

SDTS_AL

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Chapter 1

ISO8211Lib

Introduction

ISO8211Lib is intended to be a simple reader for ISO/IEC 8211 formatted files, particularly those that are part of SDTS and S-57 datasets. It consists of open source, easy to compile and integrate C++ code.

ISO 8211 Background

The [ISO 8211 FAQ](#) has some good background on ISO 8211 formatted files. I will briefly introduce it here, with reference to the library classes representing the components.

An 8211 file ([DDFModule](#)) consists of a series of logical records. The first record is special, and is called the DDR (Data Description Record). It basically contains definitions of all the data objects (fields or [DDFFieldDefn](#) objects) that can occur on the following data records.

The remainder of the records are known as DRs (data records - [DDFRecord](#)). They each contain one or more field ([DDFField](#)) instances. What fields appear on what records is not defined by ISO 8211, though more specific requirements may be implied by a particular data standard such as SDTS or S-57.

Each field instance has a name, and consists of a series of subfields. A given field always has the same subfields in each field instance, and these subfields are defined in the DDR ([DDFSubfieldDefn](#)), in association with their field definition ([DDFFieldDefn](#)). A field may appear 0, 1, or many times in a DR.

Each subfield has a name, format (from the [DDFSubfieldDefn](#)) and actual subfield data for a particular DR. Some fields contain an *array* of their group of subfields. For instance a *coordinate field* may have X and Y subfields, and they may repeat many times within one coordinate field indicating a series of points.

This would be a real good place for a UML diagram of ISO 8211, and the corresponding library classes!

Development Information

The [iso8211.h](#) contains the definitions for all public ISO8211Lib classes, enumerations and other services.

To establish access to an ISO 8211 dataset, instantiate a [DDFModule](#) object, and then use the [DDFModule::Open\(\)](#) method. This will read the DDR, and establish all the [DDFFieldDefn](#), and [DDFSubfieldDefn](#) objects which can be queried off the [DDFModule](#).

The use [DDFModule::ReadRecord\(\)](#) to fetch data records ([DDFRecord](#)). When a record is read, a list of field objects ([DDFField](#)) on that record are created. They can be queried with various [DDFRecord](#) methods.

Data pointers for individual subfields of a [DDFField](#) can be fetched with [DDFField::GetSubfieldData\(\)](#). The interpreted value can then be extracted with the appropriate one of [DDFSubfieldDefn::ExtractIntValue\(\)](#), [DDFSubfieldDefn::ExtractStringValue\(\)](#), or [DDFSubfieldDefn::ExtractFloatValue\(\)](#). Note that there is no object instantiated for individual subfields of a [DDFField](#). Instead the application extracts a pointer to the subfields raw data, and then uses the [DDFSubfieldDefn](#) for that subfield to extract a usable value from the raw data.

Once the end of the file has been encountered (`DDFModule::ReadRecord()` returns NULL), the `DDFModule` should be deleted, which will close the file, and cleanup all records, definitions and related objects.

Class APIs

- `DDFModule` class.
- `DDFFieldDefn` class.
- `DDFSubfieldDefn` class.
- `DDFRecord` class.
- `DDFField` class.

A complete `Example Reader` should clarify simple use of ISO8211Lib.

Related Information

- The ISO 8211 standard can be ordered through [ISO](#). It cost me about \$200CDN.
- The [ISO/IEC 8211/DDFS Home Page](#) contains tutorials and some code by Dr. Alfred A. Brooks, one of the originators of the 8211 standard.
- The [ISO/IEC 8211 Home Page](#) has some python code for parsing 8211 files, and some other useful background.
- The [SDTS++](#) library from the USGS includes support for ISO 8211. It doesn't include some of the 1994 additions to ISO 8211, but it is sufficient for SDTS, and quite elegantly done. Also supports writing ISO 8211 files.
- The USGS also has an older [FIPS123](#) library which supports the older profile of ISO 8211 (to some extent).

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Building the Source

1. First, fetch the source. The most recent source should be accessible at an url such as <http://home.gdal.org/projects/iso8211/iso8211lib-1.4.zip>.
2. Untar the source.

```
% unzip iso8211lib-1.4.zip
```
3. On unix you can now type “configure” to establish configuration options.
4. On unix you can now type make to build libiso8211.a, and the sample mainline 8211view.

Windows developers will have to create their own makefile/project but can base it on the very simple Makefile.in provided. As well, you would need to copy cpl_config.h.in to [cpl_config.h](#), and modify as needed. The default will likely work OK, but may result in some compiler warnings. Let me know if you are having difficulties, and I will prepare a VC++ makefile.

Author and Acknowledgements

The primary author of ISO8211Lib is [Frank Warmerdam](#), and I can be reached at warmerdam@pobox.com. I am eager to receive bug reports, and also open to praise or suggestions.

I would like to thank:

- [Safe Software](#) who funded development of this library, and agreed for it to be Open Source.
- Mark Colletti, a primary author of SDTS++ from which I derived most of what I know about ISO 8211 and who was very supportive, answering a variety of questions.
- Tony J Ibbs, author of the ISO/IEC 8211 home page who answered a number of questions, and collected a variety of very useful information.
- Rodney Jenson, for a detailed bug report related to repeating variable length fields (from S-57).

I would also like to dedicate this library to the memory of Sol Katz. Sol released a variety of SDTS (and hence ISO8211) translators, at substantial personal effort, to the GIS community along with the many other generous contributions he made to the community. His example has been an inspiration to me, and I hope similar efforts on my part will contribute to his memory.

Chapter 2

sdts_al_main

<title>SDTS Abstraction Library</title>

Introduction

SDTS_AL, the SDTS Abstraction Library, is intended to be an relatively easy to use library for reading vector from SDTS TVP (Topological Vector Profile) files, primary DLG data from the USGS. It also include support for reading raster data such as USGS DEMs in SDTS format. It consists of open source, easy to compile and integrate C++ code.

SDTS Background

The USGS SDTS Page at <http://mcmweb.er.usgs.gov/sdts> is the definitive source of information on the SDTS format. The SDTS format is based on the ISO 8211 encoding scheme for the underlying files, and the SDTS Abstraction Library uses ISO8211Lib library to decode them. All references to DDF* classes are from ISO8211Lib.

An SDTS Transfer is a grouping of ISO8211 encoded files (ending in the .DDF extension), normally with part of the basename in common. For instance a USGS DLG SDTS transfer might consists of many files matching the SC01?????.DDF pattern. The key file in an SDTS transfer is the catalog file, such as SC01CATD.DDF.

Development Information

The `sdts_al.h` include file contains the definitions for all public SDTS classes, enumerations and other services.

The `SDTSTransfer` class is used to access a transfer as a whole. The `SDTSTransfer::Open()` method is passed the name of the catalog file, such as SC01CATD.DDF, to open.

The `SDTSTransfer` analyses the catalog, and some other aspects of the transfer, and builds a list of feature layers. This list can be accessed using the `SDTSTransfer::GetLayerCount()`, `SDTSTransfer::GetLayerType()`, and `SDTSTransfer::GetLayerIndexedReader()` methods. A typical TVP (Topological Vector Profile) transfer might include three point layers (of type `SLTPoint`), a line layer (of type `SLTLine`), a polygon layer (of type `SLTPoly`) as well as some additional attribute layers (of type `SLTAttr`). the `SDTSTransfer::GetLayerIndexedReader()` method can be used to instantiate a reader object for reading a particular layer. (NOTE: raster layers are handled differently).

Each type of `SDTSIndexedReader` (`SDTSPointReader`, `SDTSLineReader`, `SDTSPolygonReader`, and `SDTSAttrReader`) returns specific subclasses of `SDTSIndexedFeature` from the `SDTSIndexedReader::GetNextFeature()` method. These classes are `SDTSRawPoint`, `SDTSRawLine`, `SDTSRawPolygon` and `SDTSAttrRecord`. These classes can be investigated for details on the data available for each.

See the [SDTS_AL Tutorial](#) for more information on how to use this library.

Building the Source on Unix

1. First, fetch the source. The most recent source should be accessible at an url such as ftp://gdal.velocet.ca/pub/outgoing/sdts_1_3.tar.gz.
2. Unpack the source.


```
% gzip -d sdts_1_3.tar.gz
% tar xzvf sdts_1_3.tar.gz
```
3. Type "configure" to establish configuration options.
4. Type make to build sdts_al.a, and the sample mainline sdts2shp.

See the [SDTS_AL Tutorial](#) for more information on how to use this library.

Building the Source on Windows

1. First, fetch the source. The most recent source should be accessible at an url such as ftp://gdal.velocet.ca/pub/outgoing/sdts_1_3.zip.
2. Unpack the source.


```
C:> unzip sdts_1_3.zip
```
3. Build using makefile.vc with VC++. You will need the VC++ runtime environment variables (LIB/INCLUDE) set properly. This will build the library (sdts_al.lib), and the executables sdts2shp.exe, 8211view.exe and 8211dump.exe.

```
C:> nmake /f makefile.vc
```

See the [SDTS_AL Tutorial](#) for more information on how to use this library.

The sdts2shp Sample Program

The sdts2shp program distributed with this toolkit is primary intended to serve as an example of how to use the SDTS access library. However, it can be useful to translate SDTS datasets into ESRI Shapefile format.

```
Usage: sdts2shp CATD_filename [-o shapefile_name]
      [-m module_name] [-v]
```

Modules include 'LE01', 'PC01', 'NP01' and 'ARDF'

A typical session in which we inspect the contents of a transfer, and then extract polygon and line layers might look like this:

```
warmerda[134]% sdts2shp data/SC01CATD.DDF -v
Layers:
  ASCF: 'Attribute Primary      '
  AHDR: 'Attribute Primary      '
  NP01: 'Point-Node             '
  NA01: 'Point-Node             '
  NO01: 'Point-Node             '
  LE01: 'Line                    '
  PC01: 'Polygon                 '
```

```
warmerda[135]% sdts2shp data/SC01CATD.DDF -m PC01 -o pc01.shp
warmerda[136]% sdts2shp data/SC01CATD.DDF -m LE01 -o le01.shp
```

A [prebuilt executable](#) is available for Windows.

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Author and Acknowledgements

The primary author of SDTS_AL is [Frank Warmerdam](#), and I can be reached at warmerdam@pobox.com. I am eager to receive bug reports, and also open to praise or suggestions.

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Chapter 3

SDTS_AL_TUT

<title>SDTS Abstraction Library Tutorial</title>

This page is a walk through of the polygon layer portion of the `sdts2shp.cpp` example application. It should give sufficient information to utilize the SDTS_AL library to read SDTS files.

Opening the Transfer

The following statements will open an SDTS transfer. The filename passed to `SDTSTransfer::Open()` should be the name of the catalog file, such as `palo_alto/SC01CATD.DDF`. The `Open()` method returns `FALSE` if it fails for any reason. In addition to the message we print out ourselves, the `SDTSTransfer::Open()` method will also emit it's own error message using `CPLERROR()`. See the `cpl_error.h` page for more information on how to capture and control `CPLERROR()` style error reporting.

```
#include "stds_al.h"

...

SDTSTransfer oTransfer;

if( !oTransfer.Open( pszCATDFilename ) )
{
    fprintf( stderr,
            "Failed to read CATD file '%s'\n",
            pszCATDFilename );
    exit( 100 );
}
```

Getting a Layer List

Once an `SDTSTransfer` has been opened, it is possible to establish what layers are available. The `sdts2shp` example problem includes a `-v` argument to dump a list of available layers. It isn't normally necessary to use the `SDTS_CATD` (catalog) from an application to access SDTS files; however, in this example we use it to fetch a module name, and description for each of the available layers.

In particular, the `SDTSTransfer::GetLayerCount()` method returns the number of feature layers in the transfer and the `SDTSTransfer::GetLayerCATDEntry()` is used to translate layer indexes into `SDTS_CATD` compatible CATD indexes.

```
printf( "Layers:\n" );
for( i = 0; i < oTransfer.GetLayerCount(); i++ )
{
    int    iCATDEntry = oTransfer.GetLayerCATDEntry(i);
```

```

    printf( "   %s: '%s'\n",
            oTransfer.GetCATD()->GetEntryModule(iCATDEntry),
            oTransfer.GetCATD()->GetEntryTypeDesc(iCATDEntry) );
}
printf( "\n" );

```

The following would be a typical layer list. Note that there are many other modules (files) registered with the catalog, but only these ones are considered to be feature layers by the [SDTSTransfer](#) object. The rest are supporting information, much of it, like data quality, is ignored by the SDTS_AL library.

```

warmerda-c[113]% sdts2shp data/SC01CATD.DDF -v
Layers:
  ASCF: `Attribute Primary      '
  AHDR: `Attribute Primary      '
  NP01: `Point-Node            '
  NA01: `Point-Node            '
  NO01: `Point-Node            '
  LE01: `Line                   '
  PC01: `Polygon                '

```

Getting a Reader

In order to read polygon features, it is necessary to instantiate a polygon reader on the desired layer. The `sdts2shp.cpp` program allow the user to select a module name (such as PC01, stored in `pszMODN`) to write to shape format. Other application might just search for, and operate on all known layers of a desired type.

The [SDTSTransfer::GetLayerIndexedReader\(\)](#) method instantiates a reader of the desired type. In this case we know we are instantiating a [SDTSPolygonReader](#) so we can safely cast the returned [SDTSIndexedReader](#) pointer to the more specific type [SDTSPolygonReader](#).

```

SDTSPolygonReader *poPolyReader;

poPolyReader = (SDTSPolygonReader *)
    poTransfer->GetLayerIndexedReader( poTransfer->FindLayer( pszMODN ) );

if( poPolyReader == NULL )
{
    fprintf( stderr, "Failed to open %s.\n",
            poTransfer->GetCATD()->GetModuleFilePath( pszMODN ) );
    return;
}

```

Note that readers returned by [SDTSTransfer::GetLayerIndexedReader\(\)](#) are managed by the [SDTSTransfer](#), and should not be deleted by the application.

Collecting Polygon Geometry

The SDTS TVP format does not directly associate a polygons geometry (the points forming it's boundary) with the polygon feature. Instead it is stored in separate line layers, and the lines contain references to the right, and left polygons that the lines border.

The SDTS_AL library provides a convenient method for forming the polygon geometry. Basically just call the [SDTSPolygonReader::AssemblePolygons\(\)](#) method. This method will scan all `SLTLine` layers in the transfer, indexing them and attaching their line work to the polygons. Then it assembles the line work into rings. It also ensures that the outer ring comes first, that the outer ring is counter-clockwise and that the inner ring(s) are clockwise.

```

poPolyReader->AssembleRings( poTransfer );

```

Upon completion the [SDTSPolygonReader](#) will have been "indexed". That means that all the polygon information will have been read from disk, and the polygon objects will now have information stored with them indicating the list of edges that form their border.

Identifying Attributes

In order to create the schema for the output shapefile dataset, it is necessary to identify the attributes associated with the polygons. There are two types of attributes which can occur. The first are hardcoded attributes specific to the feature type, and the second are generic user attributes stored in a separate primary attribute layer.

In the case of [SDTSRawPolygon](#), there is only one attribute of interest, and that is the record number of the polygon. This is actually stored within the `oModId` data member of the `SDTSIndexedFeature` base class, as will be seen in later examples when we write it to disk. For now we create a DBF field for the record number. This record number is a unique identifier of the polygon within this module/layer.

```
nSDTSRecordField = DBFAddField( hDBF, "SDTSRecId", FTInteger, 8, 0 );
```

Identification of user attributes is more complicated. Any feature in a layer can have associates with 0, 1, 2 or potentially more attribute records in other primary attribute layers. In order to establish a schema for the layer it is necessary to build up a list of all attribute layers (tables) to which references appear. The [SDTSIndexedReader::ScanModuleReferences\(\)](#) method can be used to scan a whole module for references to attribute modules via the `ATID` field. The return result is a list of referenced modules in the form of a string list. In a typical case this is one or two modules, such as "ASCF".

```
char **papszModRefs = poPolyReader->ScanModuleReferences();
```

In `sdts2shp.cpp`, a subroutine (`AddPrimaryAttrToDBFSchema()`) is defined to add all the fields of all references attribute layers to the DBF file. For each module in the list the following steps are executed.

Fetch an Attribute Module Reader

The following code is similar to our code for create a polygon layer reader. It creates a reader on one of the attribute layers referenced. We explicitly rewind it since it may have been previously opened and read by another part of the application.

```
SDTSAttrReader *poAttrReader;

poAttrReader = (SDTSAttrReader *)
    poTransfer->GetLayerIndexedReader(
        poTransfer->FindLayer( papszModuleList[iModule] ) );

if( poAttrReader == NULL )
{
    printf( "Unable to open attribute module %s, skipping.\n" ,
        papszModuleList[iModule] );
    continue;
}

poAttrReader->Rewind();
```

Get a Prototype Record

In order to get access to field definitions, and in order to establish some sort of reasonable default lengths for field without fixed lengths the `sdts2shp` program fetches a prototype record from the attribute module.

```
SDTSAttrRecord *poAttrFeature;
```

```

poAttrFeature = (SDTSAttrRecord *) poAttrReader->GetNextFeature();
if( poAttrFeature == NULL )
{
    fprintf( stderr,
            "Didn't find any meaningful attribute records in %s.\n",
            papszModuleList[iModule] );

    continue;
}

```

When no longer needed, the attribute record may need to be explicitly deleted if it is not part of an indexed cached.

```

if( !poAttrReader->IsIndexed() )
    delete poAttrFeature;

```

Extract Field Definitions

The Shapefile DBF fields are defined based on the information available for each of the subfields of the attribute records ATTR **DDFField** (the poATTR data member). The following code loops over each of the subfields, getting a pointer to the DDSubfieldDefn containing information about that subfield.

```

DDFFieldDefn *poFDefn = poAttrFeature->poATTR->GetFieldDefn();
int iSF;
DDFField *poSR = poAttrFeature->poATTR;

for( iSF=0; iSF < poFDefn->GetSubfieldCount(); iSF++ )
{
    DDSubfieldDefn *poSFDefn = poFDefn->GetSubfield( iSF );

```

Then each of the significant ISO8211 field types is translated to an appropriate DBF field type. In cases where the nWidth field is zero, indicating that the field is variable width, we use the length of the field in the prototype record. Ideally we would scan the whole file to find the longest value for each field, but that would be a significant amount of work.

```

int nWidth = poSFDefn->GetWidth();

switch( poSFDefn->GetType() )
{
    case DDFString:
        if( nWidth == 0 )
        {
            int nMaxBytes;

            const char * pachData = poSR->GetSubfieldData(poSFDefn,
                                                         &nMaxBytes);

            nWidth = strlen(poSFDefn->ExtractStringData(pachData,
                                                         nMaxBytes, NULL ));
        }

        DBFAddField( hDBF, poSFDefn->GetName(), FTString, nWidth, 0 );
        break;

    case DDFInt:
        if( nWidth == 0 )
            nWidth = 9;

```

```

        DBFAddField( hDBF, poSFDefn->GetName(), FTInteger, nWidth, 0 );
        break;

    case DDFFloat:
        DBFAddField( hDBF, poSFDefn->GetName(), FTDouble, 18, 6 );
        break;

    default:
        fprintf( stderr,
            "Dropping attribute '%s' of module '%s'. "
            "Type unsupported\n",
            poSFDefn->GetName(),
            papszModuleList[iModule] );
        break;
    }
}

```

Reading Polygon Features

With definition of the attribute schema out of the way, we return to the main event, reading polygons from the polygon layer. We have already instantiated the [SDTSPolygonReader](#) (`poPolyReader`), and now we loop reading features from it. Note that we `Rewind()` the reader to ensure we are starting at the beginning. After we are done process the polygon we delete it, if and only if the layer does not have an index cache.

```

SDTSRawPolygon *poRawPoly;

poPolyReader->Rewind();
while( (poRawPoly = (SDTSRawPolygon *) poPolyReader->GetNextFeature())
    != NULL )
{
    ... process and write polygon ...

    if( !poPolyReader->IsIndexed() )
        delete poRawPoly;
}

```

Translate Geometry

In an earlier step we used the [SDTSPolygonReader::AssembleRings\(\)](#) method to build ring geometry on the polygons from the linework in the line layers.

Coincidentally (well, ok, maybe it isn't a coincidence) it so happens that the ring organization exactly matches what is needed for the shapefile api. The following call creates a polygon from the ring information in the [SDTSRawPolygon](#). See the [SDTSRawPolygon](#) reference help for a fuller definition of the `nRings`, `panRingStart`, `nVertices`, and vertex fields.

```

psShape = SHPCreateObject( SHPT_POLYGON, -1, poRawPoly->nRings,
    poRawPoly->panRingStart, NULL,
    poRawPoly->nVertices,
    poRawPoly->padfX,
    poRawPoly->padfY,
    poRawPoly->padfZ,
    NULL );

```

Write Record Number

The following call is used to write out the record number of the polygon, fetched from the `SDTSIndexedFeature::o-ModId` data member. The `szModule` value in this data field will always match the module name for the whole layer.

While not shown here, there is also an szOB RP field on oModId which have different values depending on whether the polygon is a universe or regular polygon.

```
DBFWriteIntegerAttribute( hDBF, iShape, nSDTSRecordField,
                        poRawPoly->oModId.nRecord );
```

Fetch Associated User Records

In keeping with the setting up of the schema, accessing the user records is somewhat complicated. In sdts2shp, the primary attribute records associated with any feature (including SDTSRawPolygons) can be fetched with the WriteAttrRecordToDBF() function defined as follows.

In particular, the poFeature->nAttributes member indicates how many associated attribute records there are. The poFeature->aoATID[] array contains the SDTSModId's for each record. This SDTSModId can be passed to SDTSTransfer::GetAttr() to fetch the DDFField pointer for the user attributes. The WriteAttrRecordToDBF() method is specific to sdts2shp and will be define later.

```
int    iAttrRecord;

for( iAttrRecord = 0; iAttrRecord < poFeature->nAttributes; iAttrRecord++)
{
    DDFField    *poSR;

    poSR = poTransfer->GetAttr( poFeature->aoATID+iAttrRecord );

    WriteAttrRecordToDBF( hDBF, iRecord, poTransfer, poSR );
}
```

Write User Attributes

In a manner analogous to the definition of the fields from the prototype attribute record, the following code loops over the subfields, and fetches the data for each. The data extraction via poSR->GetSubfieldData() is a bit involved, and more information can be found on the DDFField reference page.

```
/* ----- */
/*    Process each subfield in the record.          */
/* ----- */
    DDFFieldDefn    *poFDefn = poSR->GetFieldDefn();

    {
        DDFSubfieldDefn *poSFDefn = poFDefn->GetSubfield( iSF );
        int            iField;
        int            nMaxBytes;
        const char *    pachData = poSR->GetSubfieldData(poSFDefn,
                                                         &nMaxBytes);

/* ----- */
/*    Identify the related DBF field, if any.        */
/* ----- */
        for( iField = 0; iField < hDBF->nFields; iField++ )
        {
            if( EQUALN(poSFDefn->GetName(),
                      hDBF->pszHeader+iField*32,10) )
                break;
        }

        iField = -1;
```

```
/* ----- */
/*   Handle each of the types.                               */
/* ----- */

{
  case DDFString:
    const char *pszValue;

    pszValue = poSFDefn->ExtractStringData(pachData, nMaxBytes,
                                           NULL);

    DBFWriteStringAttribute(hDBF, iRecord, iField, pszValue );
    break;

  case DDFFloat:
    double dfValue;

    dfValue = poSFDefn->ExtractFloatData(pachData, nMaxBytes,
                                          NULL);

    DBFWriteDoubleAttribute( hDBF, iRecord, iField, dfValue );
    break;

  case DDFInt:
    int nValue;

    nValue = poSFDefn->ExtractIntData(pachData, nMaxBytes, NULL);

    DBFWriteIntegerAttribute( hDBF, iRecord, iField, nValue );
    break;

  default:
    break;
}
} /* next subfield */
```

Cleanup

In the case of `sdt2shp`, the [SDTSTransfer](#) is created on the stack. When it falls out of scope it is destroyed, and all the indexed readers, and their indexed features caches are also cleaned up.

