



Chapter 2:

Obsolete Routines

This chapter contains complete documentation for obsoleted IDL routines. New IDL code should not use these routines. For a list of the routines that replace each of these obsolete routines, see [Appendix I, “Obsolete Routines”](#) in the *IDL Reference Guide*.

DDE Routines

These routines are obsolete and should not be used in new IDL code.

Windows-Only Routines for Dynamic Data Exchange (DDE)

IDL for Windows supports DDE client capability for cold DDE links. The relevant system calls are documented below:

Result = DDE_GETSERVERS()

This function returns an array of service names for the currently-available DDE servers.

Result = DDE_GETTOPICS(*server*)

This function returns the topics list for the specified server. The server argument is a scalar string containing the name of the desired DDE server.

Result = DDE_GETITEMS(*server*)

This function returns the items list for the specified server. The server argument is a scalar string containing the name of the desired DDE server.

Result = DDE_REQUEST(*server, topic, item*)

This function returns the requested data in string format. The server, topic, and item arguments must be scalar strings.

DDE_EXECUTE, *server, topic, command*

This procedure causes the DDE server to execute the command for the specified topic. The server, topic, and command arguments must be scalar strings.

DEMO_MODE

This routine is obsolete and should not be used in new IDL code.

The DEMO_MODE function returns True if IDL is running in the timed demo mode (i.e., a license manager is not running). Calling this function causes a FLUSH, -1 command to be issued.

Syntax

Result = DEMO_MODE()

GETHELP

This routine is obsolete and should not be used in new IDL code.

The GETHELP function returns information on variables defined at the program level from which GETHELP is called. The function builds a string array that contains information that follows the format used by the IDL HELP command.

When called without an argument, GETHELP returns a string array that normally contains variable data that is in the same format as used by the IDL HELP procedure. The variables in this list are those defined for the routine (or program level) that called GETHELP. If there are no variables defined, or the specified variable does not exist, GETHELP returns a null string. Other information can be obtained by setting keywords.

Syntax

Result = GETHELP(*Variable*)

Arguments

Variable

A scalar string that contains the name of the variable from which to get information. If this argument is omitted, GETHELP returns an array of strings where each element contains information on a separate variable, one element for each defined variable.

Keywords

FULLSTRING

Normally a string that is longer than 45 chars is truncated and followed by “...” just like the HELP command. Setting this keyword will cause the full string to be returned.

FUNCTIONS

Setting this keyword will cause the function to return all current IDL compiled functions.

ONELINE

If a variable name is greater than 15 characters it is usually returned as 2 two elements of the output array (Variable name in 1st element, variable info in the 2nd

element). Setting this keyword will put all the information in one string, separating the name and data with a space.

PROCEDURES

Setting this keyword will cause the function to return all current IDL compiled procedures.

SYS_PROCS

Setting this keyword will cause the function to return the names of all IDL system (built-in) procedures.

SYS_FUNCS

Setting this keyword will cause the function to return the names of all IDL system (built-in) functions.

Note

RESTRICTIONS: Due to the difficulties in determining if a variable is of type associate, the following conditions will result in the variable being listed as a structure. These conditions are:

- Associate record type is structure.
- Associated file is opened for update (openu).
- Associate file is not empty.

Another difference between this routine and the IDL help command is that if a variable is in a common block, the common block name is not listed next to the variable name. Currently there is no method available to get the common block names used in a routine.

Example

To obtain a listing in a help format of the variables contained in the current routine you would make the following call:

```
HelpData = GetHelp()
```

The variable HelpData would be a string array containing the requested information.

HANDLE_CREATE

This routine is obsolete and should not be used in new IDL code.

The `HANDLE_CREATE` function creates a new handle. A “handle” is a dynamically-allocated variable that is identified by a unique integer value known as a “handle ID”. Handles can have a value, of any IDL data type and organization, associated with them. This function returns the handle ID of the newly-created handle.

Because handles are dynamic, they can be used to create complex data structures. They are also global in scope, but do not suffer from the limitations of `COMMON` blocks. That is, handles are available to all program units at all times. (Remember, however, that IDL variables containing handle IDs are not global in scope and must be declared in a `COMMON` block if you want to share them between program units.)

Handle Terminology

The following terms are used to describe handles in the documentation for this function and other handle-related routines:

- **Handle ID:** The unique integer identifier associated with a handle.
- **Handle value:** Data of any IDL type and organization associated with a handle.
- **Top-level handle:** A handle at the top of a handle hierarchy. A top-level handle can have children, but does not have a parent.
- **Parents, children, and siblings:** These terms describe the relationship between handles in a handle hierarchy. When a new handle is created, it can be the start of a new handle hierarchy (a top-level handle) or it can belong to the level of a handle hierarchy below an existing handle. A handle created in this way is said to be a child of the specified parent. Parents can have any number of children. All handles that share the same parent are said to be siblings.

Syntax

```
Result = HANDLE_CREATE(ID)
```


Arguments

ID

If this argument is present, it specifies the handle ID relative to which the new handle is created. Normally, the new handle becomes the last child of the parent handle specified by ID. However, this behavior can be changed by setting the `FIRST_CHILD` or `SIBLING` keywords.

Omit this argument to create a new top-level handle without a parent.

Keywords

FIRST_CHILD

Set this keyword to create the new handle as the first child of the handle specified by ID. Any existing children of ID become later siblings of the new first child (i.e., the existing first child becomes the second child, the second child becomes the third child, etc.).

NO_COPY

Usually, when the `VALUE` keyword is used, the source variable memory is copied to the handle value. If the `NO_COPY` keyword is set, the value data is taken away from the source variable and attached directly to the destination. This feature can be used to move data very efficiently. However, it has the side effect of causing the source variable to become undefined.

SIBLING

Set this keyword to create the new handle as the sibling handle immediately following ID. Any other siblings currently following ID become later siblings of the new handle. Note that you cannot create a handle that is a sibling of a top-level handle.

VALUE

The value to be assigned to the handle.

Every handle can contain a user-specified value of any data type and organization. This value is not used by the handle in any way, but exists entirely for the convenience of the IDL programmer. Use this keyword to set the handle value when the handle is first created.

If the `VALUE` keyword is not specified, the handle's initial value is undefined.

Handle values can be retrieved using the `HANDLE_VALUE` procedure.

Examples

The following commands create a top-level handle with 3 child handles. Each handle is assigned a different string value:

```
;Create top-level handle without an initial handle value:
top = HANDLE_CREATE()
;Create first child of the top-level handle:
first = HANDLE_CREATE(top, VALUE='First child')
;Create second child of the top-level handle:
second = HANDLE_CREATE(top, VALUE='Second child')
;Create a new sibling between first and second.
;This handle is also a child of the top-level handle:
third = HANDLE_CREATE(first, VALUE='Another child', /SIBLING)
```

HANDLE_FREE

This routine is obsolete and should not be used in new IDL code.

The `HANDLE_FREE` procedure frees an existing handle, along with any dynamic memory currently being used by its value. Any child handles associated with `ID` are also freed.

Syntax

```
HANDLE_FREE, ID
```

Arguments

ID

The ID of the handle to be freed. Once the handle is freed, further use of it is invalid and causes an error to be issued.

Example

To free all memory associated with the top-level handle `top`, and all its children, use the command:

```
HANDLE_FREE, top
```

HANDLE_INFO

This routine is obsolete and should not be used in new IDL code.

The HANDLE_INFO function returns information about handle validity and connectivity. By default, it returns True if the specified handle ID is valid. Keywords can be set to return other types of information.

Syntax

```
Result = HANDLE_INFO(ID)
```

Arguments

ID

The ID of the handle for which information is desired. This argument can be scalar or array an array of IDs. The result of HANDLE_INFO has the same structure as ID, and each element gives the desired information for the corresponding element of ID.

Keywords

FIRST_CHILD

Set this keyword to return the handle ID of the first child of the specified handle. If the handle has no children, 0 is returned.

NUM_CHILDREN

Set this keyword to return the number of children related to ID.

PARENT

Set this keyword to return the handle ID of the parent of the specified handle. If the specified handle is a top-level handle (i.e., it has no parent), 0 is returned.

SIBLING

Set this keyword to return the handle ID of the sibling handle following ID. If ID has no later siblings, or if ID is a top-level handle, 0 is returned.

VALID_ID

Set this keyword to return 1 if ID represents a currently valid handle. Otherwise, zero is returned. This is the default action for HANDLE_INFO if no other keywords are specified.

Examples

The following commands demonstrate a number of different uses of `HANDLE_INFO`:

```
;Print a message if handle1 is a valid handle ID.  
IF HANDLE_INFO(handle1) THEN PRINT, 'Valid handle.'  
;Retrieve the handle ID of the first child of top.  
handle = HANDLE_INFO(top, /FIRST_CHILD)  
;Retrieve the handle ID of the next sibling of handle1.  
next= HANDLE_INFO(handle1, /SIBLING)
```

HANDLE_MOVE

This routine is obsolete and should not be used in new IDL code.

The HANDLE_MOVE procedure moves a handle (specified by Move_ID) to a new location. This new position is specified relative to Static_ID.

Syntax

```
HANDLE_MOVE, Static_ID, Move_ID
```

Arguments

Static_ID

The handle ID relative to which the handle specified by Move_ID is moved. By default, Move_ID becomes the last child of Static_ID. This behavior can be changed by specifying one of the keywords described below.

If Static_ID is set to 0, Move_ID becomes a top level handle without any parent. Static_ID cannot be a child of Move_ID.

Move_ID

The ID of the handle to be moved.