Chapter 4

sdts2shp.cpp

<title>SDTS To Shape Example Application</title>

```
/* *****  
 *  
 * Project:  SDTS Translator  
 * Purpose:  Mainline for converting to ArcView Shapefiles.  
 * Author:   Frank Warmerdam, warmerdam@pobox.com  
 *  
 * *****  
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 * *****/  
  
#include "sdts_al.h"  
#include "shapefil.h"  
#include "cpl_string.h"  
  
CPL_CVSID("$Id: sdts2shp.cpp 36770 2016-12-10 01:47:26Z goatbar $");  
  
static int  bVerbose = FALSE;  
  
static void WriteLineShapefile( const char *, SDTSTransfer *,  
                               const char * );  
static void WritePointShapefile( const char *, SDTSTransfer *,  
                                 const char * );  
static void WriteAttributeDBF( const char *, SDTSTransfer *,  
                              const char * );  
static void WritePolygonShapefile( const char *, SDTSTransfer *,  
                                  const char * );  
  
static void  
AddPrimaryAttrToDBFSchema( DBFHandle hDBF, SDTSTransfer * poTransfer,  
                           char ** papszModuleList );  
  
static void  
WritePrimaryAttrToDBF( DBFHandle hDBF, int nRecord,  
                      SDTSTransfer *, SDTSFeature * poFeature );  
  
static void  
WriteAttrRecordToDBF( DBFHandle hDBF, int nRecord,  
                     SDTSTransfer *, DDFField * poAttributes );  
  
/* *****/  
/*                               Usage()                               */  
/* *****/  
  
static void Usage()
```

```

{
    printf( "Usage: sdts2shp CATD_filename [-o shapefile_name]\n" /*ok*/
           "          [-m module_name] [-v]\n"
           "\n"
           "Modules include 'LE01', 'PC01', 'NP01' and 'ARDF'\n" );
    exit( 1 );
}

/* ***** */
/*          main()          */
/* ***** */

int main( int nArgc, char ** papszArgv )
{
    {
        int          i;
        const char  *pszCATDFilename = NULL;
        const char  *pszMODN = "LE01";
        char        *pszShapefile = "sdts_out.shp";
        SDTSTransfer oTransfer;

/* ----- */
/* Interpret commandline switches.          */
/* ----- */
        if( nArgc < 2 )
            Usage();

        pszCATDFilename = papszArgv[1];

        for( i = 2; i < nArgc; i++ )
        {
            if( EQUAL(papszArgv[i],"-m") && i+1 < nArgc )
                pszMODN = papszArgv[i+1];
            else if( EQUAL(papszArgv[i],"-o") && i+1 < nArgc )
                pszShapefile = papszArgv[i+1];
            else if( EQUAL(papszArgv[i],"-v") )
                bVerbose = TRUE;
            else
            {
                printf( "Incomplete, or unsupported option '%s'\n\n",/*ok*/
                       papszArgv[i] );
                Usage();
            }
        }

/* ----- */
/* Message shapefile name to have no extension.          */
/* ----- */
        pszShapefile = CPLStrdup(pszShapefile);
        for( i = strlen(pszShapefile)-1; i >= 0; i-- )
        {
            if( pszShapefile[i] == '.' )
            {
                pszShapefile[i] = '\0';
                break;
            }
            else if( pszShapefile[i] == '/' || pszShapefile[i] == '\\' )
                break;
        }

/* ----- */
/* Open the transfer.          */
/* ----- */
        if( !oTransfer.Open( pszCATDFilename ) )
        {
            fprintf( stderr,
                    "Failed to read CATD file '%s'\n",
                    pszCATDFilename );
            exit( 100 );
        }

/* ----- */
/* Dump available layer in verbose mode.          */
/* ----- */
        if( bVerbose )
        {
            printf( "Layers:\n" );/*ok*/
            for( i = 0; i < oTransfer.GetLayerCount(); i++ )
            {
                int          iCATDEntry = oTransfer.GetLayerCATDEntry(i);

                printf( " %s: '%s'\n",/*ok*/
                       oTransfer.GetCATD()->GetEntryModule(iCATDEntry),
                       oTransfer.GetCATD()->GetEntryTypeDesc(iCATDEntry) );
            }
        }
    }
}

```

```

        printf( "\n" );/*ok*/
    }

/* ----- */
/*     Check that module exists.                               */
/* ----- */
    if( oTransfer.FindLayer( pszMODN ) == -1 )
    {
        fprintf( stderr, "Unable to identify module: %s\n", pszMODN );
        exit( 1 );
    }

/* ----- */
/*     If the module is an LE module, write it to an Arc file. */
/* ----- */
    if( pszMODN[0] == 'L' || pszMODN[0] == 'l' )
    {
        WriteLineShapefile( pszShapefile, &oTransfer, pszMODN );
    }

/* ----- */
/*     If the module is an attribute primary one, dump to DBF. */
/* ----- */
    else if( pszMODN[0] == 'A' || pszMODN[0] == 'a'
            || pszMODN[0] == 'B' || pszMODN[0] == 'b' )
    {
        WriteAttributeDBF( pszShapefile, &oTransfer, pszMODN );
    }

/* ----- */
/*     If the module is a point one, dump to Shapefile.       */
/* ----- */
    else if( pszMODN[0] == 'N' || pszMODN[0] == 'n' )
    {
        WritePointShapefile( pszShapefile, &oTransfer, pszMODN );
    }

/* ----- */
/*     If the module is a polygon one, dump to Shapefile.     */
/* ----- */
    else if( pszMODN[0] == 'P' || pszMODN[0] == 'p' )
    {
        WritePolygonShapefile( pszShapefile, &oTransfer, pszMODN );
    }

    else
    {
        fprintf( stderr, "Unrecognized module name: %s\n", pszMODN );
    }

    CPLFree( pszShapefile );
}
#ifdef DBMALLOC
    malloc_dump(1);
#endif
}

/* ***** */
/*     WriteLineShapefile()                                     */
/* ***** */

static void WriteLineShapefile( const char * pszShapefile,
                               SDTSTransfer * poTransfer,
                               const char * pszMODN )
{
/* ----- */
/*     Fetch a reference to the indexed Pointgon reader.       */
/* ----- */
    SDTSLineReader *poLineReader = (SDTSLineReader *)
        poTransfer->GetLayerIndexedReader( poTransfer->
            FindLayer( pszMODN ) );

    if( poLineReader == NULL )
    {
        fprintf( stderr, "Failed to open %s.\n",
            poTransfer->GetCATD()->GetModuleFilePath( pszMODN ) );
        return;
    }

    poLineReader->Rewind();

/* ----- */
/*     Create the Shapefile.                                   */
/* ----- */
    SHPHandle    hSHP;

```

```

hSHP = SHPCreate( pszShapefile, SHPT_ARC );
if( hSHP == NULL )
{
    fprintf( stderr, "Unable to create shapefile '%s'\n",
            pszShapefile );
    return;
}

/* ----- */
/*      Create the database file, and our basic set of attributes.      */
/* ----- */
DBFHandle    hDBF;
int          nLeftPolyField, nRightPolyField;
int          nStartNodeField, nEndNodeField, nSDTSRecordField;
char         szDBFFilename[1024];

sprintf( szDBFFilename, "%s.dbf", pszShapefile );

hDBF = DBFCreate( szDBFFilename );
if( hDBF == NULL )
{
    fprintf( stderr, "Unable to create shapefile .dbf for '%s'\n",
            pszShapefile );
    return;
}

nSDTSRecordField = DBFAddField( hDBF, "SDTSRecId", FTInteger, 8, 0 );
nLeftPolyField = DBFAddField( hDBF, "LeftPoly", FTString, 12, 0 );
nRightPolyField = DBFAddField( hDBF, "RightPoly", FTString, 12, 0 );
nStartNodeField = DBFAddField( hDBF, "StartNode", FTString, 12, 0 );
nEndNodeField = DBFAddField( hDBF, "EndNode", FTString, 12, 0 );

char **papszModRefs = poLineReader->ScanModuleReferences();
AddPrimaryAttrToDBFSchema( hDBF, poTransfer, papszModRefs );
CSLDestroy( papszModRefs );

/* ----- */
/*      Process all the line features in the module.                    */
/* ----- */
SDTSRawLine *poRawLine = NULL;

while( (poRawLine = poLineReader->GetNextLine()) != NULL )
{
    /* ----- */
    /*      Write out a shape with the vertices.                        */
    /* ----- */
    SHPObject *psShape =
        SHPCreateSimpleObject( SHPT_ARC, poRawLine->nVertices,
                              poRawLine->padfX, poRawLine->padfY,
                              poRawLine->padfZ );

    int iShape = SHPWriteObject( hSHP, -1, psShape );

    SHPDestroyObject( psShape );

    /* ----- */
    /*      Write out the attributes.                                    */
    /* ----- */
    char    szID[13];

    DBFWriteIntegerAttribute( hDBF, iShape, nSDTSRecordField,
                              poRawLine->oModId.nRecord );

    sprintf( szID, "%s:%d",
            poRawLine->oLeftPoly.szModule,
            poRawLine->oLeftPoly.nRecord );
    DBFWriteStringAttribute( hDBF, iShape, nLeftPolyField, szID );

    sprintf( szID, "%s:%d",
            poRawLine->oRightPoly.szModule,
            poRawLine->oRightPoly.nRecord );
    DBFWriteStringAttribute( hDBF, iShape, nRightPolyField, szID );

    sprintf( szID, "%s:%d",
            poRawLine->oStartNode.szModule,
            poRawLine->oStartNode.nRecord );
    DBFWriteStringAttribute( hDBF, iShape, nStartNodeField, szID );

    sprintf( szID, "%s:%d",
            poRawLine->oEndNode.szModule,
            poRawLine->oEndNode.nRecord );
    DBFWriteStringAttribute( hDBF, iShape, nEndNodeField, szID );

    WritePrimaryAttrToDBF( hDBF, iShape, poTransfer, poRawLine );

    if( !poLineReader->IsIndexed() )
        delete poRawLine;
}

```

```

    }

/* ----- */
/*      Close, and cleanup.                               */
/* ----- */
    DBFClose( hDBF );
    SHPClose( hSHP );
}

/* ----- */
/*      WritePointShapefile()                             */
/* ----- */
static void WritePointShapefile( const char * pszShapefile,
                                SDTSTransfer * poTransfer,
                                const char * pszMODN )

{
/* ----- */
/*      Fetch a reference to the indexed Pointgon reader.  */
/* ----- */
    SDTSPointReader *poPointReader = (SDTSPointReader *)
        poTransfer->GetLayerIndexedReader( poTransfer->
            FindLayer( pszMODN ) );

    if( poPointReader == NULL )
    {
        fprintf( stderr, "Failed to open %s.\n",
            poTransfer->GetCATD()->GetModuleFilePath( pszMODN ) );
        return;
    }

    poPointReader->Rewind();

/* ----- */
/*      Create the Shapefile.                               */
/* ----- */
    SHPHandle hSHP;

    hSHP = SHPCreate( pszShapefile, SHPT_POINT );
    if( hSHP == NULL )
    {
        fprintf( stderr, "Unable to create shapefile '%s'\n",
            pszShapefile );
        return;
    }

/* ----- */
/*      Create the database file, and our basic set of attributes. */
/* ----- */
    DBFHandle hDBF;
    int nAreaField, nSDTSRecordField;
    char szDBFFilename[1024];

    sprintf( szDBFFilename, "%s.dbf", pszShapefile );

    hDBF = DBFCreate( szDBFFilename );
    if( hDBF == NULL )
    {
        fprintf( stderr, "Unable to create shapefile .dbf for '%s'\n",
            pszShapefile );
        return;
    }

    nSDTSRecordField = DBFAddField( hDBF, "SDTSRecId", FTInteger, 8, 0 );
    nAreaField = DBFAddField( hDBF, "AreaId", FTString, 12, 0 );

    char **papszModRefs = poPointReader->ScanModuleReferences();
    AddPrimaryAttrToDBFSchema( hDBF, poTransfer, papszModRefs );
    CSLDestroy( papszModRefs );

/* ===== */
/*      Process all the line features in the module.         */
/* ===== */
    SDTSRawPoint *poRawPoint = NULL;

    while( (poRawPoint = poPointReader->GetNextPoint()) != NULL )
    {
/* ----- */
/*      Write out a shape with the vertices.                 */
/* ----- */
        SHPObject *psShape =
            SHPCreateSimpleObject( SHPT_POINT, 1,
                &(poRawPoint->dfX),
                &(poRawPoint->dfY),
                &(poRawPoint->dfZ) );

```

```

int iShape = SHPWriteObject( hSHP, -1, psShape );

SHPDestroyObject( psShape );

/* ----- */
/* Write out the attributes. */
/* ----- */
char    szID[13];

DBFWriteIntegerAttribute( hDBF, iShape, nSDTSRecordField,
                          poRawPoint->oModId.nRecord );

sprintf( szID, "%s:%d",
          poRawPoint->oAreaId.szModule,
          poRawPoint->oAreaId.nRecord );
DBFWriteStringAttribute( hDBF, iShape, nAreaField, szID );

WritePrimaryAttrToDBF( hDBF, iShape, poTransfer, poRawPoint );

if( !poPointReader->IsIndexed() )
    delete poRawPoint;
}

/* ----- */
/* Close, and cleanup. */
/* ----- */
DBFClose( hDBF );
SHPClose( hSHP );
}

/* ***** */
/* WriteAttributeDBF() */
/* ***** */

static void WriteAttributeDBF( const char * pszShapefile,
                              SDTSTransfer * poTransfer,
                              const char * pszMODN )

{
/* ----- */
/* Fetch a reference to the indexed Pointgon reader. */
/* ----- */
SDTSAttrReader *poAttrReader = (SDTSAttrReader *)
    poTransfer->GetLayerIndexedReader( poTransfer->
        FindLayer( pszMODN ) );

if( poAttrReader == NULL )
{
    fprintf( stderr, "Failed to open %s.\n",
            poTransfer->GetCATD()->GetModuleFilePath( pszMODN ) );
    return;
}

poAttrReader->Rewind();

/* ----- */
/* Create the database file, and our basic set of attributes. */
/* ----- */
DBFHandle    hDBF;
char        szDBFFilename[1024];

sprintf( szDBFFilename, "%s.dbf", pszShapefile );

hDBF = DBFCreate( szDBFFilename );
if( hDBF == NULL )
{
    fprintf( stderr, "Unable to create shapefile .dbf for '%s'\n",
            pszShapefile );
    return;
}

DBFAddField( hDBF, "SDTSRecId", FTInteger, 8, 0 );

/* ----- */
/* Prepare the schema. */
/* ----- */
char        **papszMODNList = CSLAddString( NULL, pszMODN );

AddPrimaryAttrToDBFSchema( hDBF, poTransfer, papszMODNList );

CSLDestroy( papszMODNList );

/* ===== */
/* Process all the records in the module. */
/* ===== */
SDTSAttrRecord *poRecord = NULL;
int iRecord = 0;

```

```

while( (poRecord = (SDTSAttrRecord*)poAttrReader->
  GetNextFeature()
    != NULL )
  {
    DBFWriteIntegerAttribute( hDBF, iRecord, 0,
      poRecord->oModId.nRecord );

    WriteAttrRecordToDBF( hDBF, iRecord, poTransfer, poRecord->poATTR );

    if( !poAttrReader->IsIndexed() )
      delete poRecord;

    iRecord++;
  }

/* ----- */
/*      Close, and cleanup.                               */
/* ----- */
DBFClose( hDBF );
}

/* ***** */
/*      WritePolygonShapefile()                             */
/* ***** */

static void WritePolygonShapefile( const char * pszShapefile,
                                   SDTSTransfer * poTransfer,
                                   const char * pszMODN )

{
/* ----- */
/*      Fetch a reference to the indexed polygon reader.    */
/* ----- */
SDTSPolygonReader *poPolyReader = (SDTSPolygonReader *)
  poTransfer->GetLayerIndexedReader( poTransfer->
    FindLayer( pszMODN ) );

if( poPolyReader == NULL )
  {
    fprintf( stderr, "Failed to open %s.\n",
      poTransfer->GetCATD()->GetModuleFilePath( pszMODN ) );
    return;
  }

/* ----- */
/*      Assemble polygon geometries from all the line layers. */
/* ----- */
poPolyReader->AssembleRings( poTransfer, poTransfer->FindLayer( pszMODN ) );

/* ----- */
/*      Create the Shapefile.                               */
/* ----- */
SHPHandle  hSHP;

hSHP = SHPCreate( pszShapefile, SHPT_POLYGON );
if( hSHP == NULL )
  {
    fprintf( stderr, "Unable to create shapefile '%s'\n",
      pszShapefile );
    return;
  }

/* ----- */
/*      Create the database file, and our basic set of attributes. */
/* ----- */
DBFHandle  hDBF;
int        nSDTSRecordField;
char       szDBFFilename[1024];

sprintf( szDBFFilename, "%s.dbf", pszShapefile );

hDBF = DBFCreate( szDBFFilename );
if( hDBF == NULL )
  {
    fprintf( stderr, "Unable to create shapefile .dbf for '%s'\n",
      pszShapefile );
    return;
  }

nSDTSRecordField = DBFAddField( hDBF, "SDTSRecId", FTInteger, 8, 0 );

char **papszModRefs = poPolyReader->ScanModuleReferences();
AddPrimaryAttrToDBFSchema( hDBF, poTransfer, papszModRefs );
CSLDestroy( papszModRefs );

/* ===== */

```

```

/*      Process all the polygon features in the module.      */
/* ===== */
poPolyReader->Rewind();

SDTSRawPolygon *poRawPoly = NULL;
while( (poRawPoly = (SDTSRawPolygon *) poPolyReader->
GetNextFeature())
      != NULL )
{
/* ----- */
/*      Write out a shape with the vertices.      */
/* ----- */
  SHPObject *psShape =
    SHPCreateObject( SHPT_POLYGON, -1, poRawPoly->nRings,
                    poRawPoly->panRingStart, NULL,
                    poRawPoly->nVertices,
                    poRawPoly->padfX,
                    poRawPoly->padfY,
                    poRawPoly->padfZ,
                    NULL );

  int iShape = SHPWriteObject( hSHP, -1, psShape );

  SHPDestroyObject( psShape );

/* ----- */
/*      Write out the attributes.      */
/* ----- */
  DBFWriteIntegerAttribute( hDBF, iShape, nSDTSRecordField,
                           poRawPoly->oModId.nRecord );
  WritePrimaryAttrToDBF( hDBF, iShape, poTransfer, poRawPoly );

  if( !poPolyReader->IsIndexed() )
    delete poRawPoly;
}

/* ----- */
/*      Close, and cleanup.      */
/* ----- */
  DBFClose( hDBF );
  SHPClose( hSHP );
}

/* ===== */
/*      AddPrimaryAttrToDBF()      */
/* ===== */
/*      Add the fields from all the given primary attribute modules      */
/*      to the schema of the passed DBF file.      */
/* ===== */

static void
AddPrimaryAttrToDBFSchema( DBFHandle hDBF, SDTSTransfer *poTransfer,
                          char ** papszModuleList )
{
  for( int iModule = 0;
        papszModuleList != NULL && papszModuleList[iModule] != NULL;
        iModule++ )
  {
/* ----- */
/*      Get a reader on the desired module.      */
/* ----- */
    SDTSAttrReader *poAttrReader = (SDTSAttrReader *)
      poTransfer->GetLayerIndexedReader(
        poTransfer->FindLayer( papszModuleList[iModule] ) );

    if( poAttrReader == NULL )
    {
      printf( "Unable to open attribute module %s, skipping.\n" , /*ok*/
             papszModuleList[iModule] );
      continue;
    }

    poAttrReader->Rewind();

/* ----- */
/*      Read the first record so we can clone schema information off      */
/*      of it.      */
/* ----- */
    SDTSAttrRecord *poAttrFeature =
      (SDTSAttrRecord *) poAttrReader->GetNextFeature();
    if( poAttrFeature == NULL )
    {
      fprintf( stderr,
              "Didn't find any meaningful attribute records in %s.\n",
              papszModuleList[iModule] );
    }
  }
}

```

```

        continue;
    }

/* ----- */
/* Clone schema off the first record. Eventually we need to */
/* get the information out of the DDR record, but it isn't */
/* clear to me how to accomplish that with the SDTS++ API. */
/* ----- */
/* The following approach may fail (dramatically) if some */
/* records do not include all subfields. Furthermore, no */
/* effort is made to make DBF field names unique. The SDTS */
/* attributes often have names much beyond the 14 character dbf */
/* limit which may result in non-unique attributes. */
/* ----- */
    DDFFieldDefn *poFDefn = poAttrFeature->poATTR->
    GetFieldDefn();
    int iSF;
    DDFField *poSR = poAttrFeature->poATTR;

    for( iSF=0; iSF < poFDefn->GetSubfieldCount(); iSF++ )
    {
        DDFSubfieldDefn *poSFDefn = poFDefn->GetSubfield( iSF );
        int nWidth = poSFDefn->GetWidth();

        switch( poSFDefn->GetType() )
        {
        case DDFString:
            if( nWidth == 0 )
            {
                int nMaxBytes;

                const char * pachData = poSR->GetSubfieldData( poSFDefn,
                                                                &nMaxBytes);

                nWidth = strlen( poSFDefn->ExtractStringData( pachData,
                                                                nMaxBytes, NULL ));
            }

            DBFAddField( hDBF, poSFDefn->GetName(), FTString, nWidth, 0 );
            break;

        case DDFInt:
            if( nWidth == 0 )
                nWidth = 9;

            DBFAddField( hDBF, poSFDefn->GetName(), FTInteger, nWidth, 0 );
            break;

        case DDFFloat:
            DBFAddField( hDBF, poSFDefn->GetName(), FTDouble, 18, 6 );
            break;

        default:
            fprintf( stderr,
                    "Dropping attribute '%s' of module '%s'. "
                    "Type unsupported\n",
                    poSFDefn->GetName(),
                    papszModuleList[iModule] );

            break;
        }
    }

    if( !poAttrReader->IsIndexed() )
        delete poAttrFeature;
} /* next module */

/* ----- */
/* WritePrimaryAttrToDBF() */
/* ----- */

static void
WritePrimaryAttrToDBF( DBFHandle hDBF, int iRecord,
                      SDTSTransfer * poTransfer, SDTSFeature * poFeature )
{
/* ----- */
/* Loop over all the attribute records linked to this feature. */
/* ----- */
    for( int iAttrRecord = 0;
         iAttrRecord < poFeature->nAttributes;
         iAttrRecord++ )
    {
        DDFField *poSR = poTransfer->GetAttr( poFeature->paoATID+iAttrRecord );

        WriteAttrRecordToDBF( hDBF, iRecord, poTransfer, poSR );
    }
}

```

```

}

/* *****
/*                               WriteAttrRecordToDBF()                               */
/* *****

static void
WriteAttrRecordToDBF( DBFHandle hDBF, int iRecord,
                    SDTSTransfer * poTransfer, DDFField * poSR )

{
/* ----- */
/*   Process each subfield in the record.   */
/* ----- */
    DDFFieldDefn      *poFDefn = poSR->GetFieldDefn();

    for( int iSF=0; iSF < poFDefn->GetSubfieldCount(); iSF++ )
    {
        DDFSubfieldDefn *poSFDefn = poFDefn->GetSubfield( iSF );
        int              iField;
        int              nMaxBytes;
        const char *     pachData = poSR->GetSubfieldData(poSFDefn,
                                                         &nMaxBytes);

/* ----- */
/*   Identify the related DBF field, if any.   */
/* ----- */
        for( iField = 0; iField < hDBF->nFields; iField++ )
        {
            if( EQUALN(poSFDefn->GetName(),
                    hDBF->pszHeader+iField*32,10) )
                break;
        }

        if( iField == hDBF->nFields )
            iField = -1;

/* ----- */
/*   Handle each of the types.   */
/* ----- */
        switch( poSFDefn->GetType() )
        {
            case DDFString:
                const char *pszValue
                    = poSFDefn->ExtractStringData( pachData, nMaxBytes, NULL);

                if( iField != -1 )
                    DBFWriteStringAttribute( hDBF, iRecord, iField, pszValue );
                break;

            case DDFFloat:
                double      dfValue;

                dfValue = poSFDefn->ExtractFloatData( pachData, nMaxBytes,
                                                    NULL);

                if( iField != -1 )
                    DBFWriteDoubleAttribute( hDBF, iRecord, iField, dfValue );
                break;

            case DDFInt:
                int          nValue;

                nValue = poSFDefn->ExtractIntData( pachData, nMaxBytes, NULL);

                if( iField != -1 )
                    DBFWriteIntegerAttribute( hDBF, iRecord, iField, nValue );
                break;

            default:
                break;
        }
    } /* next subfield */
}

```

Chapter 5

ISO8211_Example

```
/* *****
 *
 * Project:   SDTS Translator
 * Purpose:  Example program dumping data in 8211 data to stdout.
 * Author:   Frank Warmerdam, warmerdam@pobox.com
 *
 * *****
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 *
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 * *****/

#include <stdio.h>
#include "iso8211.h"

#include <algorithm>

CPL_CVSID("$Id: 8211view.cpp 36352 2016-11-20 22:31:49Z rouault $");

static void ViewRecordField( DDFField * poField );
static int ViewSubfield( DDFSubfieldDefn *poSFDefn,
                        const char * pachFieldData,
                        int nBytesRemaining );

/* *****/
/*                               main()                               */
/* *****/

int main( int nArgc, char ** papszArgv )

{
    DDFModule   oModule;
    const char *pszFilename = NULL;
    int         bFSPTHack = FALSE;

    for( int iArg = 1; iArg < nArgc; iArg++ )
    {
        if( EQUAL(papszArgv[iArg], "-fspt_repeating") )
            bFSPTHack = TRUE;
        else
            pszFilename = papszArgv[iArg];
    }

    if( pszFilename == NULL )
    {
        printf( "Usage: 8211view filename\n" );
        exit( 1 );
    }
}
```

```

}

/* ----- */
/*   Open the file. Note that by default errors are reported to   */
/*   stderr, so we don't bother doing it ourselves.             */
/* ----- */
if( !oModule.Open( pszFilename ) )
{
    exit( 1 );
}

if( bFSPTHack )
{
    DDFFieldDefn *poFSPT = oModule.FindFieldDefn( "FSPT" );

    if( poFSPT == NULL )
        fprintf( stderr,
                "unable to find FSPT field to set repeating flag.\n" );
    else
        poFSPT->SetRepeatingFlag( TRUE );
}

/* ----- */
/*   Loop reading records till there are none left.             */
/* ----- */
DDFRecord *poRecord = NULL;
int iRecord = 0;

while( (poRecord = oModule.ReadRecord()) != NULL )
{
    printf( "Record %d (%d bytes)\n",
           ++iRecord, poRecord->GetDataSize() );

    /* ----- */
    /*   Loop over each field in this particular record.         */
    /* ----- */
    for( int iField = 0; iField < poRecord->GetFieldCount(); iField++ )
    {
        DDFField *poField = poRecord->GetField( iField );

        ViewRecordField( poField );
    }
}

/* ***** */
/*   ViewRecordField()                                         */
/*   Dump the contents of a field instance in a record.       */
/* ***** */
static void ViewRecordField( DDFField * poField )
{
    DDFFieldDefn *poFieldDefn = poField->GetFieldDefn();

    // Report general information about the field.
    printf( "   Field %s: %s\n",
           poFieldDefn->GetName(), poFieldDefn->GetDescription() );

    // Get pointer to this fields raw data. We will move through
    // it consuming data as we report subfield values.

    const char *pachFieldData = poField->GetData();
    int nBytesRemaining = poField->GetDataSize();

    /* ----- */
    /*   Loop over the repeat count for this fields            */
    /*   subfields. The repeat count will almost               */
    /*   always be one.                                        */
    /* ----- */
    for( int iRepeat = 0; iRepeat < poField->GetRepeatCount(); iRepeat++ )
    {
        /* ----- */
        /*   Loop over all the subfields of this field, advancing */
        /*   the data pointer as we consume data.                 */
        /* ----- */
        for( int iSF = 0; iSF < poFieldDefn->GetSubfieldCount(); iSF++ )
        {
            DDFSubfieldDefn *poSFDefn = poFieldDefn->GetSubfield( iSF );
            int nBytesConsumed =
                ViewSubfield( poSFDefn, pachFieldData, nBytesRemaining );

            nBytesRemaining -= nBytesConsumed;
            pachFieldData += nBytesConsumed;
        }
    }
}

```

```

}
}

/* *****
/*                               ViewSubfield()                               */
/* *****

static int ViewSubfield( DDFSubfieldDefn *poSFDefn,
                        const char * pachFieldData,
                        int nBytesRemaining )

{
    int          nBytesConsumed = 0;

    switch( poSFDefn->GetType() )
    {
        case DDFInt:
            if( poSFDefn->GetBinaryFormat() == DDFSubfieldDefn::UInt )
                printf( "          %s = %u\n",
                    poSFDefn->GetName(),
                    static_cast<unsigned int>(
                        poSFDefn->ExtractIntData( pachFieldData, nBytesRemaining,
                                                &nBytesConsumed ) ) );
            else
                printf( "          %s = %d\n",
                    poSFDefn->GetName(),
                    poSFDefn->ExtractIntData( pachFieldData, nBytesRemaining,
                                                &nBytesConsumed ) );
            break;

        case DDFFloat:
            printf( "          %s = %f\n",
                poSFDefn->GetName(),
                poSFDefn->ExtractFloatData( pachFieldData, nBytesRemaining,
                                            &nBytesConsumed ) );
            break;

        case DDFString:
            printf( "          %s = '%s'\n",
                poSFDefn->GetName(),
                poSFDefn->ExtractStringData( pachFieldData, nBytesRemaining,
                                            &nBytesConsumed ) );
            break;

        case DDFBinaryString:
            {
                int i;
                //rjensen 19-Feb-2002 5 integer variables to decode NAME and LNAM
                int vrid_rcnm=0;
                int vrid_rcid=0;
                int foid_agen=0;
                int foid_find=0;
                int foid_fids=0;

                GByte *pabyBString = (GByte *)
                    poSFDefn->ExtractStringData( pachFieldData, nBytesRemaining,
                                                &nBytesConsumed );

                printf( "          %s = 0x", poSFDefn->GetName() );
                for( i = 0; i < std::min(nBytesConsumed, 24); i++ )
                    printf( "%02X", pabyBString[i] );

                if( nBytesConsumed > 24 )
                    printf( "%s", "..." );

                // rjensen 19-Feb-2002 S57 quick hack. decode NAME and LNAM bitfields
                if ( EQUAL(poSFDefn->GetName(), "NAME") )
                {
                    vrid_rcnm=pabyBString[0];
                    vrid_rcid=pabyBString[1] + (pabyBString[2]*256)+
                        (pabyBString[3]*65536)+ (pabyBString[4]*16777216);
                    printf("\tvRID RCNM = %d,RCID = %d",vrid_rcnm,vrid_rcid);
                }
                else if ( EQUAL(poSFDefn->GetName(), "LNAM") )
                {
                    foid_agen=pabyBString[0] + (pabyBString[1]*256);
                    foid_find=pabyBString[2] + (pabyBString[3]*256)+
                        (pabyBString[4]*65536)+ (pabyBString[5]*16777216);
                    foid_fids=pabyBString[6] + (pabyBString[7]*256);
                    printf("\tFOID AGEN = %d,FIDN = %d,FIDS = %d",
                        foid_agen,foid_find,foid_fids);
                }
            }

            printf( "\n" );
        }
        break;
    }
}

```

```
    return nBytesConsumed;  
}
```

Chapter 6

Deprecated List

Member [CPL_LSBINT16PTR](#) (x)

Use rather `CPL_LSBSINT16PTR` or `CPL_LSBUINT16PTR` for explicit signedness.

Member [CPL_LSBINT32PTR](#) (x)

Use rather `CPL_LSBSINT32PTR` or `CPL_LSBUINT32PTR` for explicit signedness.

Chapter 7

Hierarchical Index

7.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

_CPL_SHA256Context	??
_CPLHashSet	??
_CPLList	??
_CPLLock	??
_CPLQuadTree	??
_CPLSpawnedProcess	??
_CPLSpinLock	??
_MutexLinkedElt	??
_QuadTreeNode	??
CPL_SHA1Context	??
CPLErrorContext	??
CPLHTTPResult	??
CPLMimePart	??
CPLODBCDriverInstaller	??
CPLODBCSession	??
CPLODBCStatement	??
CPLRectObj	??
CPLSharedFileInfo	??
CPLSharedFileInfoExtra	??
CPLStdCallThreadInfo	??
CPLVirtualMem	??
CPLWorkerThread	??
CPLWorkerThreadJob	??
CPLWorkerThreadPool	??
CPLXMLNode	??
CPLZip	??
ctb	??
curfile_info	??
DDFField	??
DDFFieldDefn	??
DDFModule	??
DDFRecord	??
DDFSubfieldDefn	??
DefaultCSVFileNameTLS	??
errHandler	??
file_in_zip_read_info_s	??
FindFileTLS	??
GDALPamDataset	

SDTSDataset	??
GDALPamRasterBand	
SDTSRasterBand	??
GDALScaledProgressInfo	??
linkedlist_data_s	??
linkedlist_datablock_internal_s	??
ParseContext	??
SDTS_CATD	??
SDTS_CATDEntry	??
SDTS_IREF	??
SDTS_XREF	??
SDTSFeature	??
SDTSAttrRecord	??
SDTSRawLine	??
SDTSRawPoint	??
SDTSRawPolygon	??
SDTSIndexedReader	??
SDTSAttrReader	??
SDTSLineReader	??
SDTSPointReader	??
SDTSPolygonReader	??
SDTSModId	??
SDTSRasterReader	??
SDTSTransfer	??
SFFRegion	??
StackContext	??
tm_unz_s	??
tm_zip_s	??
TupleEnvVarOptionName	??
unz_file_info_internal_s	??
unz_file_info_s	??
unz_file_pos_s	??
unz_global_info_s	??
unz_s	??
VSIArchiveContent	??
VSIArchiveEntry	??
VSIArchiveEntryFileOffset	??
VSIArchiveReader	??
VSIDIR	??
VSIErrorContext	??
VSIFileManager	??
VSIFilesystemHandler	??
VSIArchiveFilesystemHandler	??
VSI DummyCryptFilesystemHandler	??
VSI SparseFileFilesystemHandler	??
VSI SubFileFilesystemHandler	??
VSIReadDirRecursiveTask	??
VSVirtualHandle	??
VSI SparseFileHandle	??
VSI SubFileHandle	??
zip_fileinfo	??
zip_internal	??
zlib_filefunc_def_s	??

Chapter 8

Class Index

8.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

_CPL_SHA256Context	??
_CPLHashSet	??
_CPLList	??
_CPLLock	??
_CPLQuadTree	??
_CPLSpawnedProcess	??
_CPLSpinLock	??
_MutexLinkedElt	??
_QuadTreeNode	??
CPL_SHA1Context	??
CPLErrorContext	??
CPLHTTPResult	??
CPLMimePart	??
CPLODBCDriverInstaller	??
CPLODBCSession	??
CPLODBCStatement	??
CPLRectObj	??
CPLSharedFileInfo	??
CPLSharedFileInfoExtra	??
CPLStdCallThreadInfo	??
CPLVirtualMem	??
CPLWorkerThread	??
CPLWorkerThreadJob	??
CPLWorkerThreadPool	??
CPLXMLNode	??
CPLZip	??
ctb	??
curfile_info	??
DDFField	??
DDFFieldDefn	??
DDFModule	??
DDFRecord	??
DDFSubfieldDefn	??
DefaultCSVFileNameTLS	??
errHandler	??
file_in_zip_read_info_s	??
FindFileTLS	??
GDALScaledProgressInfo	??

linkedList_data_s	??
linkedList_datablock_internal_s	??
ParseContext	??
SDTS_CATD	??
SDTS_CATDEntry	??
SDTS_IREF	??
SDTS_XREF	??
SDTSAttrReader	??
SDTSAttrRecord	??
SDTSDataset	??
SDTSFeature	??
SDTSIndexedReader	??
SDTSLineReader	??
SDTSModId	??
SDTSPointReader	??
SDTSPolygonReader	??
SDTSRasterBand	??
SDTSRasterReader	??
SDTSRawLine	??
SDTSRawPoint	??
SDTSRawPolygon	??
SDTSTransfer	??
SFRegion	??
StackContext	??
tm_unz_s	??
tm_zip_s	??
TupleEnvVarOptionName	??
unz_file_info_internal_s	??
unz_file_info_s	??
unz_file_pos_s	??
unz_global_info_s	??
unz_s	??
VSIArchiveContent	??
VSIArchiveEntry	??
VSIArchiveEntryFileOffset	??
VSIArchiveFilesystemHandler	??
VSIArchiveReader	??
VSIDIR	??
VSIDummyCryptFilesystemHandler	??
VSIErrorContext	??
VSIFileManager	??
VSIFilesystemHandler	??
VSIReadDirRecursiveTask	??
VSI SparseFileFilesystemHandler	??
VSI SparseFileHandle	??
VSI SubFileFilesystemHandler	??
VSI SubFileHandle	??
VSI VirtualHandle	??
zip_fileinfo	??
zip_internal	??
zlib_filefunc_def_s	??

Chapter 9

File Index

9.1 File List

Here is a list of all documented files with brief descriptions:

cpl_atomic_ops.h	??
cpl_aws.h	??
cpl_config.h	??
cpl_config_extras.h	??
cpl_conv.h	??
cpl_cpu_features.h	??
cpl_csv.h	??
cpl_error.h	??
cpl_google_cloud.h	??
cpl_hash_set.h	??
cpl_http.h	??
cpl_list.h	??
cpl_minixml.h	??
cpl_minizip_ioapi.h	??
cpl_minizip_unzip.h	??
cpl_minizip_zip.h	??
cpl_multiproc.h	??
cpl_odbc.h	??
cpl_port.h	??
cpl_progress.h	??
cpl_quad_tree.h	??
cpl_sha1.h	??
cpl_sha256.h	??
cpl_spawn.h	??
cpl_string.h	??
cpl_time.h	??
cpl_virtualmem.h	??
cpl_vsi.h	??
cpl_vsi_error.h	??
cpl_vsi_virtual.h	??
cpl_vsil_curl_priv.h	??
cpl_worker_thread_pool.h	??
cplkeywordparser.h	??
gdal_csv.h	??
iso8211.h	??
sdts_al.h	??
sdtsdataset.cpp	??

Chapter 10

Class Documentation

10.1 `_CPL_SHA256Context` Struct Reference

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

- `cpl_sha256.h`

10.2 `_CPLHashSet` Struct Reference

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

- `cpl_hash_set.cpp`

10.3 `_CPLList` Struct Reference

```
#include <cpl_list.h>
```

Public Attributes

- `void * pData`
- `struct _CPLList * psNext`

10.3.1 Detailed Description

List element structure.

10.3.2 Member Data Documentation

10.3.2.1 `void* _CPLList::pData`

Pointer to the data object. Should be allocated and freed by the caller.

10.3.2.2 `struct _CPLList* _CPLList::psNext`

Pointer to the next element in list. NULL, if current element is the last one.

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

- [cpl_list.h](#)

10.4 [_CPLLock Struct Reference](#)

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

- [cpl_multiproc.cpp](#)

10.5 [_CPLQuadTree Struct Reference](#)

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

- [cpl_quad_tree.cpp](#)

10.6 [_CPLSpawnedProcess Struct Reference](#)

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

- [cpl_spawn.cpp](#)

10.7 [_CPLSpinLock Struct Reference](#)

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

- [cpl_multiproc.cpp](#)

10.8 [_MutexLinkedElt Struct Reference](#)

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

- [cpl_multiproc.cpp](#)

10.9 [_QuadTreeNode Struct Reference](#)

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

- [cpl_quad_tree.cpp](#)

10.10 [CPL_SHA1Context Struct Reference](#)

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

- [cpl_sha1.cpp](#)

10.11 CPLObjectContext Struct Reference

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

- `cpl_error.cpp`

10.12 CPLHTTPResult Struct Reference

```
#include <cpl_http.h>
```

Public Attributes

- `int nStatus`
- `char * pszContentType`
- `char * pszErrBuf`
- `int nDataLen`
- `int nDataAlloc`
- `GByte * pabyData`
- `char ** papszHeaders`
- `int nMimePartCount`
- `CPLMimePart * pasMimePart`

10.12.1 Detailed Description

Describe the result of a `CPLHTTPFetch()` call

10.12.2 Member Data Documentation

10.12.2.1 `int CPLHTTPResult::nDataAlloc`

Allocated size of the `pabyData` buffer

10.12.2.2 `int CPLHTTPResult::nDataLen`

Length of the `pabyData` buffer

10.12.2.3 `int CPLHTTPResult::nMimePartCount`

Number of parts in a multipart message

10.12.2.4 `int CPLHTTPResult::nStatus`

cURL error code : 0=success, non-zero if request failed

10.12.2.5 `GByte* CPLHTTPResult::pabyData`

Buffer with downloaded data

10.12.2.6 char** CPLHTTPResult::papszHeaders

Headers returned

10.12.2.7 CPLMimePart* CPLHTTPResult::pasMimePart

Array of parts (resolved by [CPLHTTPParseMultipartMime\(\)](#))

10.12.2.8 char* CPLHTTPResult::pszContentType

Content-Type of the response

10.12.2.9 char* CPLHTTPResult::pszErrMsgBuf

Error message from curl, or NULL

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

- [cpl_http.h](#)

10.13 CPLMimePart Struct Reference

```
#include <cpl_http.h>
```

Public Attributes

- char ** [papszHeaders](#)
- [GByte](#) * [pabyData](#)
- int [nDataLen](#)

10.13.1 Detailed Description

Describe a part of a multipart message

10.13.2 Member Data Documentation

10.13.2.1 int CPLMimePart::nDataLen

Buffer length

10.13.2.2 [GByte](#)* CPLMimePart::pabyData

Buffer with data of the part

10.13.2.3 char** CPLMimePart::papszHeaders

NULL terminated array of headers

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

- [cpl_http.h](#)

10.14 CPLODBCDriverInstaller Class Reference

```
#include <cpl_odbc.h>
```

Public Member Functions

- int [InstallDriver](#) (const char *pszDriver, const char *pszPathIn, WORD fRequest=ODBC_INSTALL_COMPLETE)
- int [RemoveDriver](#) (const char *pszDriverName, int fRemoveDSN=FALSE)
- int [GetUsageCount](#) () const
- const char * [GetPathOut](#) () const
- const char * [GetLastError](#) () const
- DWORD [GetLastErrorCode](#) () const

10.14.1 Detailed Description

A class providing functions to install or remove ODBC driver.

10.14.2 Member Function Documentation

10.14.2.1 const char* [CPLODBCDriverInstaller::GetLastError](#) () const `[inline]`

If [InstallDriver](#) returns FALSE, then [GetLastError](#) then error message can be obtained by calling this function. Internally, it calls ODBC's [SQLInstallerError](#) function.

10.14.2.2 DWORD [CPLODBCDriverInstaller::GetLastErrorCode](#) () const `[inline]`

If [InstallDriver](#) returns FALSE, then [GetLastErrorCode](#) then error code can be obtained by calling this function. Internally, it calls ODBC's [SQLInstallerError](#) function. See ODBC API Reference for possible error flags.

10.14.2.3 const char* [CPLODBCDriverInstaller::GetPathOut](#) () const `[inline]`

Path of the target directory where the driver should be installed. For details, see ODBC API Reference and [lpszPathOut](#) parameter of [SQLInstallDriverEx](#)

10.14.2.4 int [CPLODBCDriverInstaller::GetUsageCount](#) () const `[inline]`

The usage count of the driver after this function has been called

10.14.2.5 int [CPLODBCDriverInstaller::InstallDriver](#) (const char * *pszDriver*, const char * *pszPathIn*, WORD *fRequest* = ODBC_INSTALL_COMPLETE)

Installs ODBC driver or updates definition of already installed driver. Internally, it calls ODBC's [SQLInstallDriverEx](#) function.

Parameters

<i>pszDriver</i>	- The driver definition as a list of keyword-value pairs describing the driver (See ODBC API Reference).
------------------	--

<i>pszPathIn</i>	- Full path of the target directory of the installation, or a null pointer (for unixODBC, NULL is passed).
<i>fRequest</i>	- The <i>fRequest</i> argument must contain one of the following values: ODBC_INSTALL_COMPLETE - (default) complete the installation request ODBC_INSTALL_INQUIRY - inquire about where a driver can be installed

Returns

TRUE indicates success, FALSE if it fails.

10.14.2.6 `int CPLODBCDriverInstaller::RemoveDriver (const char * pszDriverName, int fRemoveDSN = FALSE)`

Removes or changes information about the driver from the Odbcinst.ini entry in the system information.

Parameters

<i>pszDriverName</i>	- The name of the driver as registered in the Odbcinst.ini key of the system information.
<i>fRemoveDSN</i>	- TRUE: Remove DSNs associated with the driver specified in <i>lpszDriver</i> . FALSE: Do not remove DSNs associated with the driver specified in <i>lpszDriver</i> .