Keywords

FIRST_CHILD

Set this keyword to make Move_ID the first child of Static_ID. Any existing children of Static_ID become later siblings of the new first child (i.e., the existing first child becomes the second child, the second child becomes the third child, etc.).

SIBLING

Set this keyword to make Move_ID the sibling handle immediately following Static_ID. Any siblings currently following Static_ID become later siblings of the new handle. Note that you cannot move a handle such that it becomes a sibling of a top-level handle.

Example

```
; Create top-level handle:  
top = HANDLE_CREATE()
```

```
; Create first child of top:  
child1 = HANDLE_CREATE(top)  
; Create second child of top:  
child2 = HANDLE_CREATE(top)  
; Move the first child to be the last child of top:  
HANDLE_MOVE, top, child1
```

HANDLE_VALUE

This routine is obsolete and should not be used in new IDL code.

The HANDLE_VALUE procedure returns or sets the value of an existing handle.

Syntax

HANDLE_VALUE, *ID*, *Value*

Arguments

ID

A valid handle ID.

Value

When using HANDLE_VALUE to return an existing handle value (the default), Value is a named variable in which the value is returned.

When using HANDLE_VALUE to set a handle value, Value is the new value. Note that handle values can have any IDL data type and organization.

Keywords

NO_COPY

By default, HANDLE_VALUE works by making a second copy of the source data. Although this technique is fine for small data, it can have a significant memory cost when the data being copied is large.

If the NO_COPY keyword is set, HANDLE_VALUE works differently. Rather than copy the source data, it takes the data away from the source and attaches it directly to the destination. This feature can be used to move data very efficiently. However, it has the side effect of causing the source variable to become undefined. On a retrieve operation, the handle value becomes undefined. On a set operation, the variable passed as Value becomes undefined.

SET

Set this keyword to assign Value as the new handle value. The default is to retrieve the current handle value.

Example

The following commands demonstrate the two different uses of `HANDLE_VALUE`:

```
; Retrieve the value of handle1 into the variable current:  
HANDLE_VALUE, handle1, current  
; Set the value of handle1 to a 2-element integer vector:  
HANDLE_VALUE,handle1,[2,3],/SET
```

HDF_DFSD_ADDDATA

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_ADDDATA procedure writes data, as well as all other information set via calls to HDF_DFSD_SETINFO and HDF_DFSD_DIMSET, to an HDF file.

The *Data* array must have the same dimensions as the array in the file. The new SDS is appended to the file, unless the OVERWRITE keyword is set.

Syntax

```
HDF_DFSD_ADDDATA, Filename, Data [, /OVERWRITE]  
[, SET_DIM=value{must set either this or the DIMS keyword to  
HDF_DFSD_SETINFO}] [, /SET_TYPE]
```

Arguments

Filename

A scalar string containing the name of the file to be written.

Data

An expression (typically an array) containing the data to write.

Keywords

OVERWRITE

Set this keyword to write *Data* as the first, and only, SDS in the file. All previously-written scientific data sets in the file are removed.

SET_DIM

Set this keyword to make the dimension information for the HDF file based upon the dimensions of *Data*.

Note

You *must* set the number of dimensions in the HDF file, either by setting the SET_DIM keyword or using the DIMS keyword to HDF_DFSD_SETINFO.

SET_TYPE

Set this keyword to make the data type of the current SDS based on the data type of the Data argument.

HDF_DFSD_DIMGET

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_DIMGET procedure retrieves information about the specified dimension number of the current HDF file.

Syntax

```
HDF_DFSD_DIMGET, Dimension [, /FORMAT] [, /LABEL] [, SCALE=vector]  
[, /UNIT]
```

Arguments

Dimension

The dimension number [0, 1, 2, ...] to get information about.

Keywords

FORMAT

Set this keyword to return the dimension format string.

LABEL

Set this keyword to return the dimension label string.

SCALE

Use this keyword to return scale information about the dimension. Set this keyword to a vector of values of the same type as the data.

UNIT

Set this keyword to return the dimension unit string.

HDF_DFSD_DIMSET

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_DIMSET procedure sets the label, unit, format, or scale of dimensions in an HDF. Note that the label, unit, and format of a dataset must be set simultaneously.

Syntax

```
HDF_DFSD_DIMSET, Dimension [, FORMAT=string] [, LABEL=string]  
[, SCALE=vector] [, UNIT=string]
```

Arguments

Dimension

The dimension number that the label, unit, format or scale apply to.

Keywords

FORMAT

A string for the dimension format. This string should be a standard IDL formatting string.

LABEL

A string for the dimension label.

SCALE

A vector of values used to set the dimension scale.

UNIT

A string for the dimension units.

Example

Suppose that a stored dataset is a 20 by 100 by 50 element floating-point array of values representing water content within the volume of a cloud. Assume further that each element in the 100-element dimension (the “Y” dimension) was sampled at 1/10 mile increments. Appropriate labeling, formatting, unit, and scaling information for the Y dimension can be set with the following command:

```
HDF_DFSD_DIMSET, 1, LABEL = 'Y Position', FORMAT = 'F8.2', $  
    UNIT = 'Miles', SCALE = 0.1*FINDGEN(100)
```

HDF_DFSD_ENDSLICE

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_ENDSLICE procedure ends a sequence of calls started by HDF_DFSD_STARTSLICE by closing the internal slice interface and synchronizing the file.

Syntax

```
HDF_DFSD_ENDSLICE
```

Example

See the example in the documentation for HDF_DFSD_STARTSLICE.

HDF_DFSD_GETDATA

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_GETDATA procedure reads data from an HDF file.

Syntax

```
HDF_DFSD_GETDATA, Filename, Data [, /GET_DIMS{Set only if you have not  
called HDF_DFSD_GETINFO with the DIMS keyword}] [, /GET_TYPE]
```

Arguments

Filename

A scalar string containing the name of the file to be read.

Data

A named variable in which the data is returned.

Keywords

GET_DIMS

Set this keyword to get dimension information for reading the data. This keyword should only be used if one has *not* called HDF_DFSD_GETINFO with the DIMS keyword

GET_TYPE

Set this keyword to get the data type for the current SDS.

HDF_DFSD_GETINFO

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_GETINFO procedure retrieves information about the current HDF file.

Note that calling HDF_DFSD_GETINFO with the DIMS or TYPE keywords may alter which dataset is current. See “Reading an Entire Scientific Dataset” and “Getting Other Information About SDSs” in the *NCSA HDF Calling Interfaces and Utilities* documentation.

Note that reading a label, unit, format, or coordinate system string that has more than 256 characters can have unpredictable results.

Syntax

```
HDF_DFSD_GETINFO, Filename [, CALDATA=variable] [, /COORDSYS]
[, DIMS=variable] [, /FORMAT] [, /LABEL] [, /LASTREF] [, /NSDS] [, /RANGE]
[, TYPE=variable] [, /UNIT]
```

Arguments

Filename

A scalar string containing the name of the file to be read. A filename is only needed to determine SDS dimensions and/or the number of SDSs in a file.

Keywords

CALDATA

Set this keyword to a named variable which will contain the calibration data associated with an SDS data set. The data will be returned in a structure of the form:

```
{ CAL: 0d, CAL_ERR: 0d, OFFSET: 0d, $
  OFFSET_ERR: 0d, NUM_TYPE: 0L }
```

COORDSYS

Set this keyword to return the data coordinate system description string.

DIMS

Set this keyword to a named variable in which the dimensions of the current SDS are returned in a longword array.

FORMAT

Set this keyword to return the data format description string.

LABEL

Set this keyword to return the data label description string.

LASTREF

Set this keyword to return the last reference number written or read for an SDS.

NSDS

Set this keyword to return the number of SDSs in the file.

RANGE

Set this keyword to return the valid max/min values for the current SDS.

TYPE

Set this keyword to a named variable which returns a string describing the type of the current SDS (e.g., 'BYTE', 'FLOAT', etc.).

UNIT

Set this keyword to return the data unit description string.

Example

The following commands read an SDS, including information about its dimensions but not its annotations:

```
HDF_DFSD_GETINFO, filename, DIMS=d, TYPE=t, RANGE=r, $
    LABEL=l, UNIT=u, FORMAT=f, COORDSYS=c
...
FOR i = 0, N_ELEMENTS(d)-1 DO BEGIN
    HDF_DFSD_DIMGET, i, LABEL=dl, UNIT=du, FORMAT=df, SCALE=ds
ENDFOR
HDF_DFSD_GETDATA, filename, data
```

HDF_DFSD_GETSLICE

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_GETSLICE procedure reads a slice of data from the current Hierarchical Data Format file.

Note

Before calling HDF_DFSD_GETSLICE, call HDF_DFSD_GETINFO with the DIMS and TYPE keywords to get the dimensions and type of the next data slice. Failure to get the dimensions and type will cause the HDF interface to attempt to read the data incorrectly, and may cause unexpected results.

Syntax

```
HDF_DFSD_GETSLICE, Filename, Data [, COUNT=vector] [, OFFSET=vector]
```

Arguments

Filename

A scalar string containing the name of the file to be read.

Data

A named variable in which the data, read from the SDS, is returned.

Keywords

COUNT

An optional vector containing the counts to be used in reading Value. The default is to read all elements in each record taking the value of OFFSET into account.

OFFSET

A vector specifying the array indices within the specified record at which to begin reading. OFFSET is a 1-dimensional array containing one element per HDF dimension. The default value is zero for each dimension.

Example

See the example in the documentation for HDF_DFSD_STARTSLICE.

HDF_DFSD_PUTSLICE

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_PUTSLICE procedure writes a data slice to the current HDF file.

Note

Before calling HDF_DFSD_PUTSLICE, call HDF_DFSD_SETINFO to set the dimensions and attributes of the slice and HDF_DFSD_STARTSLICE to initialize the slice interface.

Syntax

```
HDF_DFSD_PUTSLICE, Data [, COUNT=vector]
```

Arguments

Data

An array containing the data to write. Dimensions used to write the data are taken from the dimensions of *Data*, unless the COUNT keyword is used.

Keywords

COUNT

An optional vector containing the counts to be used in writing *Data*. The counts do have to match the dimensions (number or sizes), but the count cannot describe more elements than exist.

Example

See the example in the documentation for HDF_DFSD_STARTSLICE.

HDF_DFSD_READREF

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_READREF procedure specifies the reference number of the HDF file to be read by the next call to HDF_DFSD_GETINFO or HDF_DFSD_GETDATA.

Syntax

HDF_DFSD_READREF, *Filename*, *Refno*

Arguments

Filename

A scalar string containing the name of the file to be read.

Refno

The reference number of the desired SDS.

HDF_DFSD_SETINFO

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_SETINFO procedure controls information associated with an HDF file. Because of the manner in which the underlying HDF library was written, it is necessary to set the dimensions and data type of a scientific data set the first time that HDF_DFSD_SETINFO is called.

This procedure has many options, controlled by keywords. The order in which the keywords are specified is unimportant as the routine insures the order of operation for any given call to it. CLEAR and RESTART requests are performed first, followed by type and dimension setting, followed by length setting, followed by the remaining keyword requests.

If you are not writing any ancillary information, you can call HDF_DFSD_ADDDATA with the SET_TYPE and/or SET_DIMS keywords.

Data string lengths should be set before, or at the same time as, writing the corresponding data string. For example:

```
HDF_DFSD_SETINFO, LEN_FORMAT=10, FORMAT='12.3F'
```

or

```
HDF_DFSD_SETINFO, LEN_FORMAT=10
HDF_DFSD_SETINFO, FORMAT='12.3F'
```

Due to the underlying C routines, it is necessary to set all four data strings at the same time, or the unspecified strings are treated as '' (null strings).

For example:

```
HDF_DFSD_SETINFO, LABEL = 'hi'
HDF_DFSD_SETINFO, UNIT = 'ergs'
```

is the same as:

```
HDF_DFSD_SETINFO, LABEL='hi', UNIT='', FORMAT='', COORDSYS=''
HDF_DFSD_SETINFO, LABEL='', UNIT='ergs', FORMAT='', COORDSYS=''
```

Syntax

```
HDF_DFSD_SETINFO [, CALDATA=structure] [, /CLEAR]
[, COORDSYS=string] [, DIMS=vector] [, /BYTE | /DOUBLE | /FLOAT | /INT
| /LONG] [, FORMAT=string] [, LABEL=string] [, LEN_LABEL=value]
```

```
[, LEN_UNIT=value] [, LEN_FORMAT=value] [, LEN_COORDSYS=value]
[, RANGE=[max, min]] [, /RESTART] [, UNIT=string]
```

Arguments

None

Keywords

BYTE

Set this keyword to make the SDS data type DFNT_UINT8 (1-byte unsigned integer).

CALDATA

Set this keyword to a structure containing calibration information. The structure should contain five tags, the first four of which are double-precision floating-point, and fifth of which should be long integer. For example:

```
caldata = { Cal:          1.0d $ ; Calibration factor.
            Cal_Err:     0.1d $ ; Calibration error.
            Offset:      2.5d $ ; Uncalibrated offset.
            Offset_Err:  0.1d $ ; Uncalibrated offset error.
            Num_Type:    5L  $ ; Number type of uncalib.data.
```

Some typical values for the Num_Type field include:

For byte data:

```
3L      (DFNT_UCHAR8)
21L     (DFNT_UINT8)
```

For integer data:

```
22L     (DNFT_INT16)
```

For long-integer data:

```
24L     (DFNT_INT32)
```

For floating-point data:

```
5L      (DFNT_FLOAT32)
6L      (DFNT_FLOAT64)
```

There are other types, but they are not native to IDL. They can be found in the `hdf.h` header file for the HDF library.

CLEAR

Set this keyword to reset all possible set values to their default value.

COORDSYS

A string for the data coordinate system description.

DIMS

Set this keyword to a vector of dimensions to be used in writing the next SDS. For example:

```
HDF_DFSD_SETINFO, DIMS = [10, 20, 30]
```

DOUBLE

Set this keyword to make the SDS data type DFNT_FLOAT64 (8-byte floating point).

FLOAT

Set this keyword to make the SDS data type DFNT_FLOAT32 (4-byte floating point).

FORMAT

A string for the data format description.

INT

Set this keyword to make the SDS data type DFNT_INT16 (2-byte signed integer).

LABEL

A string for the data label description.

LEN_LABEL

The label string length (default is 255).

LEN_UNIT

The unit string length (default is 255).

LEN_FORMAT

The format string length (default is 255).

LEN_COORDSYS

The format coordinate system string length (default is 255).

LONG

Set this keyword to make the SDS data type DFNT_INT32 (4-byte signed integer).

RANGE

The minimum and maximum range, represented as a 2-element vector of the same data type as the data to be written. The first element is the maximum, the second is the minimum. For example:

```
HDF_DFSD_SETINFO, RANGE = [10,0]
```

RESTART

Set this keyword to make the get (HDF_DFSD_GETSLICE) routine read from the first SDS in the file.

UNIT

A string for the data unit description.

Example

Write a 100x50 array of longs:

```
data = LONARR(100, 50)
HDF_DFSD_SETINFO, /CLEAR, /LONG, DIMS=[100,50], $
  RANGE=[MAX(data), MIN(data)], $
  LABEL='pressure', UNIT='pascals', $
  FORMAT='F10.0'
```

HDF_DFSD_STARTSLICE

This routine is obsolete and should not be used in new IDL code.

The HDF_DFSD_STARTSLICE procedure prepares the system to write a slice of data to an HDF file. HDF_DFSD_SETINFO must be called before HDF_DFSD_STARTSLICE to set the dimensions and attributes of the slice.

This procedure must be called before calling HDF_DFSD_PUTSLICE, and must be terminated with a call to HDF_DFSD_ENDSLICE.

Syntax

HDF_DFSD_STARTSLICE, *Filename*

Arguments

Filename

A scalar string containing the name of the file to be written.

Example

```

; Open an HDF file:
fid=HDF_OPEN('test.hdf',/ALL)

; Create two datasets:
slicedata1=FOUNDGEN(5,10,15)
slicedata2=DINDGEN(4,5)

; Use HDF_DFSD_SETINFO to set the dimensions, then add
; the first slice:
HDF_DFSD_SETINFO,LABEL='label1', DIMS=[5,10,15], /FLOAT
HDF_DFSD_STARTSLICE,'test.hdf'
HDF_DFSD_PUTSLICE, slicedata1
HDF_DFSD_ENDSLICE

; Repeat the process for the second slice:
HDF_DFSD_SETINFO, LABEL='label2', DIMS=[4,5], /DOUBLE
HDF_DFSD_STARTSLICE,'test.hdf'
HDF_DFSD_PUTSLICE, slicedata2
HDF_DFSD_ENDSLICE
HDF_DFSD_SETINFO, /RESTART

; Use HDF_DFSD_GETINFO to advance slices and set slice
; attributes, then get the slices:

```

```
HDF_DFSD_GETINFO, name, DIMS=dims, TYPE=type
HDF_DFSD_GETSLICE, out1
HDF_DFSD_GETINFO, name, DIMS=dims, TYPE=type
HDF_DFSD_GETSLICE, out2

; Close the HDF file:
HDF_CLOSE('test.hdf')

;Check the first slice to see if everything worked:
IF TOTAL(out1 EQ slicedata1) EQ N_ELEMENTS(out1) THEN $
  PRINT, 'SLICE 1 WRITTEN/READ CORRECTLY' ELSE $
  PRINT, 'SLICE 1 WRITTEN/READ INCORRECTLY'
; Check the second slice to see if everything worked:
IF TOTAL(out2 EQ slicedata2) EQ N_ELEMENTS(out2) THEN $
  PRINT, 'SLICE 2 WRITTEN/READ CORRECTLY' ELSE $
  PRINT, 'SLICE 2 WRITTEN/READ INCORRECTLY'
```

IDL Ouput

```
SLICE 1 WRITTEN/READ CORRECTLY

SLICE 2 WRITTEN/READ CORRECTLY
```

INP, INPW, OUTP, OUTPW

These routines are obsolete and should not be used in new IDL code.

Windows-Only Routines for Hardware Ports

You can address the hardware ports of your personal computer directly using the following routines. In each case, *Port* is specified using the hexadecimal address of the hardware port. For example, if serial port #1 of your PC is at address 3F8, you would use the following IDL commands to read that port:

```
paddr = '3F8'xSet paddr to hexadecimal value.
data = INPW(paddr)Read data.
```

Result = INP(Port, [$D_1 \dots D_N$])

This function returns either one byte (if only the port number is specified) or an array (the dimensions of which are specified by $D_1 \dots D_N$) read from the specified hardware port. Port is the hardware port number. For example,

```
result = INP(paddr)
```

would read a single byte, and

```
result = INP(paddr, 2,4)
```

would read a two-element by four-element array.

Result = INPW(Port, [$D_1 \dots D_N$])

This function returns either one 16-bit word, as an integer (if only the port number is specified), or an array (the dimensions of which are specified by $D_1 \dots D_N$) from the specified hardware port. Port is the hardware port number.