Returns

The function returns TRUE if it is successful, FALSE if it fails. If no entry exists in the system information when this function is called, the function returns FALSE. In order to obtain usage count value, call [GetUsageCount\(\)](#).

The documentation for this class was generated from the following files:

- [cpl_odbc.h](#)
- [cpl_odbc.cpp](#)

10.15 CPLODBCSession Class Reference

```
#include <cpl_odbc.h>
```

Public Member Functions

- [CPLODBCSession \(\)](#)
- [~CPLODBCSession \(\)](#)
- int [EstablishSession](#) (const char **pszDSN*, const char **pszUserid*, const char **pszPassword*)
- const char * [GetLastError](#) ()
- int [ClearTransaction](#) ()
- int [BeginTransaction](#) ()
- int [CommitTransaction](#) ()
- int [RollbackTransaction](#) ()
- int [IsInTransaction](#) ()
- int [CloseSession](#) ()
- int [Failed](#) (int, HSTMT=NULL)
- HDBC [GetConnection](#) ()
- HENV [GetEnvironment](#) ()

10.15.1 Detailed Description

A class representing an ODBC database session.

Includes error collection services.

10.15.2 Constructor & Destructor Documentation

10.15.2.1 CPODBCSession::CPODBCSession ()

Constructor

10.15.2.2 CPODBCSession::~~CPODBCSession ()

Destructor

10.15.3 Member Function Documentation

10.15.3.1 int CPODBCSession::BeginTransaction ()

Begin transaction

10.15.3.2 int CPODBCSession::ClearTransaction ()

Clear transaction

10.15.3.3 int CPODBCSession::CloseSession ()

Close session

10.15.3.4 int CPODBCSession::CommitTransaction ()

Commit transaction

10.15.3.5 int CPODBCSession::EstablishSession (const char * *pszDSN*, const char * *pszUserid*, const char * *pszPassword*)

Connect to database and logon.

Parameters

<i>pszDSN</i>	The name of the DSN being used to connect. This is not optional.
<i>pszUserid</i>	the userid to logon as, may be NULL if not not required, or provided by the DSN.
<i>pszPassword</i>	the password to logon with. May be NULL if not required or provided by the DSN.

Returns

TRUE on success or FALSE on failure. Call [GetLastError\(\)](#) to get details on failure.

10.15.3.6 int CPODBCSession::Failed (int *nRetCode*, HSTMT *hStmt* = NULL)

Test if a return code indicates failure, return TRUE if that is the case. Also update error text.

10.15.3.7 HDBC CPODBCSession::GetConnection () [inline]

Return connection handle

10.15.3.8 HENV CPODBCSession::GetEnvironment () [inline]

Return GetEnvironment handle

10.15.3.9 const char * CPODBCSession::GetLastError ()

Returns the last ODBC error message.

Returns

pointer to an internal buffer with the error message in it. Do not free or alter. Will be an empty (but not NULL) string if there is no pending error info.

10.15.3.10 int CPODBCSession::IsInTransaction () [inline]

Returns whether a transaction is active

10.15.3.11 int CPODBCSession::RollbackTransaction ()

Rollback transaction

The documentation for this class was generated from the following files:

- [cpl_odbc.h](#)
- [cpl_odbc.cpp](#)

10.16 CPODBCStatement Class Reference

```
#include <cpl_odbc.h>
```

Public Member Functions

- [CPODBCStatement](#) (CPODBCSession *)
- [~CPODBCStatement](#) ()
- [HSTMT](#) [GetStatement](#) ()
- void [Clear](#) ()
- void [AppendEscaped](#) (const char *)
- void [Append](#) (const char *)
- void [Append](#) (int)
- void [Append](#) (double)
- int [Appendf](#) (CPL_FORMAT_STRING(const char *),...) [CPL_PRINT_FUNC_FORMAT](#)(2)
- int const char * [GetCommand](#) ()
- int [ExecuteSQL](#) (const char *!=NULL)
- int [Fetch](#) (int nOrientation=SQL_FETCH_NEXT, int nOffset=0)
- void [ClearColumnData](#) ()
- int [GetColCount](#) ()
- const char * [GetColName](#) (int)
- short [GetColType](#) (int)
- const char * [GetColTypeName](#) (int)
- short [GetColSize](#) (int)
- short [GetColPrecision](#) (int)
- short [GetColNullable](#) (int)

- const char * [GetColColumnDef](#) (int)
- int [GetCollid](#) (const char *)
- const char * [GetColData](#) (int, const char *=NULL)
- const char * [GetColData](#) (const char *, const char *=NULL)
- int [GetColDataLength](#) (int)
- int [GetRowCountAffected](#) ()
- int [GetColumns](#) (const char *pszTable, const char *pszCatalog=NULL, const char *pszSchema=NULL)
- int [GetPrimaryKeys](#) (const char *pszTable, const char *pszCatalog=NULL, const char *pszSchema=NULL)
- int [GetTables](#) (const char *pszCatalog=NULL, const char *pszSchema=NULL)
- void [DumpResult](#) (FILE *fp, int bShowSchema=FALSE)
- int [CollectResultsInfo](#) ()

Static Public Member Functions

- static CPLString [GetTypeNames](#) (int)
- static SQLSMALLINT [GetTypeMapping](#) (SQLSMALLINT)

10.16.1 Detailed Description

Abstraction for statement, and resultset.

Includes methods for executing an SQL statement, and for accessing the resultset from that statement. Also provides for executing other ODBC requests that produce results sets such as SQLColumns() and SQLTables() requests.

10.16.2 Constructor & Destructor Documentation

10.16.2.1 `CPODBCStatement::CPODBCStatement (CPODBCSession * poSession) [explicit]`

Constructor

10.16.2.2 `CPODBCStatement::~~CPODBCStatement ()`

Destructor

10.16.3 Member Function Documentation

10.16.3.1 `void CPODBCStatement::Append (const char * pszText)`

Append text to internal command.

The passed text is appended to the internal SQL command text.

Parameters

<i>pszText</i>	text to append.
----------------	-----------------

10.16.3.2 `void CPODBCStatement::Append (int nValue)`

Append to internal command.

The passed value is formatted and appended to the internal SQL command text.

Parameters

<i>nValue</i>	value to append to the command.
---------------	---------------------------------

10.16.3.3 void CPODBCStatement::Append (double *dfValue*)

Append to internal command.

The passed value is formatted and appended to the internal SQL command text.

Parameters

<i>dfValue</i>	value to append to the command.
----------------	---------------------------------

10.16.3.4 void CPODBCStatement::AppendEscaped (const char * *pszText*)

Append text to internal command.

The passed text is appended to the internal SQL command text after escaping any special characters so it can be used as a character string in an SQL statement.

Parameters

<i>pszText</i>	text to append.
----------------	-----------------

10.16.3.5 int CPODBCStatement::Appendf (CPL_FORMAT_STRING(const char *), ...)

Append to internal command.

The passed format is used to format other arguments and the result is appended to the internal command text. Long results may not be formatted properly, and should be appended with the direct [Append\(\)](#) methods.

Parameters

<i>pszFormat</i>	printf() style format string.
------------------	-------------------------------

Returns

FALSE if formatting fails due to result being too large.

10.16.3.6 void CPODBCStatement::Clear ()

Clear internal command text and result set definitions.

10.16.3.7 void CPODBCStatement::ClearColumnData ()

ClearColumnData

10.16.3.8 int CPODBCStatement::CollectResultsInfo ()

CollectResultsInfo

10.16.3.9 void CPODBCStatement::DumpResult (FILE * *fp*, int *bShowSchema* = FALSE)

Dump resultset to file.

The contents of the current resultset are dumped in a simply formatted form to the provided file. If requested, the schema definition will be written first.

Parameters

<i>fp</i>	the file to write to. stdout or stderr are acceptable.
<i>bShowSchema</i>	TRUE to force writing schema information for the rowset before the rowset data itself. Default is FALSE.

10.16.3.10 int CPODBCStatement::ExecuteSQL (const char * *pszStatement* = NULL)

Execute an SQL statement.

This method will execute the passed (or stored) SQL statement, and initialize information about the resultset if there is one. If a NULL statement is passed, the internal stored statement that has been previously set via [Append\(\)](#) or [Appendf\(\)](#) calls will be used.

Parameters

<i>pszStatement</i>	the SQL statement to execute, or NULL if the internally saved one should be used.
---------------------	---

Returns

TRUE on success or FALSE if there is an error. Error details can be fetched with [OGRODBCSession::GetLastError\(\)](#).

10.16.3.11 int CPODBCStatement::Fetch (int *nOrientation* = SQL_FETCH_NEXT, int *nOffset* = 0)

Fetch a new record.

Requests the next row in the current resultset using the [SQLFetchScroll\(\)](#) call. Note that many ODBC drivers only support the default forward fetching one record at a time. Only [SQL_FETCH_NEXT](#) (the default) should be considered reliable on all drivers.

Currently it isn't clear how to determine whether an error or a normal out of data condition has occurred if [Fetch\(\)](#) fails.

Parameters

<i>nOrientation</i>	One of SQL_FETCH_NEXT , SQL_FETCH_LAST , SQL_FETCH_PRIOR , SQL_FETCH_ABSOLUTE , or SQL_FETCH_RELATIVE (default is SQL_FETCH_NEXT).
<i>nOffset</i>	the offset (number of records), ignored for some orientations.

Returns

TRUE if a new row is successfully fetched, or FALSE if not.

10.16.3.12 const char * CPODBCStatement::GetColColumnDef (int *iCol*)

Fetch a column default value.

Returns the default value of a column.

Parameters

<i>iCol</i>	the zero based column index.
-------------	------------------------------

Returns

NULL if the default value is not dpecified or the internal copy of the default value.

10.16.3.13 int CPODBCStatement::GetColCount ()

Fetch the resultset column count.

Returns

the column count, or zero if there is no resultset.

10.16.3.14 const char * CPODBCStatement::GetColData (int *iCol*, const char * *pszDefault* = NULL)

Fetch column data.

Fetches the data contents of the requested column for the currently loaded row. The result is returned as a string regardless of the column type. NULL is returned if an illegal column is given, or if the actual column is "NULL".

Parameters

<i>iCol</i>	the zero based column to fetch.
<i>pszDefault</i>	the value to return if the column does not exist, or is NULL. Defaults to NULL.

Returns

pointer to internal column data or NULL on failure.

10.16.3.15 const char * CPODBCStatement::GetColData (const char * *pszColName*, const char * *pszDefault* = NULL)

Fetch column data.

Fetches the data contents of the requested column for the currently loaded row. The result is returned as a string regardless of the column type. NULL is returned if an illegal column is given, or if the actual column is "NULL".

Parameters

<i>pszColName</i>	the name of the column requested.
<i>pszDefault</i>	the value to return if the column does not exist, or is NULL. Defaults to NULL.

Returns

pointer to internal column data or NULL on failure.

10.16.3.16 int CPODBCStatement::GetColDataLength (int *iCol*)

GetColDataLength

10.16.3.17 int CPODBCStatement::GetColId (const char * *pszColName*)

Fetch column index.

Gets the column index corresponding with the passed name. The name comparisons are case insensitive.

Parameters

<i>pszColName</i>	the name to search for.
-------------------	-------------------------

Returns

the column index, or -1 if not found.

10.16.3.18 `const char * CPODBCStatement::GetColName (int iCol)`

Fetch a column name.

Parameters

<i>iCol</i>	the zero based column index.
-------------	------------------------------

Returns

NULL on failure (out of bounds column), or a pointer to an internal copy of the column name.

10.16.3.19 `short CPODBCStatement::GetColNullable (int iCol)`

Fetch the column nullability.

Parameters

<i>iCol</i>	the zero based column index.
-------------	------------------------------

Returns

TRUE if the column may contains or FALSE otherwise.

10.16.3.20 `short CPODBCStatement::GetColPrecision (int iCol)`

Fetch the column precision.

Parameters

<i>iCol</i>	the zero based column index.
-------------	------------------------------

Returns

column precision, may be zero or the same as column size for columns to which it does not apply.

10.16.3.21 `short CPODBCStatement::GetColSize (int iCol)`

Fetch the column width.

Parameters

<i>iCol</i>	the zero based column index.
-------------	------------------------------

Returns

column width, zero for unknown width columns.

10.16.3.22 short CPODBCStatement::GetColType (int *iCol*)

Fetch a column data type.

The return type code is a an ODBC SQL_ code, one of SQL_UNKNOWN_TYPE, SQL_CHAR, SQL_NUMERIC, SQL_DECIMAL, SQL_INTEGER, SQL_SMALLINT, SQL_FLOAT, SQL_REAL, SQL_DOUBLE, SQL_DATETIME, SQL_VARCHAR, SQL_TYPE_DATE, SQL_TYPE_TIME, SQL_TYPE_TIMESTAMP.

Parameters

<i>iCol</i>	the zero based column index.
-------------	------------------------------

Returns

type code or -1 if the column is illegal.

10.16.3.23 const char * CPODBCStatement::GetColTypeName (int *iCol*)

Fetch a column data type name.

Returns data source-dependent data type name; for example, "CHAR", "VARCHAR", "MONEY", "LONG VARBINAR", or "CHAR () FOR BIT DATA".

Parameters

<i>iCol</i>	the zero based column index.
-------------	------------------------------

Returns

NULL on failure (out of bounds column), or a pointer to an internal copy of the column dat type name.

10.16.3.24 int CPODBCStatement::GetColumns (const char * *pszTable*, const char * *pszCatalog* = NULL, const char * *pszSchema* = NULL)

Fetch column definitions for a table.

The SQLColumn() method is used to fetch the definitions for the columns of a table (or other queryable object such as a view). The column definitions are digested and used to populate the [CPODBCStatement](#) column definitions essentially as if a "SELECT * FROM tablename" had been done; however, no resultset will be available.

Parameters

<i>pszTable</i>	the name of the table to query information on. This should not be empty.
<i>pszCatalog</i>	the catalog to find the table in, use NULL (the default) if no catalog is available.
<i>pszSchema</i>	the schema to find the table in, use NULL (the default) if no schema is available.

Returns

TRUE on success or FALSE on failure.

10.16.3.25 int const char* CPODBCStatement::GetCommand () [inline]

Return statement string

10.16.3.26 int CPODBCStatement::GetPrimaryKeys (const char * *pszTable*, const char * *pszCatalog* = NULL, const char * *pszSchema* = NULL)

Fetch primary keys for a table.

The SQLPrimaryKeys() function is used to fetch a list of fields forming the primary key. The result is returned as a result set matching the SQLPrimaryKeys() function result set. The 4th column in the result set is the column name of the key, and if the result set contains only one record then that single field will be the complete primary key.

Parameters

<i>pszTable</i>	the name of the table to query information on. This should not be empty.
<i>pszCatalog</i>	the catalog to find the table in, use NULL (the default) if no catalog is available.
<i>pszSchema</i>	the schema to find the table in, use NULL (the default) if no schema is available.

Returns

TRUE on success or FALSE on failure.

10.16.3.27 int CPODBCStatement::GetRowCountAffected ()

GetRowCountAffected

10.16.3.28 HSTMT CPODBCStatement::GetStatement () [inline]

Return statement handle

10.16.3.29 int CPODBCStatement::GetTables (const char * *pszCatalog* = NULL, const char * *pszSchema* = NULL)

Fetch tables in database.

The SQLTables() function is used to fetch a list tables in the database. The result is returned as a result set matching the SQLTables() function result set. The 3rd column in the result set is the table name. Only tables of type "TABLE" are returned.

Parameters

<i>pszCatalog</i>	the catalog to find the table in, use NULL (the default) if no catalog is available.
<i>pszSchema</i>	the schema to find the table in, use NULL (the default) if no schema is available.

Returns

TRUE on success or FALSE on failure.

10.16.3.30 SQLSMALLINT CPODBCStatement::GetTypeMapping (SQLSMALLINT *nTypeCode*) [static]

Get appropriate C data type for SQL column type.

Returns a C data type code, corresponding to the indicated SQL data type code (as returned from [CPODBCStatement::GetColType\(\)](#)).

Parameters

<i>nTypeCode</i>	the SQL_ code, such as SQL_CHAR.
------------------	----------------------------------

Returns

data type code. The valid code is always returned. If SQL code is not recognised, SQL_C_BINARY will be returned.

10.16.3.31 `CPLString CPODBCStatement::GetTypeNames (int nTypeCode) [static]`

Get name for SQL column type.

Returns a string name for the indicated type code (as returned from [CPODBCStatement::GetColType\(\)](#)).

Parameters

<i>nTypeCode</i>	the SQL_ code, such as SQL_CHAR.
------------------	----------------------------------

Returns

internal string, "UNKNOWN" if code not recognised.

The documentation for this class was generated from the following files:

- [cpl_odbc.h](#)
- [cpl_odbc.cpp](#)

10.17 CPLRectObj Struct Reference

```
#include <cpl_quad_tree.h>
```

Public Attributes

- double [minx](#)
- double [miny](#)
- double [maxx](#)
- double [maxy](#)

10.17.1 Detailed Description

Describe a rectangle

10.17.2 Member Data Documentation

10.17.2.1 double CPLRectObj::maxx

Maximum x

10.17.2.2 double CPLRectObj::maxy

Maximum y

10.17.2.3 double CPLRectObj::minx

Minimum x

10.17.2.4 double CPLRectObj::miny

Minimum y

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

- [cpl_quad_tree.h](#)

10.18 CPLSharedFileInfo Struct Reference

```
#include <cpl_conv.h>
```

Public Attributes

- FILE * [fp](#)
- int [nRefCount](#)
- int [bLarge](#)
- char * [pszFilename](#)
- char * [pszAccess](#)

10.18.1 Detailed Description

Information on a shared file

10.18.2 Member Data Documentation

10.18.2.1 int CPLSharedFileInfo::bLarge

Whether fp must be interpreted as VSIFILE*

10.18.2.2 FILE* CPLSharedFileInfo::fp

File pointer

10.18.2.3 int CPLSharedFileInfo::nRefCount

Reference counter

10.18.2.4 char* CPLSharedFileInfo::pszAccess

Access mode

10.18.2.5 char* CPLSharedFileInfo::pszFilename

Filename

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

- [cpl_conv.h](#)

10.19 CPLSharedFileInfoExtra Struct Reference

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

- [cpl_conv.cpp](#)

10.20 CPLStdCallThreadInfo Struct Reference

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

- [cpl_multiproc.cpp](#)

10.21 CPLVirtualMem Struct Reference

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

- [cpl_virtualmem.cpp](#)

10.22 CPLWorkerThread Struct Reference

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

- [cpl_worker_thread_pool.h](#)

10.23 CPLWorkerThreadJob Struct Reference

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

- [cpl_worker_thread_pool.h](#)

10.24 CPLWorkerThreadPool Class Reference

```
#include <cpl_worker_thread_pool.h>
```

Public Member Functions

- [CPLWorkerThreadPool](#) ()
- [~CPLWorkerThreadPool](#) ()
- bool [Setup](#) (int nThreads, CPLThreadFunc pfnInitFunc, void **pasInitData)
- bool [SubmitJob](#) (CPLThreadFunc pfnFunc, void *pData)
- bool [SubmitJobs](#) (CPLThreadFunc pfnFunc, const std::vector< void * > &apData)
- void [WaitCompletion](#) (int nMaxRemainingJobs=0)
- int [GetThreadCount](#) () const

10.24.1 Detailed Description

Pool of worker threads

10.24.2 Constructor & Destructor Documentation

10.24.2.1 CPLWorkerThreadPool::CPLWorkerThreadPool ()

Instantiate a new pool of worker threads.

The pool is in an uninitialized state after this call. The [Setup\(\)](#) method must be called.

10.24.2.2 `CPLWorkerThreadPool::~~CPLWorkerThreadPool ()`

Destroys a pool of worker threads.

Any still pending job will be completed before the destructor returns.

10.24.3 Member Function Documentation

10.24.3.1 `int CPLWorkerThreadPool::GetThreadCount () const [inline]`

Return the number of threads setup

10.24.3.2 `bool CPLWorkerThreadPool::Setup (int nThreads, CPLThreadFunc pfnInitFunc, void ** pasInitData)`

Setup the pool.

Parameters

<i>nThreads</i>	Number of threads to launch
<i>pfnInitFunc</i>	Initialization function to run in each thread. May be NULL
<i>pasInitData</i>	Array of initialization data. Its length must be <i>nThreads</i> , or it should be NULL.

Returns

true if initialization was successful.

10.24.3.3 `bool CPLWorkerThreadPool::SubmitJob (CPLThreadFunc pfnFunc, void * pData)`

Queue a new job.

Parameters

<i>pfnFunc</i>	Function to run for the job.
<i>pData</i>	User data to pass to the job function.

Returns

true in case of success.

10.24.3.4 `bool CPLWorkerThreadPool::SubmitJobs (CPLThreadFunc pfnFunc, const std::vector< void * > & apData)`

Queue several jobs

Parameters

<i>pfnFunc</i>	Function to run for the job.
<i>apData</i>	User data instances to pass to the job function.

Returns

true in case of success.

10.24.3.5 `void CPLWorkerThreadPool::WaitCompletion (int nMaxRemainingJobs = 0)`

Wait for completion of part or whole jobs.

Parameters

<i>nMaxRemaining-Jobs</i>	Maximum number of pending jobs that are allowed in the queue after this method has completed. Might be 0 to wait for all jobs.
---------------------------	--

The documentation for this class was generated from the following files:

- [cpl_worker_thread_pool.h](#)
- [cpl_worker_thread_pool.cpp](#)

10.25 CPLXMLNode Struct Reference

```
#include <cpl_minixml.h>
```

Public Attributes

- [CPLXMLNodeType eType](#)
Node type.
- [char * pszValue](#)
Node value.
- [struct CPLXMLNode * psNext](#)
Next sibling.
- [struct CPLXMLNode * psChild](#)
Child node.

10.25.1 Detailed Description

Document node structure.

This C structure is used to hold a single text fragment representing a component of the document when parsed. It should be allocated with the appropriate CPL function, and freed with [CPLDestroyXMLNode\(\)](#). The structure contents should not normally be altered by application code, but may be freely examined by application code.

Using the psChild and psNext pointers, a hierarchical tree structure for a document can be represented as a tree of [CPLXMLNode](#) structures.

10.25.2 Member Data Documentation

10.25.2.1 CPLXMLNodeType CPLXMLNode::eType

Node type.

One of CXT_Element, CXT_Text, CXT_Attribute, CXT_Comment, or CXT_Literal.

10.25.2.2 struct CPLXMLNode* CPLXMLNode::psChild

Child node.

Pointer to first child node, if any. Only CXT_Element and CXT_Attribute nodes should have children. For CXT_Attribute it should be a single CXT_Text value node, while CXT_Element can have any kind of child. The full list of children for a node are identified by walking the psNext's starting with the psChild node.

10.25.2.3 struct CPLXMLNode* CPLXMLNode::psNext

Next sibling.

Pointer to next sibling, that is the next node appearing after this one that has the same parent as this node. NULL if this node is the last child of the parent element.

10.25.2.4 char* CPLXMLNode::pszValue

Node value.

For CXT_Element this is the name of the element, without the angle brackets. Note there is a single CXT_Element even when the document contains a start and end element tag. The node represents the pair. All text or other elements between the start and end tag will appear as children nodes of this CXT_Element node.

For CXT_Attribute the pszValue is the attribute name. The value of the attribute will be a CXT_Text child.

For CXT_Text this is the text itself (value of an attribute, or a text fragment between an element start and end tags.

For CXT_Literal it is all the literal text. Currently this is just used for !DOCTYPE lines, and the value would be the entire line.

For CXT_Comment the value is all the literal text within the comment, but not including the comment start/end indicators ("<--" and "-->").

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

- [cpl_minixml.h](#)

10.26 CPLZip Struct Reference

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

- [cpl_minizip_zip.cpp](#)

10.27 ctb Struct Reference

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

- [cpl_csv.cpp](#)

10.28 curfile_info Struct Reference

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

- [cpl_minizip_zip.cpp](#)

10.29 DDFField Class Reference

```
#include <iso8211.h>
```

Public Member Functions

- void [Dump](#) (FILE *fp)
- const char * [GetSubfieldData](#) (DDFSubfieldDefn *, int *=&NULL, int=0)
- const char * [GetInstanceData](#) (int nInstance, int *pnSize)
- const char * [GetData](#) ()
- int [GetDataSize](#) ()
- int [GetRepeatCount](#) ()
- DDFFieldDefn * [GetFieldDefn](#) ()

10.29.1 Detailed Description

This object represents one field in a [DDFRecord](#). This models an instance of the fields data, rather than its data definition, which is handled by the [DDFFieldDefn](#) class. Note that a [DDFField](#) doesn't have DDFSubfield children as you would expect. To extract subfield values use [GetSubfieldData\(\)](#) to find the right data pointer and then use [ExtractIntData\(\)](#), [ExtractFloatData\(\)](#) or [ExtractStringData\(\)](#).

10.29.2 Member Function Documentation

10.29.2.1 void DDFField::Dump (FILE * fp)

Write out field contents to debugging file.

A variety of information about this field, and all its subfields is written to the given debugging file handle. Note that field definition information (ala [DDFFieldDefn](#)) isn't written.

Parameters

<i>fp</i>	The standard IO file handle to write to. i.e. stderr
-----------	--

10.29.2.2 const char* DDFField::GetData () [inline]

Return the pointer to the entire data block for this record. This is an internal copy, and should not be freed by the application.

10.29.2.3 int DDFField::GetDataSize () [inline]

Return the number of bytes in the data block returned by [GetData\(\)](#).

10.29.2.4 DDFFieldDefn* DDFField::GetFieldDefn () [inline]

Fetch the corresponding [DDFFieldDefn](#).

10.29.2.5 const char * DDFField::GetInstanceData (int nInstance, int * pnInstanceSize)

Get field instance data and size.

The returned data pointer and size values are suitable for use with [DDFRecord::SetFieldRaw\(\)](#).

Parameters

<i>nInstance</i>	a value from 0 to GetRepeatCount() -1.
<i>pnInstanceSize</i>	a location to put the size (in bytes) of the field instance data returned. This size will include the unit terminator (if any), but not the field terminator. This size pointer may be NULL if not needed.

Returns

the data pointer, or NULL on error.

10.29.2.6 int DDFField::GetRepeatCount ()

How many times do the subfields of this record repeat? This will always be one for non-repeating fields.

Returns

The number of times that the subfields of this record occur in this record. This will be one for non-repeating fields.

See Also

[8211view example program](#) for a demonstration of handling repeated fields properly.

10.29.2.7 const char * DDFField::GetSubfieldData (DDFSubfieldDefn * poSFDefn, int * pnMaxBytes = NULL, int iSubfieldIndex = 0)

Fetch raw data pointer for a particular subfield of this field.

The passed [DDFSubfieldDefn](#) (*poSFDefn*) should be acquired from the [DDFFieldDefn](#) corresponding with this field. This is normally done once before reading any records. This method involves a series of calls to [DDFSubfield::GetDataLength\(\)](#) in order to track through the [DDFField](#) data to that belonging to the requested subfield. This can be relatively expensive.

Parameters

<i>poSFDefn</i>	The definition of the subfield for which the raw data pointer is desired.
<i>pnMaxBytes</i>	The maximum number of bytes that can be accessed from the returned data pointer is placed in this int, unless it is NULL.
<i>iSubfieldIndex</i>	The instance of this subfield to fetch. Use zero (the default) for the first instance.

Returns

A pointer into the [DDFField](#)'s data that belongs to the subfield. This returned pointer is invalidated by the next record read ([DDFRecord::ReadRecord\(\)](#)) and the returned pointer should not be freed by the application.

The documentation for this class was generated from the following files:

- iso8211.h
- ddfield.cpp

10.30 DDFFieldDefn Class Reference

```
#include <iso8211.h>
```

Public Member Functions

- void [Dump](#) (FILE *fp)
- const char * [GetName](#) ()
- const char * [GetDescription](#) ()
- int [GetSubfieldCount](#) ()
- [DDFSubfieldDefn](#) * [GetSubfield](#) (int i)
- [DDFSubfieldDefn](#) * [FindSubfieldDefn](#) (const char *)
- int [GetFixedWidth](#) ()
- int [IsRepeating](#) ()
- void [SetRepeatingFlag](#) (int n)
- char * [GetDefaultValue](#) (int *pnSize)

10.30.1 Detailed Description

Information from the DDR defining one field. Note that just because a field is defined for a [DDFModule](#) doesn't mean that it actually occurs on any records in the module. DDFFieldDefns are normally just significant as containers of the DDFSubfieldDefns.

10.30.2 Member Function Documentation

10.30.2.1 void DDFFieldDefn::Dump (FILE * fp)

Write out field definition info to debugging file.

A variety of information about this field definition, and all its subfields is written to the give debugging file handle.

Parameters

<i>fp</i>	The standard IO file handle to write to. i.e. stderr
-----------	--

10.30.2.2 DDFSubfieldDefn * DDFFieldDefn::FindSubfieldDefn (const char * pszMnemonic)

Find a subfield definition by its mnemonic tag.

Parameters

<i>pszMnemonic</i>	The name of the field.
--------------------	------------------------

Returns

The subfield pointer, or NULL if there isn't any such subfield.

10.30.2.3 char * DDFFieldDefn::GetDefaultValue (int * pnSize)

Return default data for field instance.

10.30.2.4 const char* DDFFieldDefn::GetDescription () [inline]

Fetch a longer description of this field.

Returns

this is an internal copy and should not be freed.

10.30.2.5 `int DDFFieldDefn::GetFixedWidth () [inline]`

Get the width of this field. This function isn't normally used by applications.

Returns

The width of the field in bytes, or zero if the field is not apparently of a fixed width.

10.30.2.6 `const char* DDFFieldDefn::GetName () [inline]`

Fetch a pointer to the field name (tag).

Returns

this is an internal copy and should not be freed.

10.30.2.7 `DDFSubfieldDefn * DDFFieldDefn::GetSubfield (int i)`

Fetch a subfield by index.

Parameters

<i>i</i>	The index subfield index. (Between 0 and GetSubfieldCount() -1)
----------	---

Returns

The subfield pointer, or NULL if the index is out of range.

10.30.2.8 `int DDFFieldDefn::GetSubfieldCount () [inline]`

Get the number of subfields.

10.30.2.9 `int DDFFieldDefn::IsRepeating () [inline]`

Fetch repeating flag.

See Also

[DDFField::GetRepeatCount\(\)](#)

Returns

TRUE if the field is marked as repeating.

10.30.2.10 `void DDFFieldDefn::SetRepeatingFlag (int n) [inline]`

this is just for an S-57 hack for swedish data

The documentation for this class was generated from the following files:

- iso8211.h
- ddfielddfn.cpp

10.31 DDFModule Class Reference

```
#include <iso8211.h>
```

Public Member Functions

- [DDFModule](#) ()
- [~DDFModule](#) ()
- [int Open](#) (const char *pszFilename, int bFailQuietly=FALSE)
- [void Close](#) ()
- [void Dump](#) (FILE *fp)
- [DDFRecord * ReadRecord](#) ()
- [void Rewind](#) (long nOffset=-1)
- [DDFFieldDefn * FindFieldDefn](#) (const char *)
- [int GetFieldCount](#) ()
- [DDFFieldDefn * GetField](#) (int)
- [void AddField](#) (DDFFieldDefn *poNewFDefn)

10.31.1 Detailed Description

The primary class for reading ISO 8211 files. This class contains all the information read from the DDR record, and is used to read records from the file.

10.31.2 Constructor & Destructor Documentation

10.31.2.1 DDFModule::DDFModule ()

The constructor.

10.31.2.2 DDFModule::~~DDFModule ()

The destructor.

10.31.3 Member Function Documentation

10.31.3.1 void DDFModule::AddField (DDFFieldDefn * poNewFDefn)

Add new field definition.

Field definitions may only be added to DDFModules being used for writing, not those being used for reading. Ownership of the [DDFFieldDefn](#) object is taken by the [DDFModule](#).

Parameters

<i>poNewFDefn</i>	definition to be added to the module.
-------------------	---------------------------------------

10.31.3.2 void DDFModule::Close ()

Close an ISO 8211 file.

10.31.3.3 void DDFModule::Dump (FILE * *fp*)

Write out module info to debugging file.

A variety of information about the module is written to the debugging file. This includes all the field and subfield definitions read from the header.

Parameters

<i>fp</i>	The standard IO file handle to write to. i.e. stderr.
-----------	---

10.31.3.4 DDFFieldDefn * DDFModule::FindFieldDefn (const char * *pszFieldName*)

Fetch the definition of the named field.

This function will scan the [DDFFieldDefn](#)'s on this module, to find one with the indicated field name.

Parameters

<i>pszFieldName</i>	The name of the field to search for. The comparison is case insensitive.
---------------------	--

Returns

A pointer to the request [DDFFieldDefn](#) object is returned, or NULL if none matching the name are found. The return object remains owned by the [DDFModule](#), and should not be deleted by application code.

10.31.3.5 DDFFieldDefn * DDFModule::GetField (int *i*)

Fetch a field definition by index.

Parameters

<i>i</i>	(from 0 to GetFieldCount() - 1.
----------	---

Returns

the returned field pointer or NULL if the index is out of range.

10.31.3.6 int DDFModule::GetFieldCount () [inline]

Fetch the number of defined fields.

10.31.3.7 int DDFModule::Open (const char * *pszFilename*, int *bFailQuietly* = FALSE)

Open a ISO 8211 (DDF) file for reading.

If the open succeeds the data descriptive record (DDR) will have been read, and all the field and subfield definitions will be available.

Parameters

<i>pszFilename</i>	The name of the file to open.
<i>bFailQuietly</i>	If FALSE a CPL Error is issued for non-8211 files, otherwise quietly return NULL.

Returns

FALSE if the open fails or TRUE if it succeeds. Errors messages are issued internally with [CPL_Error\(\)](#).

10.31.3.8 DDFRecord * DDFModule::ReadRecord ()

Read one record from the file.

Returns

A pointer to a [DDFRecord](#) object is returned, or NULL if a read error, or end of file occurs. The returned record is owned by the module, and should not be deleted by the application. The record is only valid until the next [ReadRecord\(\)](#) at which point it is overwritten.

10.31.3.9 void DDFModule::Rewind (long *nOffset* = -1)

Return to first record.

The next call to [ReadRecord\(\)](#) will read the first data record in the file.

Parameters

<i>nOffset</i>	the offset in the file to return to. By default this is -1, a special value indicating that reading should return to the first data record. Otherwise it is an absolute byte offset in the file.
----------------	--

The documentation for this class was generated from the following files:

- iso8211.h
- ddfmodule.cpp

10.32 DDFRecord Class Reference

```
#include <iso8211.h>
```

Public Member Functions

- [DDFRecord * Clone](#) ()
- [DDFRecord * CloneOn](#) ([DDFModule *](#))
- void [Dump](#) ([FILE *](#))
- int [GetFieldCount](#) ()
- [DDFField * FindField](#) (const char *, int=0)
- [DDFField * GetField](#) (int)
- int [GetIntSubfield](#) (const char *, int, const char *, int, int *=NULL)
- double [GetFloatSubfield](#) (const char *, int, const char *, int, int *=NULL)
- const char * [GetStringSubfield](#) (const char *, int, const char *, int, int *=NULL)
- int [SetIntSubfield](#) (const char *pszField, int iFieldIndex, const char *pszSubfield, int iSubfieldIndex, int nValue)
- int [SetStringSubfield](#) (const char *pszField, int iFieldIndex, const char *pszSubfield, int iSubfieldIndex, const char *pszValue, int nValueLength=-1)
- int [SetFloatSubfield](#) (const char *pszField, int iFieldIndex, const char *pszSubfield, int iSubfieldIndex, double dfNewValue)
- int [GetDataSize](#) ()
- const char * [GetData](#) ()
- [DDFModule * GetModule](#) ()
- int [ResizeField](#) ([DDFField *poField](#), int nNewDataSize)
- int [DeleteField](#) ([DDFField *poField](#))
- [DDFField * AddField](#) ([DDFFieldDefn *](#))
- int [CreateDefaultFieldInstance](#) ([DDFField *poField](#), int iIndexWithinField)
- int [SetFieldRaw](#) ([DDFField *poField](#), int iIndexWithinField, const char *pachRawData, int nRawDataSize)
- int [Write](#) ()

10.32.1 Detailed Description

Contains instance data from one data record (DR). The data is contained as a list of [DDFField](#) instances partitioning the raw data into fields.

10.32.2 Member Function Documentation

10.32.2.1 [DDFField](#) * [DDFRecord::AddField](#) ([DDFFieldDefn](#) * *poDefn*)

Add a new field to record.

Add a new zero sized field to the record. The new field is always added at the end of the record.

NOTE: This method doesn't currently update the header information for the record to include the field information for this field, so the resulting record image isn't suitable for writing to disk. However, everything else about the record state should be updated properly to reflect the new field.

Parameters

<i>poDefn</i>	the definition of the field to be added.
---------------	--

Returns

the field object on success, or NULL on failure.

10.32.2.2 [DDFRecord](#) * [DDFRecord::Clone](#) ()

Make a copy of a record.

This method is used to make a copy of a record that will become (mostly) the property of application. However, it is automatically destroyed if the [DDFModule](#) it was created relative to is destroyed, as its field and subfield definitions relate to that [DDFModule](#). However, it does persist even when the record returned by [DDFModule::ReadRecord\(\)](#) is invalidated, such as when reading a new record. This allows an application to cache whole [DDFRecords](#).

Returns

A new copy of the [DDFRecord](#). This can be delete'd by the application when no longer needed, otherwise it will be cleaned up when the [DDFModule](#) it relates to is destroyed or closed.

10.32.2.3 [DDFRecord](#) * [DDFRecord::CloneOn](#) ([DDFModule](#) * *poTargetModule*)

Recreate a record referencing another module.

Works similarly to the [DDFRecord::Clone\(\)](#) method, but creates the new record with reference to a different [DDFModule](#). All [DDFFieldDefn](#) references are transcribed onto the new module based on field names. If any fields don't have a similarly named field on the target module the operation will fail. No validation of field types and properties is done, but this operation is intended only to be used between modules with matching definitions of all affected fields.

The new record will be managed as a clone by the target module in a manner similar to regular clones.

Parameters

<i>poTargetModule</i>	the module on which the record copy should be created.
-----------------------	--

Returns

NULL on failure or a pointer to the cloned record.

10.32.2.4 int DDFRecord::CreateDefaultFieldInstance (DDFField * *poField*, int *iIndexWithinField*)

Initialize default instance.

This method is normally only used internally by the [AddField\(\)](#) method to initialize the new field instance with default subfield values. It installs default data for one instance of the field in the record using the [DDFFieldDefn::GetDefaultValue\(\)](#) method and [DDFRecord::SetFieldRaw\(\)](#).

Parameters

<i>poField</i>	the field within the record to be assign a default instance.
<i>iIndexWithinField</i>	the instance to set (may not have been tested with values other than 0).

Returns

TRUE on success or FALSE on failure.

10.32.2.5 int DDFRecord::DeleteField (DDFField * *poTarget*)

Delete a field instance from a record.

Remove a field from this record, cleaning up the data portion and repacking the fields list. We don't try to reallocate the data area of the record to be smaller.

NOTE: This method doesn't actually remove the header information for this field from the record tag list yet. This should be added if the resulting record is even to be written back to disk!

Parameters

<i>poTarget</i>	the field instance on this record to delete.
-----------------	--

Returns

TRUE on success, or FALSE on failure. Failure can occur if *poTarget* isn't really a field on this record.

10.32.2.6 void DDFRecord::Dump (FILE * *fp*)

Write out record contents to debugging file.

A variety of information about this record, and all its fields and subfields is written to the given debugging file handle. Note that field definition information (ala [DDFFieldDefn](#)) isn't written.

Parameters

<i>fp</i>	The standard IO file handle to write to. i.e. stderr
-----------	--

10.32.2.7 DDFField * DDFRecord::FindField (const char * *pszName*, int *iFieldIndex* = 0)

Find the named field within this record.

Parameters

<i>pszName</i>	The name of the field to fetch. The comparison is case insensitive.
<i>iFieldIndex</i>	The instance of this field to fetch. Use zero (the default) for the first instance.

Returns

Pointer to the requested [DDFField](#). This pointer is to an internal object, and should not be freed. It remains valid until the next record read.

10.32.2.8 `const char* DDFRecord::GetData () [inline]`

Fetch the raw data for this record. The returned pointer is effectively to the data for the first field of the record, and is of size `GetDataSize()`.

10.32.2.9 `int DDFRecord::GetDataSize () [inline]`

Fetch size of records raw data (`GetData()`) in bytes.

10.32.2.10 `DDFField * DDFRecord::GetField (int i)`

Fetch field object based on index.

Parameters

<i>i</i>	The index of the field to fetch. Between 0 and <code>GetFieldCount()-1</code> .
----------	---

Returns

A `DDFField` pointer, or NULL if the index is out of range.

10.32.2.11 `int DDFRecord::GetFieldCount () [inline]`

Get the number of DDFFields on this record.

10.32.2.12 `double DDFRecord::GetFloatSubfield (const char * pszField, int iFieldIndex, const char * pszSubfield, int iSubfieldIndex, int * pnSuccess = NULL)`

Fetch value of a subfield as a float (double). This is a convenience function for fetching a subfield of a field within this record.

Parameters

<i>pszField</i>	The name of the field containing the subfield.
<i>iFieldIndex</i>	The instance of this field within the record. Use zero for the first instance of this field.
<i>pszSubfield</i>	The name of the subfield within the selected field.
<i>iSubfieldIndex</i>	The instance of this subfield within the record. Use zero for the first instance.
<i>pnSuccess</i>	Pointer to an int which will be set to TRUE if the fetch succeeds, or FALSE if it fails. Use NULL if you don't want to check success.

Returns

The value of the subfield, or zero if it failed for some reason.

10.32.2.13 `int DDFRecord::GetIntSubfield (const char * pszField, int iFieldIndex, const char * pszSubfield, int iSubfieldIndex, int * pnSuccess = NULL)`

Fetch value of a subfield as an integer. This is a convenience function for fetching a subfield of a field within this record.

Parameters

<i>pszField</i>	The name of the field containing the subfield.
<i>iFieldIndex</i>	The instance of this field within the record. Use zero for the first instance of this field.
<i>pszSubfield</i>	The name of the subfield within the selected field.
<i>iSubfieldIndex</i>	The instance of this subfield within the record. Use zero for the first instance.
<i>pnSuccess</i>	Pointer to an int which will be set to TRUE if the fetch succeeds, or FALSE if it fails. Use NULL if you don't want to check success.

Returns

The value of the subfield, or zero if it failed for some reason.

10.32.2.14 DDFModule* DDFRecord::GetModule () [inline]

Fetch the [DDFModule](#) with which this record is associated.

10.32.2.15 const char * DDFRecord::GetStringSubfield (const char * pszField, int iFieldIndex, const char * pszSubfield, int iSubfieldIndex, int * pnSuccess = NULL)

Fetch value of a subfield as a string. This is a convenience function for fetching a subfield of a field within this record.

Parameters

<i>pszField</i>	The name of the field containing the subfield.
<i>iFieldIndex</i>	The instance of this field within the record. Use zero for the first instance of this field.
<i>pszSubfield</i>	The name of the subfield within the selected field.
<i>iSubfieldIndex</i>	The instance of this subfield within the record. Use zero for the first instance.
<i>pnSuccess</i>	Pointer to an int which will be set to TRUE if the fetch succeeds, or FALSE if it fails. Use NULL if you don't want to check success.

Returns

The value of the subfield, or NULL if it failed for some reason. The returned pointer is to internal data and should not be modified or freed by the application.

10.32.2.16 int DDFRecord::ResizeField (DDFField * poField, int nNewDataSize)

Alter field data size within record.

This method will rearrange a [DDFRecord](#) altering the amount of space reserved for one of the existing fields. All following fields will be shifted accordingly. This includes updating the [DDFField](#) infos, and actually moving stuff within the data array after reallocating to the desired size.

Parameters

<i>poField</i>	the field to alter.
<i>nNewDataSize</i>	the number of data bytes to be reserved for the field.

Returns

TRUE on success or FALSE on failure.

10.32.2.17 int DDFRecord::SetFieldRaw (DDFField * poField, int iIndexWithinField, const char * pachRawData, int nRawDataSize)

Set the raw contents of a field instance.

Parameters

<i>poField</i>	the field to set data within.
<i>iIndexWithinField</i>	The instance of this field to replace. Must be a value between 0 and GetRepeatCount(). If GetRepeatCount() is used, a new instance of the field is appended.
<i>pachRawData</i>	the raw data to replace this field instance with.
<i>nRawDataSize</i>	the number of bytes pointed to by pachRawData.

Returns

TRUE on success or FALSE on failure.

10.32.2.18 int DDFRecord::SetFloatSubfield (const char * *pszField*, int *iFieldIndex*, const char * *pszSubfield*, int *iSubfieldIndex*, double *dfNewValue*)

Set a float subfield in record.

The value of a given subfield is replaced with a new float value formatted appropriately.

Parameters

<i>pszField</i>	the field name to operate on.
<i>iFieldIndex</i>	the field index to operate on (zero based).
<i>pszSubfield</i>	the subfield name to operate on.
<i>iSubfieldIndex</i>	the subfield index to operate on (zero based).
<i>dfNewValue</i>	the new value to place in the subfield.

Returns

TRUE if successful, and FALSE if not.

10.32.2.19 int DDFRecord::SetIntSubfield (const char * *pszField*, int *iFieldIndex*, const char * *pszSubfield*, int *iSubfieldIndex*, int *nNewValue*)

Set an integer subfield in record.

The value of a given subfield is replaced with a new integer value formatted appropriately.

Parameters

<i>pszField</i>	the field name to operate on.
<i>iFieldIndex</i>	the field index to operate on (zero based).
<i>pszSubfield</i>	the subfield name to operate on.
<i>iSubfieldIndex</i>	the subfield index to operate on (zero based).
<i>nNewValue</i>	the new value to place in the subfield.

Returns

TRUE if successful, and FALSE if not.