OUTP, Port, Value

This procedure writes either one byte or an array of bytes to the specified hardware port. Port is the hardware port number. *Value* is the byte value or array to be written.

OUTPW, Port, Value

This procedure writes either one 16-bit word or an array of words to the specified hardware port. Port is the hardware port number. *Value* is the integer value or array to be written.

PICKFILE

This routine is obsolete and should not be used in new IDL code.

The PICKFILE function has been renamed but retains the same functionality it had in previous releases. See `DIALOG_PICKFILE` in the *IDL Reference Guide*.

POLYFITW

This routine is obsolete and should not be used in new IDL code. To perform a weighted polynomial fit, use the `WEIGHTS` keyword to `POLY_FIT`.

The `POLYFITW` function performs a weighted least-square polynomial fit with optional error estimates and returns a vector of coefficients with a length of $NDegree+1$.

The `POLYFITW` routine uses matrix inversion. A newer version of this routine, `SVDFIT`, uses Singular Value Decomposition. The SVD technique is more flexible, but slower. Another version of this routine, `POLY_FIT`, performs a least square fit without weighting.

This routine is written in the IDL language. Its source code can be found in the file `polyfitw.pro` in the `lib` subdirectory of the IDL distribution.

Syntax

```
Result = POLYFITW(X, Y, Weights, NDegree [, Yfit, Yband, Sigma, Corrm]
[, /DOUBLE] [, STATUS=variable] )
```

Arguments

X

An n -element vector of independent variables.

Y

A vector of independent variables, the same length as *X*.

Weights

A vector of weights, the same length as *X* and *Y*.

NDegree

The degree of the polynomial to fit.

Yfit

A named variable that will contain the vector of calculated *Y* values. These values have an error of plus or minus *Yband*.

Yband

A named variable that will contain the error estimate for each point.

Sigma

A named variable that will contain the standard deviation of the returned coefficients.

Corrm

A named variable that will contain the correlation matrix of the coefficients.

Keywords**DOUBLE**

Set this keyword to force computations to be done in double-precision arithmetic.

STATUS

Set this keyword to a named variable to receive the status of the operation. Possible status values are:

- 0 = Successful completion.
- 1 = Singular array (which indicates that the inversion is invalid). *Result* is NaN.
- 2 = Warning that a small pivot element was used and that significant accuracy was probably lost.
- 3 = Undefined (NaN) error estimate was encountered.

Note

If STATUS is not specified, any error messages will be output to the screen.

Tip

Status values of 2 or 3 can often be resolved by setting the DOUBLE keyword.

RIEMANN

This routine is obsolete and should not be used in new IDL code. RIEMANN has been replaced by the [RADON](#) function.

The RIEMANN procedure computes the “Riemann sum” (or its inverse) which helps implement the backprojection operator used to reconstruct the cross-section of an object, given projections through the object from multiple directions. This technique is widely used in medical imaging in the fields of computed x-ray tomography, MRI imaging, Positron Emission Tomography (PET), and also has applications in other areas such as seismology and astronomy. The inverse Riemann sum, which evaluates the projections given a slice through an object, is also a discrete approximation to the Radon transform.

Given a matrix $A(m,n)$, which will contain the reconstructed slice; a vector P , containing the ray sums for a given view; and an angle $Theta$ measured in radians from the vertical: the Riemann sum “backprojects” the vector P into A . For each element of A , the value of the closest element of P is summed, leaving the result in A . Bilinear interpolation is an option. All operations are performed in single-precision floating point.

In the reverse operation, the ray sums contained in the view vector, P , are computed given the original slice, A , and $Theta$. This is sometimes called “front projection”.

The Riemann sum can be written:

$$\sum_{i=0}^{M-1} A(r \cdot \cos(i \cdot \Delta - \theta), i \cdot \Delta)$$

which is the sum of the data along lines through an image with an angle of θ from the vertical.

Syntax

```
RIEMANN, P, A, Theta [, /BACKPROJECT] [, /BILINEAR] [, CENTER=value]
[, COR=vector] [, CUBIC=value{-1 to 0}] [, D=spacing] [, ROW=value]
```


Arguments

P

A k -element floating-point projection vector (or matrix if the **ROW** keyword is specified). For backprojection (when the **BACKPROJECT** keyword is set), P contains the ray sums for a single view. For the inverse operation, P should contain zeros on input and will contain the ray sums for the view on output.

A

An m by n floating-point image matrix. For backprojection, A contains the accumulated results. For the inverse operation, A contains the original image. Typically, k should be larger than

$$\sqrt{m^2 + n^2}$$

which is the diagonal size of A .

Theta

The angle of the ray sums from the vertical.

Keywords

BACKPROJECT

Set this keyword to perform backprojection in which P is summed into A . If this keyword is not set, the inverse operation occurs and the ray sums are accumulated into P .

BILINEAR

Set this keyword to use bilinear interpolation rather than the default nearest neighbor sampling. Results are more accurate but slower when bilinear interpolation is used.

CENTER

Set this keyword equal to a floating-point number specifying the center of the projection. The default value for **CENTER** is one-half the number of elements of P .

COR

Set this keyword equal to a two-element floating-point vector specifying the center of rotation in the array A . The default value is $[m/2., n/2.]$, where A is an m by n array.

For symmetric results, given symmetric operands, COR should be set to the origin of symmetry $[(m-1)/2, (n-1)/2]$, and CENTER should be set to $(n-1)/2$, where n is the number of elements in the projection vector, P .

CUBIC

Set this keyword to a value between -1 and 0 to use the cubic convolution interpolation method with the specified value as the interpolation parameter. Setting this keyword equal to a value greater than zero specifies a value of -1 for the interpolation parameter. Park and Schowengerdt (see reference below) suggest that a value of -0.5 significantly improves the reconstruction properties of this algorithm.

Cubic convolution is an interpolation method that closely approximates the theoretically optimum sinc interpolation function using cubic polynomials. According to sampling theory, details of which are beyond the scope of this document, if the original signal, f , is a band-limited signal, with no frequency component larger than ω_0 , and f is sampled with spacing less than or equal to $1/2\omega_0$, then f can be reconstructed by convolving with a sinc function: $\text{sinc}(x) = \sin(\pi x) / (\pi x)$.

In the one-dimensional case, four neighboring points are used, while in the two-dimensional case 16 points are used. Note that cubic convolution interpolation is significantly slower than bilinear interpolation.

For further details see:

Rifman, S.S. and McKinnon, D.M., "Evaluation of Digital Correction Techniques for ERTS Images; Final Report", Report 20634-6003-TU-00, TRW Systems, Redondo Beach, CA, July 1974.

S. Park and R. Schowengerdt, 1983 "Image Reconstruction by Parametric Cubic Convolution", Computer Vision, Graphics & Image Processing 23, 256.

D

Use this keyword to specify the spacing between elements of P , expressed in the same units as the spacing between elements of A . The default is 1.0.

ROW

Set this keyword to specify the P vector as a given row within a matrix, so that the sinogram array can be used directly without having to extract or insert each row. In this case, P must be an array with a first dimension equal to k , and the value of ROW must be in the range of 0 to the number of vectors of length k in P , minus one.

Example

This example forms a synthetic image in *A*, computes *Nviews* equally spaced views, and stores the stacked projections (commonly called the “sinogram”) in a matrix *PP*. It then backprojects the projections into the matrix *B*, forming the reconstructed slice. In practical use, the projections are convolved with a filter before being backprojected.

```

; Define number of columns in A:
N = 100L

; Define number of rows in A:
M = 100L
; Number of views:
nviews = 100

; The length of the longest projection. If filtered backprojection
; is used, 1/2 the length of the convolution kernel must also be
; added.

K = CEIL(SQRT(N^2 + M^2))

; Form original slice:
A = FLTARR(N, M)

; Simulate a square object:
A[N/2:N/2+5, M/2:M/2+5] = 1.0

; Make array for sinogram:
pp = FLTARR(K, nviews)

; Compute each view:
FOR I=0, NIEWS-1 DO RIEMANN, pp, A, I * !PI/nviews, ROW=i

; Show sinogram:
TVSCL, pp

; Initial reconstructed image:
B = FLTARR(N,M)

; Do the backprojection for each view:
FOR I=0, nviews-1 DO $
    RIEMANN, pp, B, I * !PI/nviews, /BACKPROJECT, ROW=i

; Show reconstructed array:
TVSCL, B

```

RSTRPOS

This routine is obsolete and should not be used in new IDL code.

The RSTRPOS function has been replaced by the STRPOS function's REVERSE_SEARCH keyword. See [STRPOS](#) in the *IDL Reference Guide*.

The RSTRPOS function finds the *last* occurrence of a substring within an object string (the STRPOS function finds the first occurrence of a substring). If the substring is found in the expression, RSTRPOS returns the character position of the match, otherwise it returns -1.

Syntax

```
Result = RSTRPOS( Expression, Search_String [, Pos] )
```

Arguments

Expression

The expression string in which to search for the substring.

Search_String

The substring to be searched for within *Expression*.

Pos

The character position before which the search is begun. If *Pos* is omitted, the search begins at the last character of *Expression*.

Example

```
; Define the expression:
exp = 'Holy smokes, Batman!'
; Find the position of a substring:
pos = RSTRPOS(exp, 'smokes')
; Print the substring's position:
PRINT, pos
```

IDL prints:

```
5
```

Note

Substring begins at position 5 (the sixth character).

SIZE Executive Command

This command is obsolete and is should not be used in new IDL code.

.SIZE Code_Size, Data_Size

The `.SIZE` command resizes the memory area used to compile programs. The default code and data area sizes are 32,768 and 8,192 bytes, respectively. These sizes represent a compromise between an unlimited program space and conservation of memory. User procedures and functions are compiled in this large program area. After successful compilation, a new memory area of the required size is allocated to contain the newly compiled program unit.