10.32.2.20 int DDFRecord::SetStringSubfield (const char * *pszField*, int *iFieldIndex*, const char * *pszSubfield*, int *iSubfieldIndex*, const char * *pszValue*, int *nValueLength* = -1)

Set a string subfield in record.

The value of a given subfield is replaced with a new string value formatted appropriately.

Parameters

<i>pszField</i>	the field name to operate on.
<i>iFieldIndex</i>	the field index to operate on (zero based).
<i>pszSubfield</i>	the subfield name to operate on.
<i>iSubfieldIndex</i>	the subfield index to operate on (zero based).
<i>pszValue</i>	the new string to place in the subfield. This may be arbitrary binary bytes if nValueLength is specified.
<i>nValueLength</i>	the number of valid bytes in pszValue, may be -1 to internally fetch with strlen().

Returns

TRUE if successful, and FALSE if not.

10.32.2.21 int DDFRecord::Write ()

Write record out to module.

This method writes the current record to the module to which it is attached. Normally this would be at the end of the file, and only used for modules newly created with DDFModule::Create(). Rewriting existing records is not supported at this time. Calling [Write\(\)](#) multiple times on a [DDFRecord](#) will result it multiple copies being written at the end of the module.

Returns

TRUE on success or FALSE on failure.

The documentation for this class was generated from the following files:

- iso8211.h
- ddfrecord.cpp

10.33 DDFSubfieldDefn Class Reference

```
#include <iso8211.h>
```

Public Types

- enum [DDFBinaryFormat](#)

Public Member Functions

- const char * [GetName](#) ()
- const char * [GetFormat](#) ()
- DDFDataType [GetType](#) ()
- double [ExtractFloatData](#) (const char *pachData, int nMaxBytes, int *pnConsumedBytes)
- int [ExtractIntData](#) (const char *pachData, int nMaxBytes, int *pnConsumedBytes)
- const char * [ExtractStringData](#) (const char *pachData, int nMaxBytes, int *pnConsumedBytes)
- int [GetDataLength](#) (const char *, int, int *)
- void [DumpData](#) (const char *pachData, int nMaxBytes, FILE *fp)
- int [FormatStringValue](#) (char *pachData, int nBytesAvailable, int *pnBytesUsed, const char *pszValue, int nValueLength=-1)
- int [FormatIntValue](#) (char *pachData, int nBytesAvailable, int *pnBytesUsed, int nNewValue)
- int [FormatFloatValue](#) (char *pachData, int nBytesAvailable, int *pnBytesUsed, double dfNewValue)

- int [GetWidth](#) ()
- int [GetDefaultValue](#) (char *pachData, int nBytesAvailable, int *pnBytesUsed)
- void [Dump](#) (FILE *fp)

10.33.1 Detailed Description

Information from the DDR record describing one subfield of a [DDFFieldDefn](#). All subfields of a field will occur in each occurrence of that field (as a [DDFField](#)) in a [DDFRecord](#). Subfield's actually contain formatted data (as instances within a record).

10.33.2 Member Enumeration Documentation

10.33.2.1 enum DDFSubfieldDefn::DDFBinaryFormat

Binary format: this is the digit immediately following the B or b for binary formats.

10.33.3 Member Function Documentation

10.33.3.1 void DDFSubfieldDefn::Dump (FILE * fp)

Write out subfield definition info to debugging file.

A variety of information about this field definition is written to the give debugging file handle.

Parameters

<i>fp</i>	The standard IO file handle to write to. i.e. stderr
-----------	--

10.33.3.2 void DDFSubfieldDefn::DumpData (const char * pachData, int nMaxBytes, FILE * fp)

Dump subfield value to debugging file.

Parameters

<i>pachData</i>	Pointer to data for this subfield.
<i>nMaxBytes</i>	Maximum number of bytes available in pachData.
<i>fp</i>	File to write report to.

10.33.3.3 double DDFSubfieldDefn::ExtractFloatData (const char * pachSourceData, int nMaxBytes, int * pnConsumedBytes)

Extract a subfield value as a float. Given a pointer to the data for this subfield (from within a [DDFRecord](#)) this method will return the floating point data for this subfield. The number of bytes consumed as part of this field can also be fetched. This method may be called for any type of subfield, and will return zero if the subfield is not numeric.

Parameters

<i>pachSourceData</i>	The pointer to the raw data for this field. This may have come from DDFRecord::GetData() , taking into account skip factors over previous subfields data.
<i>nMaxBytes</i>	The maximum number of bytes that are accessible after pachSourceData.
<i>pnConsumed-Bytes</i>	Pointer to an integer into which the number of bytes consumed by this field should be written. May be NULL to ignore. This is used as a skip factor to increment pachSourceData to point to the next subfields data.

Returns

The subfield's numeric value (or zero if it isn't numeric).

See Also

[ExtractIntData\(\)](#), [ExtractStringData\(\)](#)

10.33.3.4 int DDFSubfieldDefn::ExtractIntData (const char * *pachSourceData*, int *nMaxBytes*, int * *pnConsumedBytes*)

Extract a subfield value as an integer. Given a pointer to the data for this subfield (from within a [DDFRecord](#)) this method will return the int data for this subfield. The number of bytes consumed as part of this field can also be fetched. This method may be called for any type of subfield, and will return zero if the subfield is not numeric.

Parameters

<i>pachSourceData</i>	The pointer to the raw data for this field. This may have come from DDFRecord::GetData() , taking into account skip factors over previous subfields data.
<i>nMaxBytes</i>	The maximum number of bytes that are accessible after <i>pachSourceData</i> .
<i>pnConsumed-Bytes</i>	Pointer to an integer into which the number of bytes consumed by this field should be written. May be NULL to ignore. This is used as a skip factor to increment <i>pachSourceData</i> to point to the next subfields data.

Returns

The subfield's numeric value (or zero if it isn't numeric).

See Also

[ExtractFloatData\(\)](#), [ExtractStringData\(\)](#)

10.33.3.5 const char * DDFSubfieldDefn::ExtractStringData (const char * *pachSourceData*, int *nMaxBytes*, int * *pnConsumedBytes*)

Extract a zero terminated string containing the data for this subfield. Given a pointer to the data for this subfield (from within a [DDFRecord](#)) this method will return the data for this subfield. The number of bytes consumed as part of this field can also be fetched. This number may be one longer than the string length if there is a terminator character used.

This function will return the raw binary data of a subfield for types other than [DDFString](#), including data past zero chars. This is the standard way of extracting [DDFBinaryString](#) subfields for instance.

Parameters

<i>pachSourceData</i>	The pointer to the raw data for this field. This may have come from DDFRecord::GetData() , taking into account skip factors over previous subfields data.
<i>nMaxBytes</i>	The maximum number of bytes that are accessible after <i>pachSourceData</i> .
<i>pnConsumed-Bytes</i>	Pointer to an integer into which the number of bytes consumed by this field should be written. May be NULL to ignore. This is used as a skip factor to increment <i>pachSourceData</i> to point to the next subfields data.

Returns

A pointer to a buffer containing the data for this field. The returned pointer is to an internal buffer which is invalidated on the next [ExtractStringData\(\)](#) call on this [DDFSubfieldDefn\(\)](#). It should not be freed by the application.

See Also

[ExtractIntData\(\)](#), [ExtractFloatData\(\)](#)

10.33.3.6 int DDFSubfieldDefn::FormatFloatValue (char * *pachData*, int *nBytesAvailable*, int * *pnBytesUsed*, double *dfNewValue*)

Format float subfield value.

Returns a buffer with the passed in float value reformatted in a way suitable for storage in a [DDFField](#) for this subfield.

10.33.3.7 int DDFSubfieldDefn::FormatIntValue (char * *pachData*, int *nBytesAvailable*, int * *pnBytesUsed*, int *nNewValue*)

Format int subfield value.

Returns a buffer with the passed in int value reformatted in a way suitable for storage in a [DDFField](#) for this subfield.

10.33.3.8 int DDFSubfieldDefn::FormatStringValue (char * *pachData*, int *nBytesAvailable*, int * *pnBytesUsed*, const char * *pszValue*, int *nValueLength* = -1)

Format string subfield value.

Returns a buffer with the passed in string value reformatted in a way suitable for storage in a [DDFField](#) for this subfield.

10.33.3.9 int DDFSubfieldDefn::GetDataLength (const char * *pachSourceData*, int *nMaxBytes*, int * *pnConsumedBytes*)

Scan for the end of variable length data. Given a pointer to the data for this subfield (from within a [DDFRecord](#)) this method will return the number of bytes which are data for this subfield. The number of bytes consumed as part of this field can also be fetched. This number may be one longer than the length if there is a terminator character used.

This method is mainly for internal use, or for applications which want the raw binary data to interpret themselves. Otherwise use one of [ExtractStringData\(\)](#), [ExtractIntData\(\)](#) or [ExtractFloatData\(\)](#).

Parameters

<i>pachSourceData</i>	The pointer to the raw data for this field. This may have come from DDFRecord::GetData() , taking into account skip factors over previous subfields data.
<i>nMaxBytes</i>	The maximum number of bytes that are accessible after <i>pachSourceData</i> .
<i>pnConsumed-Bytes</i>	Pointer to an integer into which the number of bytes consumed by this field should be written. May be NULL to ignore.

Returns

The number of bytes at pachSourceData which are actual data for this record (not including unit, or field terminator).

10.33.3.10 `int DDFSubfieldDefn::GetDefaultValue (char * pachData, int nBytesAvailable, int * pnBytesUsed)`

Get default data.

Returns the default subfield data contents for this subfield definition. For variable length numbers this will normally be "0<unit-terminator>". For variable length strings it will be "<unit-terminator>". For fixed length numbers it is zero filled. For fixed length strings it is space filled. For binary numbers it is binary zero filled.

Parameters

<i>pachData</i>	the buffer into which the returned default will be placed. May be NULL if just querying default size.
<i>nBytesAvailable</i>	the size of pachData in bytes.
<i>pnBytesUsed</i>	will receive the size of the subfield default data in bytes.

Returns

TRUE on success or FALSE on failure or if the passed buffer is too small to hold the default.

10.33.3.11 `const char* DDFSubfieldDefn::GetFormat () [inline]`

Get pointer to subfield format string

10.33.3.12 `const char* DDFSubfieldDefn::GetName () [inline]`

Get pointer to subfield name.

10.33.3.13 `DDFDataType DDFSubfieldDefn::GetType () [inline]`

Get the general type of the subfield. This can be used to determine which of [ExtractFloatData\(\)](#), [ExtractIntData\(\)](#) or [ExtractStringData\(\)](#) should be used.

Returns

The subfield type. One of DDFInt, DDFFloat, DDFString or DDFBinaryString.

10.33.3.14 `int DDFSubfieldDefn::GetWidth () [inline]`

Get the subfield width (zero for variable).

The documentation for this class was generated from the following files:

- iso8211.h
- ddfsubfielddefn.cpp

10.34 DefaultCSVFileNameTLS Struct Reference

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

- `cpl_csv.cpp`

10.35 errHandler Struct Reference

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

- `cpl_error.cpp`

10.36 file_in_zip_read_info_s Struct Reference

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

- `cpl_minizip_unzip.cpp`

10.37 FindFileTLS Struct Reference

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

- `cpl_findfile.cpp`

10.38 GDALScaledProgressInfo Struct Reference

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

- `cpl_progress.cpp`

10.39 linkedlist_data_s Struct Reference

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

- `cpl_minizip_zip.cpp`

10.40 linkedlist_datablock_internal_s Struct Reference

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

- `cpl_minizip_zip.cpp`

10.41 ParseContext Struct Reference

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

- `cpl_minixml.cpp`

10.42 SDTS_CATD Class Reference

```
#include <sdts_al.h>
```

Public Member Functions

- const char * [GetEntryTypeDesc](#) (int)
- const char * [GetEntryFilePath](#) (int)
- SDTSLayerType [GetEntryType](#) (int)

10.42.1 Detailed Description

Class for accessing the CATD (Catalog Directory) file containing a list of all other files (modules) in the transfer.

10.42.2 Member Function Documentation

10.42.2.1 const char * SDTS_CATD::GetEntryFilePath (int *iEntry*)

Fetch the full filename of the requested module.

Parameters

<i>iEntry</i>	The module index within the CATD catalog. A number from zero to GetEntryCount()-1.
---------------	--

Returns

A pointer to an internal string containing the filename. This string should not be altered, or freed by the application.

10.42.2.2 SDTSLayerType SDTS_CATD::GetEntryType (int *iEntry*)

Fetch the enumerated type of a module in the catalog.

Parameters

<i>iEntry</i>	The module index within the CATD catalog. A number from zero to GetEntryCount()-1.
---------------	--

Returns

A value from the SDTSLayerType enumeration indicating the type of the module, and indicating the corresponding type of reader.

- SLTPoint: Read with [SDTSPointReader](#), underlying type of `Point-Node`.
- SLTLine: Read with [SDTSLineReader](#), underlying type of `Line`.
- SLTAttr: Read with [SDTSAttrReader](#), underlying type of `Attribute Primary` or `Attribute Secondary`.
- SLTPolygon: Read with [SDTSPolygonReader](#), underlying type of `Polygon`.

10.42.2.3 const char * SDTS_CATD::GetEntryTypeDesc (int *iEntry*)

Fetch the type description of a module in the catalog.

Parameters

<i>iEntry</i>	The module index within the CATD catalog. A number from zero to GetEntryCount()-1.
---------------	--

Returns

A pointer to an internal string with the type description for this module. This is from the CATD file (subfield TYPE of field CATD), and will be something like "Attribute Primary ".

The documentation for this class was generated from the following files:

- `sdt_s_al.h`
- `sdtscatd.cpp`

10.43 SDTS_CATDEntry Class Reference

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

- `sdtscatd.cpp`

10.44 SDTS_IREF Class Reference

```
#include <sdt_s_al.h>
```

10.44.1 Detailed Description

Class holding SDTS IREF (internal reference) information, internal coordinate system format, scaling and resolution. This object isn't normally needed by applications.

The documentation for this class was generated from the following files:

- `sdt_s_al.h`
- `sdt_siref.cpp`

10.45 SDTS_XREF Class Reference

```
#include <sdt_s_al.h>
```

Public Attributes

- `char * pszSystemName`
- `char * pszDatum`
- `int nZone`

10.45.1 Detailed Description

Class for reading the XREF (external reference) module containing the data projection definition.

10.45.2 Member Data Documentation

10.45.2.1 int SDTS_XREF::nZone

Zone number for UTM and SPCS projections, from the ZONE field.

10.45.2.2 char* SDTS_XREF::pszDatum

Horizontal datum name, from the HDAT field. One of NAS, NAX, WGA, WGB, WGC, WGE.

10.45.2.3 char* SDTS_XREF::pszSystemName

Projection system name, from the RSNM field. One of GEO, SPCS, UTM, UPS, OTHR, UNSP.

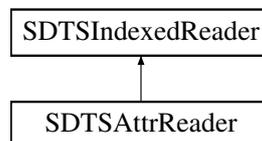
The documentation for this class was generated from the following files:

- `sdts_al.h`
- `sdtsxref.cpp`

10.46 SDTSAttrReader Class Reference

```
#include <sdts_al.h>
```

Inheritance diagram for SDTSAttrReader:



Public Member Functions

- int [IsSecondary](#) ()

10.46.1 Detailed Description

Class for reading [SDTSAttrRecord](#) features from a primary or secondary attribute module.

10.46.2 Member Function Documentation

10.46.2.1 int SDTSAttrReader::IsSecondary () [inline]

Returns TRUE if this is a Attribute Secondary layer rather than an Attribute Primary layer.

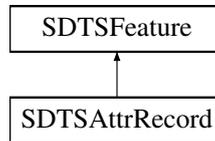
The documentation for this class was generated from the following files:

- `sdts_al.h`
- `sdtsattrreader.cpp`

10.47 SDTSAttrRecord Class Reference

```
#include <sdts_al.h>
```

Inheritance diagram for SDTSAttrRecord:



Public Member Functions

- virtual void [Dump](#) (FILE *) override

Public Attributes

- [DDFRecord](#) * [poWholeRecord](#)
- [DDFField](#) * [poATTR](#)

10.47.1 Detailed Description

SDTS attribute record feature, as read from A* modules by [SDTSAttrReader](#).

Note that even though [SDTSAttrRecord](#) is derived from [SDTSFeature](#), there are never any attribute records associated with attribute records using the aoATID[] mechanism. [SDTSFeature::nAttributes](#) will always be zero.

10.47.2 Member Function Documentation

10.47.2.1 void [SDTSAttrRecord::Dump](#) (FILE *) [override],[virtual]

Dump readable description of feature to indicated stream.

Implements [SDTSFeature](#).

10.47.3 Member Data Documentation

10.47.3.1 [DDFField](#)* [SDTSAttrRecord::poATTR](#)

The ATTR [DDFField](#) with the user attribute. Each subfield is a attribute value.

10.47.3.2 [DDFRecord](#)* [SDTSAttrRecord::poWholeRecord](#)

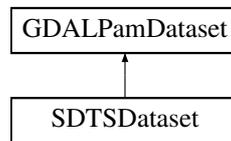
The entire [DDFRecord](#) read from the file.

The documentation for this class was generated from the following files:

- [sdts_al.h](#)
- [sdtsattrreader.cpp](#)

10.48 SDTSDataset Class Reference

Inheritance diagram for SDTSDataset:



Friends

- class **SDTSRasterBand**

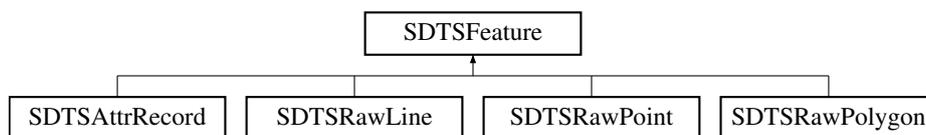
The documentation for this class was generated from the following file:

- [sdtsdataset.cpp](#)

10.49 SDTSFeature Class Reference

```
#include <sdts_al.h>
```

Inheritance diagram for SDTSFeature:



Public Member Functions

- virtual void [Dump](#) (FILE *)=0

Public Attributes

- [SDTSMoId](#) oModId
- int nAttributes
- [SDTSMoId](#) * paoATID

10.49.1 Detailed Description

Base class for various SDTS features classes, providing a generic module identifier, and list of attribute references.

10.49.2 Member Function Documentation

10.49.2.1 virtual void [SDTSFeature::Dump](#) (FILE *) [pure virtual]

Dump readable description of feature to indicated stream.

Implemented in [SDTSRawPolygon](#), [SDTSRawPoint](#), [SDTSAttrRecord](#), and [SDTSRawLine](#).

10.49.3 Member Data Documentation

10.49.3.1 int SDTSFeature::nAttributes

Number of attribute links (aoATID[]) on this feature.

10.49.3.2 SDTSModId SDTSFeature::oModId

Unique identifier for this record/feature within transfer.

10.49.3.3 SDTSModId* SDTSFeature::paoATID

List of nAttributes attribute record identifiers related to this feature.

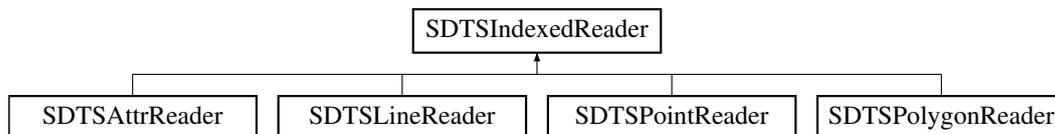
The documentation for this class was generated from the following files:

- sdt_s_al.h
- sdtlib.cpp

10.50 SDTSIndexedReader Class Reference

```
#include <sdt_s_al.h>
```

Inheritance diagram for SDTSIndexedReader:



Public Member Functions

- [SDTSFeature * GetNextFeature \(\)](#)
- virtual void [Rewind \(\)](#)
- void [FillIndex \(\)](#)
- void [ClearIndex \(\)](#)
- int [IsIndexed \(\)](#)
- [SDTSFeature * GetIndexedFeatureRef \(int\)](#)
- char ** [ScanModuleReferences](#) (const char *="ATID")

10.50.1 Detailed Description

Base class for all the [SDTSFeature](#) type readers. Provides feature caching semantics and fetching based on a record number.

10.50.2 Member Function Documentation

10.50.2.1 void SDTSIndexedReader::ClearIndex ()

Free all features in the index (if filled).

After this the reader is considered to not be indexed, and [IsIndexed\(\)](#) will return FALSE until the index is forcibly filled again.

10.50.2.2 void SDTSIndexedReader::FillIndex ()

Read all features into a memory indexed cached.

The [ClearIndex\(\)](#) method can be used to free all indexed features. [FillIndex\(\)](#) does nothing, if an index has already been built.

10.50.2.3 SDTSFeature * SDTSIndexedReader::GetIndexedFeatureRef (int *iRecordId*)

Fetch a feature based on its record number.

This method will forcibly fill the feature cache, reading all the features in the file into memory, if they haven't already been loaded. The [ClearIndex\(\)](#) method can be used to flush this cache when no longer needed.

Parameters

<i>iRecordId</i>	the record to fetch, normally based on the nRecord field of an SDTSModId .
------------------	--

Returns

a pointer to an internal feature (not to be deleted) or NULL if there is no matching feature.

10.50.2.4 SDTSFeature * SDTSIndexedReader::GetNextFeature ()

Fetch the next available feature from this reader.

The returned [SDTSFeature *](#) is to an internal indexed object if the [IsIndexed\(\)](#) method returns TRUE, otherwise the returned feature becomes the responsibility of the caller to destroy with delete.

Note that the [Rewind\(\)](#) method can be used to start over at the beginning of the modules feature list.

Returns

next feature, or NULL if no more are left. Please review above ownership/delete semantics.

10.50.2.5 int SDTSIndexedReader::IsIndexed ()

Returns TRUE if the module is indexed, otherwise it returns FALSE.

If the module is indexed all the feature have already been read into memory, and searches based on the record number can be performed efficiently.

10.50.2.6 void SDTSIndexedReader::Rewind () [virtual]

Rewind so that the next feature returned by [GetNextFeature\(\)](#) will be the first in the module.

10.50.2.7 char ** SDTSIndexedReader::ScanModuleReferences (const char * *pszFName* = "ATID")

Scan an entire SDTS module for record references with the given field name.

The fields are required to have a MODN subfield from which the module is extracted.

This method is normally used to find all the attribute modules referred to by a point, line or polygon module to build a unified schema.

This method will have the side effect of rewinding unindexed readers because the scanning operation requires reading all records in the module from disk.

Parameters

<i>pszFName</i>	the field name to search for. By default "ATID" is used.
-----------------	--

Returns

a NULL terminated list of module names. Free with [CSLDestroy\(\)](#).

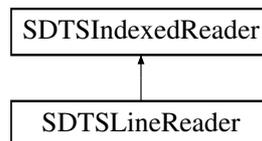
The documentation for this class was generated from the following files:

- [sdts_al.h](#)
- [sdtsindexedreader.cpp](#)

10.51 SDTSLineReader Class Reference

```
#include <sdts_al.h>
```

Inheritance diagram for SDTSLineReader:



Public Member Functions

- void [AttachToPolygons](#) ([SDTSTransfer](#) *, int iPolyLayer)

10.51.1 Detailed Description

Reader for SDTS line modules.