Resizing the code and data areas erases the currently compiled main program and all main program variables. For example, to extend the code and data areas to 30,000 and 5,000 bytes, respectively, use the following statement:

```
.SIZE 30000 5000
```

Each user-defined procedure, function, and main program has its own code area that contains the compiled code and constants. Although the maximum size of these areas is set by the `.SIZE` command, there is virtually no limit to the number of program units. Procedures or functions that run out of code area space should be broken into multiple program units.

The data area contains information describing the user-defined variables and common blocks for each procedure, function, or main program. Note that the “data area” is not the space available for variable storage, but the space available for that program unit’s symbol table.

Warning

Users are sometimes confused about the nature of the code and data areas. Note that there are separate code and data areas for each compiled function, routine, or main program. The `HELP` command can be used to see the current sizes of the code and data areas for the program unit in which the `HELP` function is called.

For example, to see the sizes of the code and data areas for the main program level, enter the following at the IDL prompt:

```
HELP
```

Each compiled function and procedure has its own code and data areas. If the compiled routine does not use the full amount of code space allocated by the default

code area size, the code area “shrinks” to just the size the routine needs. For example, enter and compile a simple procedure from the IDL prompt by entering:

```
.RUN
- PRO EXAMPLE
- PRINT, "Here are the code and data areas for this procedure:"
- HELP
- END
```

Call the EXAMPLE procedure from the command line to see the result:

```
EXAMPLE
```

The third line of output from the HELP procedure displays:

```
Code area used: 100.00% (100/100), Data area used: 2.02% (2/99)
```

Note that the code area for the EXAMPLE procedure is completely filled and that the total size of the code area is just 100 bytes.

SLICER

This routine is obsolete and should not be used in new IDL code.

The IDL SLICER is a widget-based application to show 3D volume slices and isosurfaces. On exit, the Z-buffer contains the most recent image generated by the SLICER. The image may be redisplayed on a different device by reading the Z-buffer contents plus the current color table. Note that the volume data must fit in memory.

Using the SLICER

Data is passed to the SLICER via the common block `VOLUME_DATA`. Note that the variable used to contain the volume data must be defined as part of the common block *before* the volume data is read into the variable. (See the *Example* section, below.)

The SLICER has the following modes:

- Slices: Displays or removes orthogonal or oblique slices through the data volume.
- Block: Displays the surfaces of a selected block inside the volume.
- Cutout: Cuts blocks from previously drawn objects.
- Isosurface: Draws an isosurface contour.
- Probe: Displays the position and value of objects using the mouse.
- Colors: Manipulates the color tables and contrast.
- Rotations: Sets the orientation of the display.
- Journal: Records or plays back files of SLICER commands.

See the SLICER's help file (available by clicking the "Help" button on the SLICER widget) for more information about drawing slices and images.

Syntax

```
COMMON VOLUME_DATA, A
```

```
A = your_volume_data
```

```
SLICER
```

Arguments

A

A 3D array containing volume data. Note that the variable *A* must be included in the common block `VOLUME_DATA` *before* being equated with the volume data. *A* is *not* an explicit argument to `SLICER`.

Keywords

CMD_FILE

Set this keyword to a string that contains the name of a file containing `SLICER` commands to execute as described under *SLICER Commands*, below. The file should contain one command per line.

Command files can be created interactively, using the `SLICER`'s "Journal" feature.

COMMAND

Set this keyword equal to a $1 \times n$ string array containing commands to be executed by the `SLICER` before entering interactive mode. Available commands are described under *SLICER Commands*, below.

Note that commands passed to the `SLICER` with the `COMMAND` keyword must be in a $1 \times n$ array, rather than in an n -element vector. String arrays can be easily specified in the proper format using the `TRANSPOSE` command. For example, the following passes three commands to the slicer:

```
com=TRANSPOSE(['COLOR 5', 'TRANS 1 20', 'ISO 17 1'])
SLICER, COMMAND=com
```

DETACHED

Set this keyword to put the drawable in a separate window. This can be useful when working with large images.

GROUP

Set this keyword to the widget ID of the widget that calls `SLICER`. When `GROUP` is specified, a command to destroy the calling widget also destroys the `SLICER`.

NO_BLOCK

Set this keyword equal to zero to have `XMANAGER` *block* when this application is registered. By default, `NO_BLOCK` is set equal to one, providing access to the command line if active command line processing is available. Setting

NO_BLOCK=0 will cause *all* widget applications to block, not just this application. For more information, see the documentation for the NO_BLOCK keyword to XMANAGER.

RANGE

Set this keyword to a two-element array containing minimum and maximum data values of interest. If RANGE is omitted, the data is scanned for the minimum and maximum values.

RESOLUTION

Set this keyword to a two-element vector specifying the width and height of the drawing window. The default is 55% by 44% of the screen width.

SLICER Commands

The slicer accepts a number of commands that replicate the action of controls in the graphical user interface. These commands can be specified at the IDL command line using either CMD_FILE keyword or the COMMAND keyword. Files of SLICER commands can also be created and played back from within the SLICER, using the “Journal” feature.

Commands, in this context, are strings that include a command identifier and (in some cases) one or more numeric parameters separated by blanks. The following are the available SLICER commands, with parameters.

COLOR *Table_Index Low High Shading*

Set the color tables. *Table_Index* is the pre-defined color table number (see LOADCT), or -1 to retain the present table. *Low* is the contrast minimum, *High* is the contrast maximum, and *Shading* is the differential shading, all expressed in percent. For example, the following command picks color table number 2, sets the minimum contrast to 10%, the maximum contrast to 90%, and the differential shading to 50%:

```
COLOR 2 10 90 50
```

CUBE *Mode Cut_Ovr Interp X0 Y0 Z0 X1 Y1 Z1*

Defines the volume used for “Block” and “Cutout” operations. Set *Mode*=1 for Block mode or *Mode*=2 for Cutout mode. Set *Cut_Ovr*=0 to mimic selecting the “Cut Into” button or *Cut_Ovr*=1 to mimic selecting the “Cut Over” button.

Note

These buttons have no effect in Block mode. See the online help on SLICER for further explanation of Cut Into and Cut Over.

Set *Interp*=1 for bilinear interpolation sampling or *Interp*=0 for nearest neighbor sampling.

X0,Y0,Z0 are the coordinates of the lower corner of the volume, and *X1,Y1,Z1* are the coordinates of the upper corner. For example:

```
CUBE 1 0 1 20 0 56 60 75 42
```

selects Block mode, the “Cut Into” button, bilinear interpolation and defines the volume’s corners at (20, 0, 56) and (60, 75, 42).

ERASE

Erases the display. Mimics clicking on the “Erase” button.

ISO *Threshold Hi_Lo*

Draws an iso-surface. *Threshold* is the isosurface threshold value. Set *Hi_Lo* equal to 1 to view the low side, or equal to 0 to view the high side.

ORI *X_Axis Y_Axis Z_axis X_Rev Y_Rev Z_Rev X_Rot Z_Rot Asp*

Sets the orientation for the SLICER display, mimicking the action of the “Orientation” button. Set *X_Axis*, *Y_Axis*, and *Z_Axis* to 0, 1, or 2, where 0 represents the data X axis, 1 the data Y axis, and 2 the data Z axis. Set *X_Rev*, *Y_Rev*, and *Z_Rev* to 0 for normal orientation or to 1 for reversed. Set *X_Rot* and *Z_Rot* to the desired rotations of the X and Z axes, in degrees (30 is the default). Set *Asp* to the desired Z axis aspect ratio with respect to X and Y. For example, to interchange the X and Z axes and reverse the Y use the string:

```
ORI 2 1 0 0 1 0 30 30 1
```

SLICE *Axis Value Interp Expose 0*

Draws an orthogonal slice. Set *Axis* to 0 to draw a slice parallel to the X axis, to 1 for the Y axis, or to 2 for the Z axis. Set *Value* to the pixel value of the slice. Set *Interp*=1 for bilinear interpolation sampling or *Interp*=0 for nearest neighbor sampling. Set *Expose*=1 to cut out of an existing image (mimicking the “Expose” button) or set *Expose*=0 to draw the slice on top of the current display (mimicking the “Draw” button). The final zero indicates that the slice is orthogonal rather than oblique. For example, the following command draws an orthogonal slice parallel to the X axis, at the pixel value 31, using bilinear interpolation.

```
SLICE 0 31 1 0 0
```

SLICE *Azimuth Elev Interp Expose 1 X0 Y0 Z0*

Draws an oblique slice. The oblique plane crosses the XY plane at angle *Azimuth*, with an elevation of *Elev*. Set *Interp*=1 for bilinear interpolation sampling or *Interp*=0 for nearest neighbor sampling. Set *Expose*=1 to cut out of an existing image (mimicking the “Expose” button) or set *Expose*=0 to draw the slice on top of the current display (mimicking the “Draw” button). The one indicates that the slice is oblique rather than orthogonal. The plane passes through the point (*X0*, *Y0*, *Z0*). For example, the following command exposes an oblique slice with an azimuth of 42 and an elevation of 24, using bilinear interpolation. The plane passes through the point (52, 57, 39).

```
SLICE 42 24 1 1 1 52 57 39
```

TRANS *On_Off Threshold*

Turns transparency on or off and sets the transparency threshold value. Set *On_Off*=1 to turn transparency on, *On_Off*=0 to turn transparency off. *Threshold* is expressed in percent of data range (0 = minimum data value, 100 = maximum data value). For example, this command turns transparency on and sets the threshold at 20 percent:

```
TRANS 1 20
```

UNDO

Undoes the previous operation.