Returns [SDTSRawLine](#) features. Normally readers are instantiated with the [SDTSTransfer::GetIndexedReader\(\)](#) method.

10.51.2 Member Function Documentation

10.51.2.1 void SDTSLineReader::AttachToPolygons ([SDTSTransfer](#) * *poTransfer*, int *iTargetPolyLayer*)

Attach lines in this module to their polygons as the first step in polygon formation.

See also the [SDTSRawPolygon::AssembleRings\(\)](#) method.

Parameters

<i>poTransfer</i>	the SDTSTransfer of this SDTSLineReader , and from which the related SDTSPolygonReader will be instantiated.
<i>iTargetPolyLayer</i>	the polygon reader instance number, used to avoid processing lines for other layers.

The documentation for this class was generated from the following files:

- [sdts_al.h](#)
- [sdtslinereader.cpp](#)

10.52 SDTSModId Class Reference

```
#include <sdts_al.h>
```

Public Attributes

- char [szModule](#) [8]
- int [nRecord](#)
- char [szOB RP](#) [8]
- char [szName](#) [20]

10.52.1 Detailed Description

Object representing a unique module/record identifier within an SDTS transfer.

10.52.2 Member Data Documentation

10.52.2.1 int SDTSModId::nRecord

The record within the module referred to. This is -1 for unused SDTSModIds.

10.52.2.2 char SDTSModId::szModule[8]

The module name, such as PC01, containing the indicated record.

10.52.2.3 char SDTSModId::szName[20]

String "szModule:nRecord"

10.52.2.4 char SDTSModId::szOB RP[8]

The "role" of this record within the module. This is normally empty for references, but set in the oModId member of a feature.

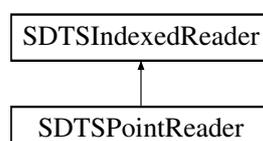
The documentation for this class was generated from the following files:

- `sdts_al.h`
- `sdtslib.cpp`

10.53 SDTSPointReader Class Reference

```
#include <sdts_al.h>
```

Inheritance diagram for SDTSPointReader:



Additional Inherited Members

10.53.1 Detailed Description

Class for reading [SDTSRawPoint](#) features from a point module (type NA, NO or NP).

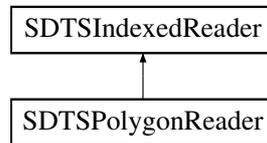
The documentation for this class was generated from the following files:

- [sdts_al.h](#)
- [sdtspointreader.cpp](#)

10.54 SDTSPolygonReader Class Reference

```
#include <sdts_al.h>
```

Inheritance diagram for SDTSPolygonReader:



Public Member Functions

- void [AssembleRings](#) ([SDTSTransfer](#) *, int iPolyLayer)

10.54.1 Detailed Description

Class for reading [SDTSRawPolygon](#) features from a polygon (PC*) module.

10.54.2 Member Function Documentation

10.54.2.1 void SDTSPolygonReader::AssembleRings ([SDTSTransfer](#) * *poTransfer*, int *iPolyLayer*)

Assemble geometry for a polygon transfer.

This method takes care of attaching lines from all the line layers in this transfer to this polygon layer, assembling the lines into rings on the polygons, and then cleaning up unnecessary intermediate results.

Currently this method will leave the line layers rewound to the beginning but indexed, and the polygon layer rewound but indexed. In the future it may restore reading positions, and possibly flush line indexes if they were not previously indexed.

This method does nothing if the rings have already been assembled on this layer using this method.

See [SDTSRawPolygon::AssembleRings\(\)](#) for more information on how the lines are assembled into rings.

Parameters

<i>poTransfer</i>	the SDTSTransfer that this reader is a part of. Used to get a list of line layers that might be needed.
-------------------	---

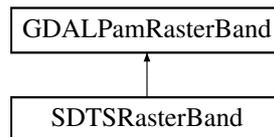
<i>iPolyLayer</i>	the polygon reader instance number, used to avoid processing lines for other layers.
-------------------	--

The documentation for this class was generated from the following files:

- `sdt_s_al.h`
- `sdtspolygonreader.cpp`

10.55 SDTSRasterBand Class Reference

Inheritance diagram for SDTSRasterBand:



Friends

- class **SDTSDataset**

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

- [sdtdataset.cpp](#)

10.56 SDTSRasterReader Class Reference

```
#include <sdt_s_al.h>
```

Public Member Functions

- `int GetRasterType ()`
- `int GetTransform (double *)`
- `int GetMinMax (double *pdfMin, double *pdfMax, double dfNoData)`
- `int GetXSize ()`
- `int GetYSize ()`
- `int GetBlockXSize ()`
- `int GetBlockYSize ()`
- `int GetBlock (int nXOffset, int nYOffset, void *pData)`

10.56.1 Detailed Description

Class for reading raster data from a raster layer.

This class is somewhat unique among the reader classes in that it isn't derived from SDTSIndexedFeature, and it doesn't return "features". Instead it is used to read raster blocks, in the natural block size of the dataset.

10.56.2 Member Function Documentation

10.56.2.1 `int SDTSRasterReader::GetBlock (int nXOffset, int nYOffset, void * pData)`

Read a block of raster data from the file.

Parameters

<i>nXOffset</i>	X block offset into the file. Normally zero for scanline organized raster files.
<i>nYOffset</i>	Y block offset into the file. Normally the scanline offset from top of raster for scanline organized raster files.
<i>pData</i>	pointer to GInt16 (signed short) buffer of data into which to read the raster.

Returns

TRUE on success and FALSE on error.

10.56.2.2 int SDTSRasterReader::GetBlockXSize () [inline]

Fetch the width of a source block (usually same as raster width).

10.56.2.3 int SDTSRasterReader::GetBlockYSize () [inline]

Fetch the height of a source block (usually one).

10.56.2.4 int SDTSRasterReader::GetMinMax (double * pdfMin, double * pdfMax, double dfNoData)

Fetch the minimum and maximum raster values that occur in the file.

Note this operation current results in a scan of the entire file.

Parameters

<i>pdfMin</i>	variable in which the minimum value encountered is returned.
<i>pdfMax</i>	variable in which the maximum value encountered is returned.
<i>dfNoData</i>	a value to ignore when computing min/max, defaults to -32766.

Returns

TRUE on success, or FALSE if an error occurs.

10.56.2.5 int SDTSRasterReader::GetRasterType ()

Fetch the pixel data type.

Returns one of SDTS_RT_INT16 (1) or SDTS_RT_FLOAT32 (6) indicating the type of buffer that should be passed to [GetBlock\(\)](#).

10.56.2.6 int SDTSRasterReader::GetTransform (double * pdfTransformOut)

Fetch the transformation between pixel/line coordinates and georeferenced coordinates.

Parameters

<i>pdfTransformOut</i>	pointer to an array of six doubles which will be filled with the georeferencing transform.
------------------------	--

Returns

TRUE is returned, indicating success.

The padfTransformOut array consists of six values. The pixel/line coordinate (Xp,Yp) can be related to a georeferenced coordinate (Xg,Yg) or (Easting, Northing).

```
Xg = padfTransformOut[0] + Xp * padfTransform[1] + Yp * padfTransform[2]
Yg = padfTransformOut[3] + Xp * padfTransform[4] + Yp * padfTransform[5]
```

In other words, for a north up image the top left corner of the top left pixel is at georeferenced coordinate (padfTransform[0],padfTransform[3]) the pixel width is padfTransform[1], the pixel height is padfTransform[5] and padfTransform[2] and padfTransform[4] will be zero.

10.56.2.7 int SDTSRasterReader::GetXSize () [inline]

Fetch the raster width.

Returns

the width in pixels.

10.56.2.8 int SDTSRasterReader::GetYSize () [inline]

Fetch the raster height.

Returns

the height in pixels.

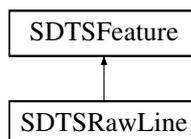
The documentation for this class was generated from the following files:

- sdt_s_al.h
- sdt_rasterreader.cpp

10.57 SDTSRawLine Class Reference

```
#include <sdt_s_al.h>
```

Inheritance diagram for SDTSRawLine:

**Public Member Functions**

- void [Dump](#) (FILE *) override

Public Attributes

- int [nVertices](#)
- double * [padfX](#)
- double * [padfY](#)
- double * [padfZ](#)
- [SDTSMoId](#) [oLeftPoly](#)
- [SDTSMoId](#) [oRightPoly](#)
- [SDTSMoId](#) [oStartNode](#)
- [SDTSMoId](#) [oEndNode](#)

10.57.1 Detailed Description

SDTS line feature, as read from LE* modules by [SDTSLineReader](#).

10.57.2 Member Function Documentation

10.57.2.1 `void SDTSRawLine::Dump (FILE *) [override],[virtual]`

Dump readable description of feature to indicated stream.

Implements [SDTSFeature](#).

10.57.3 Member Data Documentation

10.57.3.1 `int SDTSRawLine::nVertices`

Number of vertices in the `padfX`, `padfY` and `padfZ` arrays.

10.57.3.2 `SDTSMoId SDTSRawLine::oEndNode`

Identifier for the end node of this line. This is the SDTS ENID subfield.

10.57.3.3 `SDTSMoId SDTSRawLine::oLeftPoly`

Identifier of polygon to left of this line. This is the SDTS PIDL subfield.

10.57.3.4 `SDTSMoId SDTSRawLine::oRightPoly`

Identifier of polygon to right of this line. This is the SDTS PIDR subfield.

10.57.3.5 `SDTSMoId SDTSRawLine::oStartNode`

Identifier for the start node of this line. This is the SDTS SNID subfield.

10.57.3.6 `double* SDTSRawLine::padfX`

List of `nVertices` X coordinates.

10.57.3.7 double* SDTSRawLine::pdfY

List of nVertices Y coordinates.

10.57.3.8 double* SDTSRawLine::pdfZ

List of nVertices Z coordinates - currently always zero.

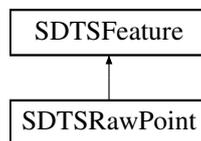
The documentation for this class was generated from the following files:

- `sdt_s_al.h`
- `sdtslinereader.cpp`

10.58 SDTSRawPoint Class Reference

```
#include <sdt_s_al.h>
```

Inheritance diagram for SDTSRawPoint:



Public Member Functions

- virtual void [Dump](#) (FILE *) override

Public Attributes

- double [dfX](#)
- double [dfY](#)
- double [dfZ](#)
- [SDTSModId oAreald](#)

10.58.1 Detailed Description

Object containing a point feature (type NA, NO or NP).

10.58.2 Member Function Documentation

10.58.2.1 void SDTSRawPoint::Dump (FILE *) [override],[virtual]

Dump readable description of feature to indicated stream.

Implements [SDTSFeature](#).

10.58.3 Member Data Documentation

10.58.3.1 double SDTSRawPoint::dfX

X coordinate of point.

10.58.3.2 double SDTSRawPoint::dfY

Y coordinate of point.

10.58.3.3 double SDTSRawPoint::dfZ

Z coordinate of point.

10.58.3.4 SDTSModId SDTSRawPoint::oAreald

Optional identifier of area marked by this point (i.e. PC01:27).

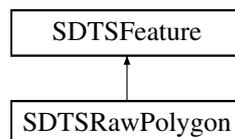
The documentation for this class was generated from the following files:

- `sdt_s_al.h`
- `sdtspointreader.cpp`

10.59 SDTSRawPolygon Class Reference

```
#include <sdt_s_al.h>
```

Inheritance diagram for SDTSRawPolygon:



Public Member Functions

- int [AssembleRings](#) ()
- virtual void [Dump](#) (FILE *) override

Public Attributes

- int [nRings](#)
- int [nVertices](#)
- int * [panRingStart](#)
- double * [padfX](#)
- double * [padfY](#)
- double * [padfZ](#)

10.59.1 Detailed Description

Class for holding information about a polygon feature.

When directly read from a polygon module, the polygon has no concept of its geometry. Just it's ID, and references to attribute records. However, if the [SDTSLineReader::AttachToPolygons\(\)](#) method is called on the module containing the lines forming the polygon boundaries, then the nEdges/papoEdges information on the [SDTSRawPolygon](#) will be filled in.

Once this is complete the [AssembleRings\(\)](#) method can be used to fill in the nRings/nVertices/panRingStart/padfX/padfY/padfZ information defining the ring geometry.

Note that the rings may not appear in any particular order, nor with any meaningful direction (clockwise or counter-clockwise).

10.59.2 Member Function Documentation

10.59.2.1 int SDTSRawPolygon::AssembleRings ()

This method will assemble the edges associated with a polygon into rings, returning FALSE if problems are encountered during assembly.

Form border lines (arcs) into outer and inner rings.

See SDTSPolygonReader::AssemblePolygons() for a simple one step process to assembling geometry for all polygons in a transfer.

This method will assemble the lines attached to a polygon into an outer ring, and zero or more inner rings. Before calling it is necessary that all the lines associated with this polygon have already been attached. Normally this is accomplished by calling [SDTSLineReader::AttachToPolygons\(\)](#) on all line layers that might contain edges related to this layer.

This method then forms the lines into rings. Rings are formed by:

1. Take a previously unconsumed line, and start a ring with it. Mark it as consumed, and keep track of its start and end node ids as being the start and end node ids of the ring.
2. If the rings start id is the same as the end node id then this ring is completely formed, return to step 1.
3. Search all unconsumed lines for a line with the same start or end node id as the rings current node id. If none are found then the assembly has failed. Return to step 1 but report failure on completion.
4. Once found, add the line to the current ring, dropping the duplicated vertex and reverse order if necessary. Mark the line as consumed, and update the rings end node id accordingly.
5. go to step 2.

Once ring assembly from lines is complete, another pass is made to order the rings such that the exterior ring is first, the first ring has counter-clockwise vertex ordering and the inner rings have clockwise vertex ordering. This is accomplished based on the assumption that the outer ring has the largest area, and using the +/- sign of area to establish direction of rings.

Returns

TRUE if all rings assembled without problems or FALSE if a problem occurred. If a problem occurs rings are still formed from all lines, but some of the rings will not be closed, and rings will have no particular order or direction.

10.59.2.2 void SDTSRawPolygon::Dump (FILE *) [override],[virtual]

Dump readable description of feature to indicated stream.

Implements [SDTSFeature](#).

10.59.3 Member Data Documentation

10.59.3.1 int SDTSRawPolygon::nRings

Number of rings in assembled polygon.

10.59.3.2 `int SDTSRawPolygon::nVertices`

Total number of vertices in all rings of assembled polygon.

10.59.3.3 `double* SDTSRawPolygon::pdfX`

List of nVertices X coordinates for the polygon (split over multiple rings via panRingStart).

10.59.3.4 `double* SDTSRawPolygon::pdfY`

List of nVertices Y coordinates for the polygon (split over multiple rings via panRingStart).

10.59.3.5 `double* SDTSRawPolygon::pdfZ`

List of nVertices Z coordinates for the polygon (split over multiple rings via panRingStart). The values are almost always zero.

10.59.3.6 `int* SDTSRawPolygon::panRingStart`

Offsets into pdfX/pdfY/pdfZ for the beginning of each ring in the polygon. This array is nRings long.

The documentation for this class was generated from the following files:

- `sdt_s_al.h`
- `sdtspolygonreader.cpp`

10.60 SDTSTransfer Class Reference

```
#include <sdt_s_al.h>
```

Public Member Functions

- `int Open` (`const char *`)
- `int FindLayer` (`const char *`)
- `SDTSLayerType GetLayerType` (`int`)
- `int GetLayerCATDEntry` (`int`)
- `SDTSRasterReader * GetLayerRasterReader` (`int`)
- `SDTSIndexedReader * GetLayerIndexedReader` (`int`)
- `SDTS_CATD * GetCATD` (`()`)
- `SDTS_XREF * GetXREF` (`()`)
- `DDFField * GetAttr` (`SDTSModId *`)
- `int GetBounds` (`double *pdfMinX, double *pdfMinY, double *pdfMaxX, double *pdfMaxY`)

10.60.1 Detailed Description

Master class representing an entire SDTS transfer.

This class is used to open the transfer, to get a list of available feature layers, and to instantiate readers for those layers.

10.60.2 Member Function Documentation

10.60.2.1 int SDTSTransfer::FindLayer (const char * *pszModule*)

Fetch the [SDTSTransfer](#) layer number corresponding to a module name.

Parameters

<i>pszModule</i>	the name of the module to search for, such as "PC01".
------------------	---

Returns

the layer number (between 0 and GetLayerCount()-1 corresponding to the module, or -1 if it doesn't correspond to a layer.

10.60.2.2 DDFField * SDTSTransfer::GetAttr (SDTSModId * poModId)

Fetch the attribute fields given a particular module/record id.

Parameters

<i>poModId</i>	an attribute record identifier, normally taken from the aoATID[] array of an SDTSIndexed-Feature.
----------------	---

Returns

a pointer to the [DDFField](#) containing the user attribute values as subfields.

10.60.2.3 int SDTSTransfer::GetBounds (double * pdfMinX, double * pdfMinY, double * pdfMaxX, double * pdfMaxY)

Fetch approximate bounds for a transfer by scanning all point layers and raster layers.

For TVP datasets (where point layers are scanned) the results can, in theory miss some lines that go outside the bounds of the point layers. However, this isn't common since most TVP sets contain a bounding rectangle whose corners will define the most extreme extents.

Parameters

<i>pdfMinX</i>	western edge of dataset
<i>pdfMinY</i>	southern edge of dataset
<i>pdfMaxX</i>	eastern edge of dataset
<i>pdfMaxY</i>	northern edge of dataset

Returns

TRUE if success, or FALSE on a failure.

10.60.2.4 SDTS_CATD* SDTSTransfer::GetCATD () [inline]

Fetch the catalog object for this transfer.

Returns

pointer to the internally managed [SDTS_CATD](#) for the transfer.

10.60.2.5 int SDTSTransfer::GetLayerCATDEntry (int iEntry)

Fetch the CATD module index for a layer. This can be used to fetch details about the layer/module from the [SDTS_CATD](#) object, such as its filename, and description.

Parameters

<i>iEntry</i>	the layer index from 0 to GetLayerCount()-1.
---------------	--

Returns

the module index suitable for use with the various [SDTS_CATD](#) methods.

10.60.2.6 SDTSIndexedReader * SDTSTransfer::GetLayerIndexedReader (int *iEntry*)

Returns a pointer to a reader of the appropriate type to the requested layer.

Notes:

- The returned reader remains owned by the [SDTSTransfer](#), and will be destroyed when the [SDTSTransfer](#) is destroyed. It should not be destroyed by the application.
- If an indexed reader was already created for this layer using [GetLayerIndexedReader\(\)](#), it will be returned instead of creating a new reader. Among other things this means that the returned reader may not be positioned to read from the beginning of the module, and may already have its index filled.
- The returned reader will be of a type appropriate to the layer. See [SDTSTransfer::GetLayerType\(\)](#) to see what reader classes correspond to what layer types, so it can be cast accordingly (if necessary).

Parameters

<i>iEntry</i>	the index of the layer to instantiate a reader for. A value between 0 and GetLayerCount()-1.
---------------	--

Returns

a pointer to an appropriate reader or NULL if the method fails.

10.60.2.7 SDTSRasterReader * SDTSTransfer::GetLayerRasterReader (int *iEntry*)

Instantiate an [SDTSRasterReader](#) for the indicated layer.

Parameters

<i>iEntry</i>	the index of the layer to instantiate a reader for. A value between 0 and GetLayerCount()-1.
---------------	--

Returns

a pointer to a new [SDTSRasterReader](#) object, or NULL if the method fails.

NOTE: The reader returned from [GetLayerRasterReader\(\)](#) becomes the responsibility of the caller to delete, and isn't automatically deleted when the [SDTSTransfer](#) is destroyed. This method is different from the [GetLayerIndexedReader\(\)](#) method in this regard.

10.60.2.8 SDTSLayerType SDTSTransfer::GetLayerType (int *iEntry*)

Fetch type of requested feature layer.

Parameters

<i>iEntry</i>	the index of the layer to fetch information on. A value from zero to GetLayerCount()-1.
---------------	---

Returns

the layer type.

- SLTPoint: A point layer. An [SDTSPointReader](#) is returned by [SDTSTransfer::GetLayerIndexedReader\(\)](#).
- SLTLine: A line layer. An [SDTSLineReader](#) is returned by [SDTSTransfer::GetLayerIndexedReader\(\)](#).
- SLTAttr: An attribute primary or secondary layer. An [SDTSAAttrReader](#) is returned by [SDTSTransfer::GetLayerIndexedReader\(\)](#).
- SLTPoly: A polygon layer. An [SDTSPolygonReader](#) is returned by [SDTSTransfer::GetLayerIndexedReader\(\)](#).
- SLTRaster: A raster layer. [SDTSTransfer::GetLayerIndexedReader\(\)](#) is not implemented. Use [SDTSTransfer::GetLayerRasterReader\(\)](#) instead.

10.60.2.9 SDTS_XREF* SDTSTransfer::GetXREF () [inline]

Fetch the external reference object for this transfer.

Returns

pointer to the internally managed [SDTS_XREF](#) for the transfer.

10.60.2.10 int SDTSTransfer::Open (const char * pszFilename)

Open an SDTS transfer, and establish a list of data layers in the transfer.

Parameters

<i>pszFilename</i>	The name of the CATD file within the transfer.
--------------------	--

Returns

TRUE if the open success, or FALSE if it fails.