WAIT Secs

Causes the SLICER to pause for the specified time, in seconds.

Example

Data is transferred to the SLICER via the `VOLUME_DATA` common block instead of as an argument. This technique is used because volume datasets can be very large and the duplication that occurs when passing values as arguments is a waste of memory.

Suppose that you want to read some data from the file `head.dat`, which is included in the IDL examples directory, into IDL for use in the SLICER. Before you read the data, establish the `VOLUME_DATA` common block with the following command:

```
COMMON VOLUME_DATA, VOL
```

The `VOLUME_DATA` common block has just one variable in it. (The variable can have any name; here, we're using the name `VOL`.) Now read the data from the file into `VOL`. For example:

```
OPENR, UNIT, /GET, FILEPATH('head.dat', SUBDIRECTORY=['examples',
'data'])
VOL = BYTARR(80, 100, 57, /NOZERO)
READU, UNIT, VOL
CLOSE, UNIT
```

Now you can run the `SLICER` widget application by entering:

```
SLICER
```

The data stored in `VOL` is the data being worked on by the `SLICER`.

To obtain the image in the slicer window after slicer is finished:

```
SET_PLOT, 'Z' Use the Z buffer graphics device.
A = TVRD() Read the image.
```

STR_SEP

This routine is obsolete and should not be used in new IDL code.

The STR_SEP function has been replaced by STRSPLIT for single character delimiters, and STRSPLIT with the REGEX keyword set for longer delimiters. See [STRSPLIT](#) in the *IDL Reference Guide*.

The STR_SEP function divides a string into pieces as designated by a separator string. STR_SEP returns a string array where each element is a separated piece of the original string.

Syntax

```
Result = STR_SEP( Str, Separator [, /TRIM] [, /REMOVE_ALL] [, /ESC] )
```

Arguments

Str

The string to be separated.

Separator

The separator string.

Keywords

TRIM

Set this keyword to remove leading and trailing blanks from each element of the returned string array. TRIM performs STRTRIM(*String*, 2).

REMOVE_ALL

Set this keyword to remove all blanks from each element of the returned string array. REMOVE_ALL performs STRCOMPRESS(*String*, /REMOVE_ALL)

ESC

Set this keyword to interpret the characters following the <ESC> character literally and not as separators. For example, if the separator is a comma and the escape character is a backslash, the character sequence “a\b” is interpreted as a single field containing the characters “a,b”.

Example

```
; Create a string:
str = 'Doug.is.a.cool.dude!'

; Separate the parts between the periods:
parts = STR_SEP(str, '.')

; Confirm that the string has been broken up into 5 elements:
HELP, parts

PRINT, parts[3]
```

IDL Output

```
PARTS   STRING = Array[5]
cool
```

TIFF_DUMP

This routine is obsolete and should not be used in new IDL code.

The TIFF_DUMP procedure dumps the Image File Directories of a TIFF file directly to the terminal screen. Each TIFF Image File Directory entry is printed. This procedure is used mainly for debugging.

Note that not all of the tags have names encoded. In particular, Facsimile, Document Storage and Retrieval, and most no-longer-recommended fields are not encoded.

Syntax

TIFF_DUMP, *File*

Arguments

File

A scalar string containing the name of file to read.

TIFF_READ

This routine is obsolete and should not be used in new IDL code.

The TIFF_READ function has been renamed but retains the same functionality it had in previous releases. See READ_TIFF in the *IDL Reference Guide*.

The TIFF_READ function reads 8-bit or 24-bit images in TIFF format files (classes G, P, and R) and returns the image and color table vectors in the form of IDL variables. Only one image per file is read. TIFF_READ returns a byte array containing the image data. The dimensions of the result are the same as defined in the TIFF file (*Columns, Rows*).

For TIFF images that are RGB interleaved by pixel, the output dimensions are (3, *Columns, Rows*).

For TIFF images that are RGB interleaved by image, TIFF_READ returns the integer value zero, sets the variable defined by the PLANARCONFIG keyword to 2, and returns three separate images in the variables defined by the R, G, and B arguments.

Syntax

```
Result = TIFF_READ(File [, R, G, B])
```

Arguments

File

A scalar string containing the name of file to read.

R, G, B

Named variables that will contain the Red, Green, and Blue color vectors extracted from TIFF Class P, Palette Color images. For TIFF images that are RGB interleaved by image (when the variable specified by the PLANARCONFIG keyword is returned as 2) the R, G, and B variables each hold an image with the dimensions (*Columns, Rows*).

Keywords

ORDER

Set this keyword to a named variable that will contain the order parameter from the TIFF File. This parameter is returned as 0 for images written bottom to top, and 1 for

images written top to bottom. If the Orientation parameter does not appear in the TIFF file, an order of 1 is returned.

PLANARCONFIG

Set this keyword to a named variable that will contain the interleave parameter from the TIFF file. This parameter is returned as 1 for TIFF files that are GrayScale, Palette, or RGB color interleaved by pixel, or as 2 for RGB color TIFF files interleaved by image.

Example

Read the file `my.tif` in the current directory into the variable `image`, and save the color tables in the variables, `R`, `G`, and `B` by entering:

```
image = TIFF_READ('my.tif', R, G, B)
```

To view the image, load the new color table and display the image by entering:

```
TVLCT, R, G, B  
TV, image
```

TIFF_WRITE

This routine is obsolete and should not be used in new IDL code.

The TIFF_WRITE procedure has been renamed but retains the same functionality it had in previous releases. See WRITE_TIFF in the *IDL Reference Guide*.

The TIFF_WRITE procedure writes 8- or 24-bit images to a TIFF file. Files are written in a single strip, or in three strips when the PLANARCONFIG keyword is set to 2.

Syntax

TIFF_WRITE, *File*, *Array* [, *Orientation*]

Arguments

File

A scalar string containing the name of file to create.

Array

The image data to be written. If not already a byte array, it is made a byte array. Array may be either an (n, m) array for Grayscale or Palette classes, or a $(3, n, m)$ array for RGB full color, interleaved by image. If the PLANARCONFIG keyword is set to 2 then the *Array* parameter is ignored (and may be omitted).

Orientation

This parameter should be 0 if the image is stored from bottom-to-top (the default). For images stored from top-to-bottom, this parameter should be 1.

Warning: not all TIFF readers are capable of reversing the scan line order. If in doubt, first convert the image to top-to-bottom order (use the REVERSE function), and set *Orientation* to 1.

Keywords

RED, GREEN, BLUE

If you are writing a Class P, Palette color image, set these keywords equal to the color table vectors, scaled from 0 to 255.

If you are writing an image that is RGB interleaved by image (i.e., if the `PLANARCONFIG` keyword is set to 2), set these keywords to the names of the variables containing the 3 color component image.

PLANARCONFIG

Set this keyword equal to 2 if writing an RGB image that is contained in three separate images (color planes). The three images must be stored in the variables specified by the `RED`, `GREEN`, and `BLUE` keywords. Otherwise, omit this parameter (or set it to 1).

XRESOL

The horizontal resolution, in pixels per inch. The default is 100.

YRESOL

The vertical resolution, in pixels per inch. The default is 100.

Examples

Four types of TIFF files can be written:

TIFF Class G, Grayscale.

The variable `array` contains the 8-bit image array. A value of 0 is black, 255 is white. The `Red`, `Green`, and `Blue` keywords are omitted.

```
TIFF_WRITE, 'a.tif', array
```

TIFF Class P, Palette Color

The variable `array` contains the 8-bit image array. The keyword parameters `RED`, `GREEN`, and `BLUE` contain the color tables, which can have up to 256 elements, scaled from 0 to 255.

```
TIFF_WRITE, 'a.tif', array, RED = r, GREEN = g, BLUE = b
```

TIFF Class R, RGB Full Color, color interleaved by pixel

The variable `array` contains the byte data, and is dimensioned (*3, cols, rows*).

```
TIFF_WRITE, 'a.tif', array
```

TIFF Class R, RGB Full Color, color interleaved by image

Input is three separate images, provided in the keyword parameters `RED`, `GREEN`, and `BLUE`. The input argument `Array` is ignored. The keyword `PLANARCONFIG` must be set to 2 in this case.

```
TIFF_WRITE, 'a.tif', RED = r, GREEN = g, BLUE = b, PLAN = 2
```

WIDED

This routine is obsolete and should not be used in new IDL code.

The WIDED procedure invokes IDL's graphical user interface designer, known as the Widget Builder. This functionality has been replaced by the GUIBuilder, which is documented in *Building IDL Applications*.

Syntax

WIDED

WIDGET_MESSAGE

This routine is obsolete and should not be used in new IDL code.

The WIDGET_MESSAGE function has been renamed but retains the same functionality it had in previous releases. See [DIALOG_MESSAGE](#) in the *IDL Reference Guide*.



Chapter 3:

Remote Procedure Calls

Note

Remote Procedure Calls are still included in IDL. The RPC API described here (the API included with IDL version 4.0) has been replaced with a new API. See the External Development Guide for details on the RPC API included with IDL version 5.0 and later.

Remote Procedure Calls (RPCs) allow one process (the *client* process) to have another process (the *server* process) execute a procedure call just as if the caller process had executed the procedure call in its own address space. Since the client and server are separate processes, they can reside on the same machine or on different machines. RPC libraries allow the creation of network applications without having to worry about underlying networking mechanisms.

IDL supports RPCs so that other applications can communicate with IDL. A library of C language routines is included to handle communication between client programs and the IDL server. *Note that remote procedure calls are supported only on UNIX platforms.*

The current implementation allows IDL to be run as an RPC server and your own program to be run as a client. IDL commands can be sent from your application to the IDL server, where they are executed. Variable structures can be defined in the client program and then sent to the IDL server for creation as IDL variables. Similarly, the values of variables in the IDL server session can be retrieved into the client process.

Using IDL as an RPC Server

The IDL RPC Directory

All of the files related to using IDL's RPC capabilities are found in the `rpc` subdirectory of the `external` subdirectory of the main IDL directory. The main IDL directory is referred to here as *idldir*.

Running IDL in Server Mode

To use IDL as an RPC server, run IDL in server mode by using the `-server` command line option. This option can be invoked one of two ways:

```
idl -server process_id
```

or

```
idl -server=server_number process_id
```

where *server_number* is the hexadecimal server ID number (between 0x20000000 and 0x3FFFFFFF) for IDL to use. For example, to run IDL with the server ID number 0x20500000, use the command:

```
idl -server=20500000
```

If a server ID number is not supplied, IDL uses the default, `IDL_DEFAULT_ID`, defined in the file `idldir/external/rpc/rpc_idl.h`. This value is originally set to 0x2010CAFE.

The *process_id* argument is an optional argument that specifies the process ID of a UNIX process that should be contacted when IDL has finished running in interactive mode. If the IDL rpc server is placed in interactive mode and a process ID has been supplied on the command line, IDL sends the UNIX signal `SIGUSR1` to the specified process. This signal allows the client program to know when it can continue to communicate with the rpc server.

Creating the IDL RPC Library

The machine that runs the client program must have its own version of the IDL RPC library. The make file for this library is contained in the directory `idldir/external/rpc`. If the machine that runs the client program is not licensed to run IDL, simply copy the contents of the IDL `rpc` directory to an appropriate location on the client machine.

To build the IDL RPC library, copy the IDL `rpc` directory to a new directory, change to that directory, and enter the make command:

```
cp -R idldir/external/rpc newrpcdir
cd newrpcdir
make
```

The created library is contained in the file `newrpcdir/rpcidl.a`. The functions contained in the library are described in [“The IDL RPC Library”](#) on page 75

Linking your Client Program

Your client program must include the file `idldir/external/rpc/rpc_idl.h`.

You must also link the application that communicates with IDL with the IDL RPC library. For example, to compile and link a program with the IDL RPC library, you might enter:

```
cc -c rpcclient.c
cc -o rpcclient.o idldir/external/rpc/rpcidl.a
```

where `rpcclient.c` is the name of your program. Note that your actual command lines and flag settings may be different than the ones shown above, depending upon your C compiler. The `Makefile` contains details on modifications for various systems.

The IDL RPC Library

The IDL RPC library contains several C language interface functions that facilitate communication between your application and IDL. There are functions to register and unregister clients, set timeouts, get and set the value of IDL variables, send commands to the IDL server, and cause the server to exit. These functions are described below.

free_idl_variable

Syntax

```
void free_idl_var(varinfo_t* var);
```

Description

This function frees all dynamic memory associated with the given variable. Attempts to free a static variable are silently ignored. (See [“Notes on Variable Creation and Memory Management”](#) on page 100)

Parameters

var

The address of the `varinfo_t` structure that contains the information about the variable to be freed.

Return Value

None

get_idl_variable

Syntax

```
int get_idl_variable(CLIENT* client, char* name, varinfo_t* var,
                    int typecode)
```

Description

Call this function to retrieve the value of an IDL variable in the IDL session referred to by client. Any scalar or array variable type can be retrieved. Variables can be retrieved only from the main program level.

Note that it is not possible to get the value of an IDL structure. To retrieve values from an IDL structure, “decompose” the structure into regular variables in IDL, then use this function to get the values of those individual variables.

It is not possible to get the value of IDL system variables directly. To retrieve the value of an IDL system variable, first copy it to a regular IDL variable. The value of the regular variable can then be retrieved with get_idl_variable. For example:

```
varinfo_t pt; /* Declare variable pt */
send_idl_command(client, "X = !P.T");
get_idl_variable(client, "X", &pt, 0);
```

Parameters

client

A pointer to the CLIENT structure that corresponds to the desired IDL session.

name

A null terminated string that contains the name of the IDL variable to be retrieved. Only the first MAXIDLLEN characters of this string are used. MAXIDLLEN is defined in the file *idldir/external/rpc/rpc_idl.h*.

var

The address of a varinfo_t structure in which to store the returned variable information. Upon return, the Name field of the var structure contains the name of the variable as found in IDL. If the name supplied is an illegal IDL variable name, the Name field is set to <ILLEGAL_NAME>. If the variable is a structure or associated variable, the Name field is set to <BAD-VAR-TYPE>.

typecode

If you want IDL to typecast a variable (i.e., guarantee the value to be of a particular type) before it is transported, set `typecode` to one of the following values (defined in the file `export.h`):

```
IDL_TYP_BYTE, IDL_TYP_INT, IDL_TYP_LONG, IDL_TYP_FLOAT,  
IDL_TYP_DOUBLE, IDL_TYP_STRING, IDL_TYP_COMPLEX, IDL_TYP_DCOMPLEX
```

For example, the command:

```
get_idl_variable(client, "x", &xv, IDL_TYP_LONG)
```

guarantees that the value in `x` is returned as a 32-bit integer.

If `typecode` is 0, the variable is transferred with whatever data type it has in the server. Typecasting only affects the variables in the client – the server side is not affected.

Return Value

This function returns a status value that denotes the success or failure of this function as described below.

- 1 Failure: bad arguments supplied (e.g., name or var is NULL).
- 0 RPC mechanism failed (an error message may also be printed).
- 1 Success
- 2 Illegal variable name (e.g., “213xyz”, “#a”, “!DEVICE”)
- 3 Variable not transportable (e.g., the variable is a structure or associated variable)

idl_server_interactive

Syntax

```
int idl_server_interactive(CLIENT*client)
```

Description

Call this function to cause the IDL server to become an interactive IDL session. It is likely that this command will time out. Some alternative mechanism for determining when the server is finished should be implemented. See the example `server.c` in the `idldir/examples/rpc` directory.

Parameters

client

A CLIENT structure that corresponds to the desired IDL session.

Return Value

This function returns TRUE if the interactive IDL session did not time out. FALSE is returned if the session times out or otherwise fails.

kill_server

Syntax

```
int kill_server(CLIENT*client)
```

Description

Call this function to kill the IDL RPC server.

Parameters

client

The pointer to a CLIENT structure registered with the server to be killed.

Return Value

This function returns TRUE if the server was successfully killed. FALSE is returned otherwise.

register_idl_client

Syntax

```
CLIENT* register_idl_client(long server_id, char* hostname,  
                           struct timeval* timeout)
```

Description

Call this function to register your program as a client of an IDL server. Note that a program can be the client of a number of different servers at the same time and a single server can have multiple clients.

Parameters

server_id

The ID number of the IDL server that the program is to be registered with. If this value is 0, the default server ID (0x2010CAFE) is used.

hostname

The name of the machine where the IDL server is running. If this value is NULL or "", the default, `localhost`, is used.

timeout

A pointer to the timeout value for all communication with IDL servers. If this value is NULL or 0, the default timeout, 60 seconds, is used.

Return Value

A pointer to the new `CLIENT` structure is returned. This function returns NULL if it is unsuccessful.

send_idl_command

Syntax

```
int send_idl_command(CLIENT* client, char* command);
```

Description

Call this function to send an IDL command to the IDL server referred to by client. The command is executed just as if it had been entered from the IDL command line.

This function cannot be used to send multi-line commands. If the first part of a multi-line command is sent, for example:

```
send_idl_command(client, "FOR I=1,5 DO $");
```

IDL spawns an interactive session and may hang. In any case, subsequent commands are not executed.

Parameters

client

A pointer to the CLIENT structure that corresponds to the desired IDL session.

command

A null-terminated string with no more than MAX_STRING_LEN characters. MAX_STRING_LEN is defined in the file *idldir/external/rpc/rpc_idl.h*.

Return Value

This function returns a status value that denotes success or failure as described below.

- -1 = RPC communication failure (an error message is also printed).
- 0 = Command is NULL.
- 1 = Success.

For all other errors, the error number is returned. This number could be passed as an argument to STRMESSAGE () ; .

set_idl_timeout

Syntax

```
int set_idl_timeout(struct timeval* timeout)
```

Description

Call this function to replace the current timeout used by the RPC mechanism with the given timeout.

Parameters

timeout

A pointer to the new timeout value to be used. This parameter has no default.

Return Value

This function returns TRUE if the timeout was replaced. FALSE is returned if the timeout value was NULL or zero.

set_idl_variable

Syntax

```
int set_idl_variable(CLIENT* client, varinfo_t* var);
```

Description

Call this function to assign a value to an IDL variable in the IDL session referred to by `client`. The address `var` points to a `varinfo_t` structure that contains information about the variable to be set. The “helper” functions can be used to build `var`. (See “[The varinfo_t Structure](#)” on page 88) Any scalar or array variable type can be set. Variables can be set only in the main IDL program level.

Note that it is not possible to set the value of an IDL structure. To set values in an IDL structure, set the individual elements of the structure to scalar IDL variables, then use the `send_idl_command` function to create the structure in IDL.

It is not possible to set the value of IDL system variables directly. To set the value of an IDL system variable, first set the value of a regular IDL variable. The value of the regular variable can then be assigned to the system variable. For example:

```
set_idl_variable(client, &newvar); /* newvar describes the */
                                /* IDL variable "NEW" */
send_idl_command(client, "!P.T = NEW");
```

Parameters

client

A pointer to the `CLIENT` structure that corresponds to the desired IDL session.

var

The address of the `varinfo_t` structure that contains information about the variable to be set.

Return Value

This function returns a status value that denotes the success or failure of this function as described below.

- -1 = Failure: bad arguments supplied (e.g., `var` is `NULL`).
- 0 = RPC mechanism failed (an error message is also printed).

- 1 = Success

set_rpc_verbosity

Syntax

```
void set_rpc_verbosity(verbosity)
```

Description

This function controls the printing of error messages by RPC library routines. If verbosity is TRUE, error messages will be printed by the various RPC routines to explain what failed. If verbosity is FALSE, return codes continue to indicate success or failure, but no error messages are printed.

Parameters

verbosity

An `int` specifying TRUE or FALSE as explained above.

Return Value

None

unregister_idl_client

Syntax

```
void unregister_idl_client(CLIENT* client)
```

Description

Call this function to release the resources associated with the given CLIENT structure. The operating system automatically releases the resources associated with all CLIENT structures when your program exits. This function does not affect the IDL server.

Parameters

client

The pointer to the CLIENT structure to be unregistered.

Return Value

None

The `varinfo_t` Structure

The `varinfo_t` structure is used to pass variables to and from the IDL server.

The `varinfo_t` structure is defined in the `idldir/external/rpc/rpc_idl.h` file. The structure is:

```
typedef struct _VARINFO {
    char Name[MAXIDLEN+1];
    IDL_VPTR Variable;
    IDL_LONG Length;
} varinfo_t;
```

Variable Creation Functions

A number of functions are provided to help build `varinfo_t` structures. These functions are contained in the file `idldir/external/rpc/helper.c`.

The variable creation functions are described below. Unless otherwise noted, all of the following functions return `TRUE` if variable creation is successful and `FALSE` otherwise. When passing a `varinfo_t` structure pointer, if the `Variable` field is `NULL`, the variable creation functions attempt to allocate that field.

v_make_byte

Syntax

```
int v_make_byte(varinfo_t* var_struct, char* var_name,  
               unsigned value)
```

Description

Create an IDL byte variable with the given name and value.

v_make_complex

Syntax

```
int v_make_complex(varinfo_t* var_struct, char* var_name,  
                  double real_value, double imag_value)
```

Description

Create an IDL complex variable.

v_make_dcomplex

Syntax

```
int v_make_dcomplex(varinfo_t* var_struct, char* var_name,  
                   double real_value, double imag_value)
```

Description

Create an IDL double-precision complex variable.

v_make_double

Syntax

```
int v_make_double(varinfo_t* var_struct, char* var_name,  
                 double value)
```

Description

Create an IDL double-precision, floating-point variable.

v_make_float

Syntax

```
int v_make_float(varinfo_t* var_struct, char* var_name,  
                double value)
```

Description

Create an IDL single-precision, floating-point variable.

v_make_int

Syntax

```
int v_make_int(varinfo_t* var_struct, char* var_name, int value)
```

Description

Create an IDL (16-bit) integer variable.

v_make_long

Syntax

```
int v_make_long(varinfo_t* var_struct, char* var_name,  
               IDL_LONG value)
```

Description

Create an IDL long variable.

v_make_string

Syntax

```
int v_make_string(varinfo_t* var_struct, char* name,  
                 char* value)
```

Description

Create an IDL string variable.

v_fill_array

Syntax

```
int v_fill_array(varinfo_t* var, char* name, int type,
                int ndimension, IDL_LONG dims[], UCHAR* value,
                IDL_long length)
```

Description

Create an IDL array variable. The *type* argument should be one of the following values (defined in the file `export.h`):

```
IDL_TYP_BYTE, IDL_TYP_INT, IDL_TYP_LONG, IDL_TYP_FLOAT,
IDL_TYP_DOUBLE, IDL_TYP_STRING, IDL_TYP_COMPLEX, IDL_TYP_DCOMPLEX
```

This function allocates `var->Variable->value.arr`.

If `value` is `NULL` then `var->Variable->value.arr->data` is allocated.

The `dims[]` argument should have at least `ndimension` valid elements.

If `value` is supplied but `length` is 0, `var->Length` is filled with the computed size of the array (in bytes) and `value` is assumed to point to at least that many bytes of memory. If `value` and `length` are supplied, `length` is assumed to be the size (in bytes) of the region of memory that `value` points to. (See [“Notes on Variable Creation and Memory Management”](#) on page 100)

More Variable Manipulation Macros

The following macros can be used to get information from `varinfo_t` structures. Like the variable creation functions, these macros are defined in the file `rpc_idl.h`.

All of these macros accept a single argument `v` of `varinfo_t` type.

GetArrayData(*v*)

This macro returns a pointer to the array data described by the `varinfo_t` structure.

GetArrayDimensions(*v*)

This macro returns the dimensions of the array described by the `varinfo_t` structure. The dimensions are returned as `long dimensions[]`.

GetArrayNumDims(*v*)

This macro returns the number of dimensions of the array.

GetVarByte(*v*)

This macro returns the value of a 1-byte, unsigned `char` variable.

GetVarComplex(*v*)

This macro returns the value (as a *struct*, not a pointer) of a complex variable.

GetVarDComplex(*v*)

This macro returns the value (as a *struct*, not a pointer) of a double-precision, complex variable.

GetVarDouble(*v*)

This macro returns the value of a double-precision, floating-point variable.

GetVarFloat(*v*)

This macro returns the value of a single-precision, floating point variable.

GetVarInt(*v*)

This macro returns the value of a 2-byte integer variable.

GetVarLong(*v*)

This macro returns the value of a 4-byte integer variable.

GetVarString(*v*)

This macro returns the value of a string variable (as a *char**).

GetVarType(*v*)

This macro returns the type of the variable described by the `varinfo_t` structure. The type is returned as `IDL_TYP_XXX` as described under the documentation for the `get_idl_variable` function.

VarIsArray(*v*)

This macro returns non-zero if *v* is an array variable.

Notes on Variable Creation and Memory Management

This section contains miscellaneous notes about variable creation.

Freeing Resources

The variable creation functions (i.e., `v_make_xxx`) *do not* free resources associated with a variable before placing new information there. Your programs should free resources (if there are any) associated with the `varinfo_t` structure being passed.

To prevent memory leakage, memory associated with a variable is freed before new memory is allocated. You should make sure that the `varinfo_t` structure passed to the `get_idl_variable` function contains valid information or has been cleared (to zeroes) first. If an array of the same size, dimensions, and type is being read into the existing array variable, no allocation is performed and the same space is re-used. For example:

```
/* Assume that:
   X = FLTARR(1000, 1000)
   Y = FLTARR(1000, 1000)
   Z = LONARR(1000, 1000) same size, different type
*/
bzero(&vinfo, sizeof(vinfo));
get_idl_variable(client, "X", &vinfo, 0); /* array allocated */
...
get_idl_variable(client, "Y", &vinfo, 0); /* memory re-used */
...
get_idl_variable(client, "Z", &vinfo, 0); /* array allocated */
free_idl_var(&vinfo);
```

The `get_idl_variable` function calls `free_idl_var` before doing any allocation. So, in the example above, we only needed to free Z. X and Y were freed when we re-used `vinfo`.

Creating a Statically-Allocated Array

It is possible to create a statically-allocated array for receiving information from the server without having the overhead of memory reallocation every time information is received.

If the `length` field of the `varinfo_t` structure is not zero, it is assumed to be the size of the array data. The `free_idl_var` function will not do anything to a variable where `length` is non-zero. It is up to the programmer to do their own memory

management if this is the case. Storing a scalar in a static variable (i.e., a variable that has a non-zero `Length` field) fails as does attempting to store an array that does not fit the statically-allocated array. For example:

```

/* X = FLTARR(10)      40 bytes of data (10*4)
   Y = LONARR(2,2,2)  32 bytes of data(2*2*2*4)
   Z = BYTARR(50)    50 bytes of data
   W = 12             scalar
*/
char      buf[40]
varinfo_t v;
VARIABLE  var;
ARRAY     arr;
/* Build a static array. Fill in the minimum amount of */
/* information required.                                */
v.Variable = &var;
v.Length   = 40;
var.type    = IDL_TYP_BYTE;
var.flags   = V_ARR;
var.value.arr = &arr;
arr.data    = buf;
get_idl_variable(client, "X", &v, 0); /* ok */
get_idl_variable(client, "Y", &v, 0); /* ok */
get_idl_variable(client, "Z", &v, 0); /* fails - too big */
get_idl_variable(client, "W", &v, 0); /* fails - scalar */

```

Allocating Space for Strings

All space for strings is assumed to be obtained via `malloc(3)`. This fact is important only when receiving variables (using the `get_idl_variable` function). For example, the following code fragment is valid:

```

v_make_string(&foo, "UGH", "blug");
set_idl_variable(client, &foo);

```

Here is an example of code that will crash your program:

```

v_make_string(&foo, "UGH", "blug");
set_idl_variable(me, &foo);
send_idl_command(me, "UGH='hello world'");
get_idl_variable(me, "UGH", &foo, 0);

```

In this case, the `get_idl_variable` function attempts to free the old resources before allocating new storage. Freeing the constant `blug` results in an error. You could achieve the desired result without an error by changing the first line to:

```

v_make_string(&foo, "UGH", strdup("blug"));

```

RPC Examples

A number of example files are included in the `idldir/external/examples/rpc` directory. A `Makefile` for these examples is also included. These short C programs demonstrate the use of the IDL RPC library.