The documentation for this class was generated from the following files:

- [sdts_al.h](#)
- [sdtstransfer.cpp](#)

10.61 SFRegion Class Reference

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

- [cpl_vsil_sparsefile.cpp](#)

10.62 StackContext Struct Reference

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

- [cpl_minixml.cpp](#)

10.63 tm_unz_s Struct Reference

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

- cpl_minizip_unzip.h

10.64 tm_zip_s Struct Reference

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

- cpl_minizip_zip.h

10.65 TupleEnvVarOptionName Struct Reference

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

- cpl_http.cpp

10.66 unz_file_info_internal_s Struct Reference

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

- cpl_minizip_unzip.cpp

10.67 unz_file_info_s Struct Reference

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

- cpl_minizip_unzip.h

10.68 unz_file_pos_s Struct Reference

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

- cpl_minizip_unzip.h

10.69 unz_global_info_s Struct Reference

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

- cpl_minizip_unzip.h

10.70 unz_s Struct Reference

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

- cpl_minizip_unzip.cpp

10.71 VSIArchiveContent Class Reference

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

- `cpl_vsi_virtual.h`

10.72 VSIArchiveEntry Struct Reference

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

- `cpl_vsi_virtual.h`

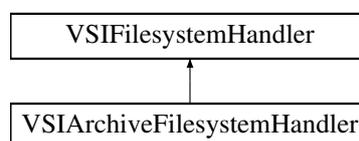
10.73 VSIArchiveEntryFileOffset Class Reference

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

- `cpl_vsi_virtual.h`

10.74 VSIArchiveFilesystemHandler Class Reference

Inheritance diagram for VSIArchiveFilesystemHandler:



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

- `cpl_vsi_virtual.h`

10.75 VSIArchiveReader Class Reference

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

- `cpl_vsi_virtual.h`

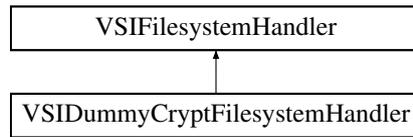
10.76 VSIDIR Struct Reference

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

- `vsipreload.cpp`

10.77 VSIDummyCryptFilesystemHandler Class Reference

Inheritance diagram for VSIDummyCryptFilesystemHandler:



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

- cpl_vsil_crypt.cpp

10.78 VSIErrorContext Struct Reference

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

- cpl_vsi_error.cpp

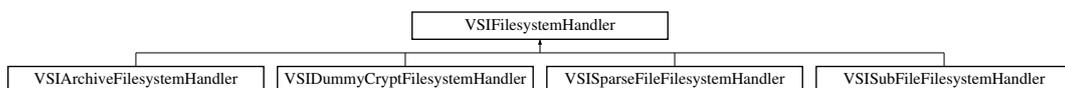
10.79 VSIFileManager Class Reference

The documentation for this class was generated from the following files:

- cpl_vsi_virtual.h
- cpl_vsil.cpp

10.80 VSIFilesystemHandler Class Reference

Inheritance diagram for VSIFilesystemHandler:



The documentation for this class was generated from the following files:

- cpl_vsi_virtual.h
- cpl_vsil.cpp

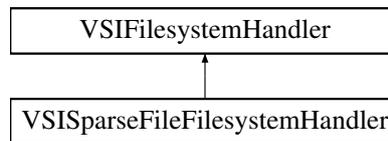
10.81 VSIReadDirRecursiveTask Struct Reference

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

- cpl_vsil.cpp

10.82 VSISparseFileFilesystemHandler Class Reference

Inheritance diagram for VSISparseFileFilesystemHandler:

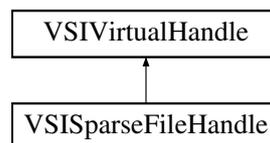


The documentation for this class was generated from the following file:

- `cpl_vsil_sparsefile.cpp`

10.83 VSISparseFileHandle Class Reference

Inheritance diagram for VSISparseFileHandle:



Public Member Functions

- virtual int [Seek](#) ([vsi_l_offset](#) nOffset, int nWhence) override
Seek to requested offset.
- virtual [vsi_l_offset](#) [Tell](#) () override
Tell current file offset.
- virtual size_t [Read](#) (void *pBuffer, size_t nSize, size_t nMemb) override
Read bytes from file.
- virtual size_t [Write](#) (const void *pBuffer, size_t nSize, size_t nMemb) override
Write bytes to file.
- virtual int [Eof](#) () override
Test for end of file.
- virtual int [Close](#) () override
Close file.

10.83.1 Member Function Documentation

10.83.1.1 int VSISparseFileHandle::Close () [override], [virtual]

Close file.

This function closes the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fclose()` function.

Returns

0 on success or -1 on failure.

Implements [VSIVirtualHandle](#).

10.83.1.2 `int VSISparseFileHandle::Eof () [override],[virtual]`

Test for end of file.

Returns TRUE (non-zero) if an end-of-file condition occurred during the previous read operation. The end-of-file flag is cleared by a successful [VSIFSeekL\(\)](#) call.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX feof() call.

Returns

TRUE if at EOF else FALSE.

Implements [VSIVirtualHandle](#).

10.83.1.3 `size_t VSISparseFileHandle::Read (void * pBuffer, size_t nSize, size_t nCount) [override],[virtual]`

Read bytes from file.

Reads nCount objects of nSize bytes from the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fread() call.

Parameters

<i>pBuffer</i>	the buffer into which the data should be read (at least nCount * nSize bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.

Returns

number of objects successfully read.

Implements [VSIVirtualHandle](#).

10.83.1.4 `int VSISparseFileHandle::Seek (vsi_l_offset nOffset, int nWhence) [override],[virtual]`

Seek to requested offset.

Seek to the desired offset (nOffset) in the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fseek() call.

Parameters

<i>nOffset</i>	offset in bytes.
<i>nWhence</i>	one of SEEK_SET, SEEK_CUR or SEEK_END.

Returns

0 on success or -1 on failure.

Implements [VSIVirtualHandle](#).

10.83.1.5 vsi_l_offset VSISparseFileHandle::Tell () [override],[virtual]

Tell current file offset.

Returns the current file read/write offset in bytes from the beginning of the file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX ftell() call.

Returns

file offset in bytes.

Implements [VSIVirtualHandle](#).

10.83.1.6 size_t VSISparseFileHandle::Write (const void * pBuffer, size_t nSize, size_t nCount) [override],[virtual]

Write bytes to file.

Writes nCount objects of nSize bytes to the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fwrite() call.

Parameters

<i>pBuffer</i>	the buffer from which the data should be written (at least nCount * nSize bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.

Returns

number of objects successfully written.

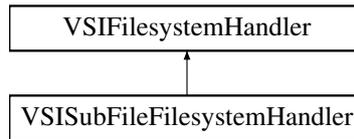
Implements [VSIVirtualHandle](#).

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

- cpl_vsil_sparsefile.cpp

10.84 VSISubFileFilesystemHandler Class Reference

Inheritance diagram for VSISubFileFilesystemHandler:

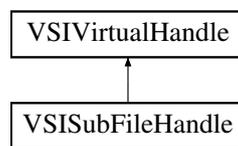


The documentation for this class was generated from the following file:

- `cpl_vsil_subfile.cpp`

10.85 VSISubFileHandle Class Reference

Inheritance diagram for VSISubFileHandle:



Public Member Functions

- virtual int [Seek](#) ([vsi_l_offset](#) nOffset, int nWhence) override
Seek to requested offset.
- virtual [vsi_l_offset](#) [Tell](#) () override
Tell current file offset.
- virtual size_t [Read](#) (void *pBuffer, size_t nSize, size_t nMemb) override
Read bytes from file.
- virtual size_t [Write](#) (const void *pBuffer, size_t nSize, size_t nMemb) override
Write bytes to file.
- virtual int [Eof](#) () override
Test for end of file.
- virtual int [Close](#) () override
Close file.

10.85.1 Member Function Documentation

10.85.1.1 int VSISubFileHandle::Close () [override],[virtual]

Close file.

This function closes the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fclose()` function.

Returns

0 on success or -1 on failure.

Implements [VSIVirtualHandle](#).

10.85.1.2 int VSISubFileHandle::Eof () [override],[virtual]

Test for end of file.

Returns TRUE (non-zero) if an end-of-file condition occurred during the previous read operation. The end-of-file flag is cleared by a successful [VSIFSeekL\(\)](#) call.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX feof() call.

Returns

TRUE if at EOF else FALSE.

Implements [VSIVirtualHandle](#).

10.85.1.3 size_t VSISubFileHandle::Read (void * *pBuffer*, size_t *nSize*, size_t *nCount*) [override],[virtual]

Read bytes from file.

Reads *nCount* objects of *nSize* bytes from the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fread() call.

Parameters

<i>pBuffer</i>	the buffer into which the data should be read (at least <i>nCount</i> * <i>nSize</i> bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.

Returns

number of objects successfully read.

Implements [VSIVirtualHandle](#).

10.85.1.4 int VSISubFileHandle::Seek (vsi_l_offset *nOffset*, int *nWhence*) [override],[virtual]

Seek to requested offset.

Seek to the desired offset (*nOffset*) in the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fseek() call.

Parameters

<i>nOffset</i>	offset in bytes.
<i>nWhence</i>	one of SEEK_SET, SEEK_CUR or SEEK_END.

Returns

0 on success or -1 on failure.

Implements [VSIVirtualHandle](#).

10.85.1.5 vsi_l_offset VSISubFileHandle::Tell () [override],[virtual]

Tell current file offset.

Returns the current file read/write offset in bytes from the beginning of the file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX ftell() call.

Returns

file offset in bytes.

Implements [VSIVirtualHandle](#).

10.85.1.6 size_t VSISubFileHandle::Write (const void * pBuffer, size_t nSize, size_t nCount) [override],[virtual]

Write bytes to file.

Writes nCount objects of nSize bytes to the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fwrite() call.

Parameters

<i>pBuffer</i>	the buffer from which the data should be written (at least nCount * nSize bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.

Returns

number of objects successfully written.

Implements [VSIVirtualHandle](#).

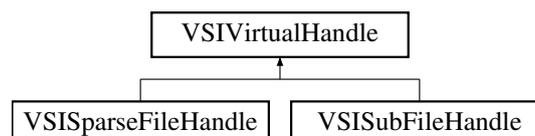
The documentation for this class was generated from the following file:

- cpl_vsil_subfile.cpp

10.86 VSIVirtualHandle Class Reference

```
#include <cpl_vsi_virtual.h>
```

Inheritance diagram for VSIVirtualHandle:



Public Member Functions

- virtual int [Seek](#) (vsi_l_offset nOffset, int nWhence)=0

- virtual `vsf_offset Tell ()=0`
Tell current file offset.
- virtual `size_t Read (void *pBuffer, size_t nSize, size_t nCount)=0`
Read bytes from file.
- virtual `int ReadMultiRange (int nRanges, void **ppData, const vsf_offset *panOffsets, const size_t *panSizes)`
Read several ranges of bytes from file.
- virtual `size_t Write (const void *pBuffer, size_t nSize, size_t nCount)=0`
Write bytes to file.
- virtual `int Eof ()=0`
Test for end of file.
- virtual `int Flush ()`
Flush pending writes to disk.
- virtual `int Close ()=0`
Close file.
- virtual `int Truncate (vsf_offset nNewSize)`
Truncate/expand the file to the specified size.
- virtual `void * GetNativeFileDescriptor ()`
Returns the "native" file descriptor for the virtual handle.
- virtual `VSIRangeStatus GetRangeStatus (CPL_UNUSED vsf_offset nOffset, CPL_UNUSED vsf_offset nLength)`
Return if a given file range contains data or holes filled with zeroes.

10.86.1 Detailed Description

Virtual file handle

10.86.2 Member Function Documentation

10.86.2.1 VSIVirtualHandle::Close () [pure virtual]

Close file.

This function closes the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fclose()` function.

Returns

0 on success or -1 on failure.

Implemented in [VSISparseFileHandle](#), and [VSISubFileHandle](#).

10.86.2.2 VSIVirtualHandle::Eof () [pure virtual]

Test for end of file.

Returns TRUE (non-zero) if an end-of-file condition occurred during the previous read operation. The end-of-file flag is cleared by a successful [VSIFSeekL\(\)](#) call.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `feof()` call.

Returns

TRUE if at EOF else FALSE.

Implemented in [VSI SparseFileHandle](#), and [VSI SubFileHandle](#).

10.86.2.3 VSIVirtualHandle::Flush () [inline],[virtual]

Flush pending writes to disk.

For files in write or update mode and on filesystem types where it is applicable, all pending output on the file is flushed to the physical disk.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fflush() call.

Returns

0 on success or -1 on error.

10.86.2.4 VSIVirtualHandle::GetNativeFileDescriptor () [inline],[virtual]

Returns the "native" file descriptor for the virtual handle.

This will only return a non-NULL value for "real" files handled by the operating system (to be opposed to GDAL virtual file systems).

On POSIX systems, this will be a integer value ("fd") cast as a void*. On Windows systems, this will be the HANDLE.

Returns

the native file descriptor, or NULL.

10.86.2.5 VSIVirtualHandle::GetRangeStatus (CPL_UNUSED vsi_I_offset nOffset, CPL_UNUSED vsi_I_offset nLength) [inline],[virtual]

Return if a given file range contains data or holes filled with zeroes.

This uses the filesystem capabilities of querying which regions of a sparse file are allocated or not. This is currently only implemented for Linux (and no other Unix derivatives) and Windows.

Note: A return of VSI_RANGE_STATUS_DATA doesn't exclude that the extent is filled with zeroes! It must be interpreted as "may contain non-zero data".

Parameters

<i>nOffset</i>	offset of the start of the extent.
<i>nLength</i>	extent length.

Returns

extent status: VSI_RANGE_STATUS_UNKNOWN, VSI_RANGE_STATUS_DATA or VSI_RANGE_STATUS_HOLE

Since

GDAL 2.2

10.86.2.6 `VSIVirtualHandle::Read (void * pBuffer, size_t nSize, size_t nCount)` [pure virtual]

Read bytes from file.

Reads *nCount* objects of *nSize* bytes from the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fread()` call.

Parameters

<i>pBuffer</i>	the buffer into which the data should be read (at least <i>nCount</i> * <i>nSize</i> bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.

Returns

number of objects successfully read.

Implemented in [VSI SparseFileHandle](#), and [VSI SubFileHandle](#).

10.86.2.7 `int VSIVirtualHandle::ReadMultiRange (int nRanges, void ** ppData, const vsi_l_offset * panOffsets, const size_t * panSizes)` [virtual]

Read several ranges of bytes from file.

Reads *nRanges* objects of *panSizes*[*i*] bytes from the indicated file at the offset *panOffsets*[*i*] into the buffer *ppData*[*i*].

Ranges must be sorted in ascending start offset, and must not overlap each other.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory or `/vsicurl/`.

Parameters

<i>nRanges</i>	number of ranges to read.
<i>ppData</i>	array of <i>nRanges</i> buffer into which the data should be read (<i>ppData</i> [<i>i</i>] must be at list <i>panSizes</i> [<i>i</i>] bytes).
<i>panOffsets</i>	array of <i>nRanges</i> offsets at which the data should be read.
<i>panSizes</i>	array of <i>nRanges</i> sizes of objects to read (in bytes).

Returns

0 in case of success, -1 otherwise.

Since

GDAL 1.9.0

10.86.2.8 `int VSIVirtualHandle::Seek (vsi_l_offset nOffset, int nWhence)` [pure virtual]

Seek to requested offset.

Seek to the desired offset (*nOffset*) in the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fseek()` call.

Parameters

<i>nOffset</i>	offset in bytes.
<i>nWhence</i>	one of SEEK_SET, SEEK_CUR or SEEK_END.

Returns

0 on success or -1 one failure.

Implemented in [VSI SparseFileHandle](#), and [VSI SubFileHandle](#).

10.86.2.9 VSIVirtualHandle::Tell () [pure virtual]

Tell current file offset.

Returns the current file read/write offset in bytes from the beginning of the file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX ftell() call.

Returns

file offset in bytes.

Implemented in [VSI SparseFileHandle](#), and [VSI SubFileHandle](#).

10.86.2.10 int VSIVirtualHandle::Truncate (vsi_l_offset nNewSize) [virtual]

Truncate/expand the file to the specified size.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX ftruncate() call.

Parameters

<i>nNewSize</i>	new size in bytes.
-----------------	--------------------

Returns

0 on success

Since

GDAL 1.9.0

10.86.2.11 VSIVirtualHandle::Write (const void * pBuffer, size_t nSize, size_t nCount) [pure virtual]

Write bytes to file.

Writes nCount objects of nSize bytes to the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fwrite() call.

Parameters

<i>pBuffer</i>	the buffer from which the data should be written (at least $nCount * nSize$ bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.

Returns

number of objects successfully written.

Implemented in [VSI SparseFileHandle](#), and [VSI SubFileHandle](#).

The documentation for this class was generated from the following files:

- `cpl_vsi_virtual.h`
- `cpl_vsil.cpp`

10.87 zip_fileinfo Struct Reference

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

- `cpl_minizip_zip.h`

10.88 zip_internal Struct Reference

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

- `cpl_minizip_zip.cpp`

10.89 zlib_filefunc_def_s Struct Reference

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

- `cpl_minizip_ioapi.h`

Chapter 11

File Documentation

11.1 cpl_conv.h File Reference

```
#include "cpl_port.h"  
#include "cpl_vsi.h"  
#include "cpl_error.h"
```

Classes

- struct [CPLSharedFileInfo](#)

Macros

- #define [CPLFree](#) [VSIFree](#)

Typedefs

- typedef const char *(* [CPLFileFinder](#))(const char *, const char *)

Functions

- [CPL_C_START](#) const char [CPL_DLL](#)
*[CPL_STDCALL](#) [CPLGetConfigOption](#) (const char *, const char *) [CPL_WARN_UNUSED_RESULT](#)
- const char [CPL_DLL](#) *[CPL_STDCALL](#) [CPLGetThreadLocalConfigOption](#) (const char *, const char *) [CPL_WARN_UNUSED_RESULT](#)
- void [CPL_DLL](#) [CPL_STDCALL](#) [CPLSetConfigOption](#) (const char *, const char *)
- void [CPL_DLL](#) [CPL_STDCALL](#) [CPLSetThreadLocalConfigOption](#) (const char *pszKey, const char *pszValue)
- char [CPL_DLL](#) ** [CPLGetConfigOptions](#) (void)
- void [CPL_DLL](#) [CPLSetConfigOptions](#) (const char *const *papszConfigOptions)
- char [CPL_DLL](#) ** [CPLGetThreadLocalConfigOptions](#) (void)
- void [CPL_DLL](#) [CPLSetThreadLocalConfigOptions](#) (const char *const *papszConfigOptions)
- void [CPL_DLL](#) * [CPLMalloc](#) (size_t) [CPL_WARN_UNUSED_RESULT](#)
- void [CPL_DLL](#) * [CPLCalloc](#) (size_t, size_t) [CPL_WARN_UNUSED_RESULT](#)
- void [CPL_DLL](#) * [CPLRealloc](#) (void *, size_t) [CPL_WARN_UNUSED_RESULT](#)
- char [CPL_DLL](#) * [CPLStrdup](#) (const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- char [CPL_DLL](#) * [CPLStrlwr](#) (char *)
- char [CPL_DLL](#) * [CPLFgets](#) (char *, int, FILE *)

- const char CPL_DLL * [CPLReadLine](#) (FILE *)
- const char CPL_DLL * [CPLReadLineL](#) (VSILFILE *)
- double CPL_DLL [CPLAtof](#) (const char *)
- double CPL_DLL [CPLAtofDelim](#) (const char *, char)
- double CPL_DLL [CPLStrtod](#) (const char *, char **)
- double CPL_DLL [CPLStrtodDelim](#) (const char *, char **, char)
- float CPL_DLL [CPLStrtof](#) (const char *, char **)
- float CPL_DLL [CPLStrtofDelim](#) (const char *, char **, char)
- double CPL_DLL [CPLAtofM](#) (const char *)
- char CPL_DLL * [CPLScanString](#) (const char *, int, int, int)
- double CPL_DLL [CPLScanDouble](#) (const char *, int)
- long CPL_DLL [CPLScanLong](#) (const char *, int)
- unsigned long CPL_DLL [CPLScanULong](#) (const char *, int)
- [GUIntBig](#) CPL_DLL [CPLScanUIntBig](#) (const char *, int)
- [GIntBig](#) CPL_DLL [CPLAtoGIntBig](#) (const char *pszString)
- [GIntBig](#) CPL_DLL [CPLAtoGIntBigEx](#) (const char *pszString, int bWarn, int *pbOverflow)
- void CPL_DLL * [CPLScanPointer](#) (const char *, int)
- int CPL_DLL [CPLPrintString](#) (char *, const char *, int)
- int CPL_DLL [CPLPrintStringFill](#) (char *, const char *, int)
- int CPL_DLL [CPLPrintInt32](#) (char *, [GInt32](#), int)
- int CPL_DLL [CPLPrintUIntBig](#) (char *, [GUIntBig](#), int)
- int CPL_DLL [CPLPrintTime](#) (char *, int, const char *, const struct tm *, const char *)
- int CPL_DLL [CPLPrintPointer](#) (char *, void *, int)
- void CPL_DLL * [CPLGetSymbol](#) (const char *, const char *)
- const char CPL_DLL * [CPLGetPath](#) (const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLGetDirname](#) (const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLGetFilename](#) (const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLGetBasename](#) (const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLGetExtension](#) (const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- char CPL_DLL * [CPLGetCurrentDir](#) (void)
- const char CPL_DLL * [CPLFormFilename](#) (const char *pszPath, const char *pszBasename, const char *pszExtension) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLFormCIFilename](#) (const char *pszPath, const char *pszBasename, const char *pszExtension) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLResetExtension](#) (const char *, const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLProjectRelativeFilename](#) (const char *pszProjectDir, const char *pszSecondaryFilename) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- int CPL_DLL [CPLIsFilenameRelative](#) (const char *pszFilename)
- const char CPL_DLL * [CPLExtractRelativePath](#) (const char *, const char *, int *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLCleanTrailingSlash](#) (const char *) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- char CPL_DLL ** [CPLCorrespondingPaths](#) (const char *pszOldFilename, const char *pszNewFilename, char **papszFileList) [CPL_WARN_UNUSED_RESULT](#)
- int CPL_DLL [CPLCheckForFile](#) (char *pszFilename, char **papszSiblingList)
- const char CPL_DLL * [CPLGenerateTempFilename](#) (const char *pszStem) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)
- const char CPL_DLL * [CPLExpandTilde](#) (const char *pszFilename) [CPL_WARN_UNUSED_RESULT](#) [CPL_RETURNS_NONNULL](#)

- const char CPL_DLL * [CPLFindFile](#) (const char *pszClass, const char *pszBasename)
- const char CPL_DLL * [CPLDefaultFindFile](#) (const char *pszClass, const char *pszBasename)
- void CPL_DLL [CPLPushFileFinder](#) ([CPLFileFinder](#) pfnFinder)
- [CPLFileFinder](#) CPL_DLL [CPLPopFileFinder](#) (void)
- void CPL_DLL [CPLPushFinderLocation](#) (const char *)
- void CPL_DLL [CPLPopFinderLocation](#) (void)
- void CPL_DLL [CPLFinderClean](#) (void)
- int CPL_DLL [CPLStat](#) (const char *, VSIFStatBuf *) [CPL_WARN_UNUSED_RESULT](#)
- FILE CPL_DLL * [CPLOpenShared](#) (const char *, const char *, int)
- void CPL_DLL [CPLCloseShared](#) (FILE *)
- [CPLSharedFileInfo](#) CPL_DLL * [CPLGetSharedList](#) (int *)
- void CPL_DLL [CPLDumpSharedList](#) (FILE *)
- double CPL_DLL [CPLDMSToDec](#) (const char *is)
- const char CPL_DLL * [CPLDecToDMS](#) (double dfAngle, const char *pszAxis, int nPrecision)
- double CPL_DLL [CPLPackedDMSToDec](#) (double)
- double CPL_DLL [CPLDecToPackedDMS](#) (double dfDec)
- void CPL_DLL [CPLStringToComplex](#) (const char *pszString, double *pdfReal, double *pdfImag)
- int CPL_DLL [CPLUnlinkTree](#) (const char *)
- int CPL_DLL [CPLCopyFile](#) (const char *pszNewPath, const char *pszOldPath)
- int CPL_DLL [CPLCopyTree](#) (const char *pszNewPath, const char *pszOldPath)
- int CPL_DLL [CPLMoveFile](#) (const char *pszNewPath, const char *pszOldPath)
- int CPL_DLL [CPLSymlink](#) (const char *pszOldPath, const char *pszNewPath, char **papszOptions)
- void CPL_DLL * [CPLCreateZip](#) (const char *pszZipFilename, char **papszOptions)
- [CPLErr](#) CPL_DLL [CPLCreateFileInZip](#) (void *hZip, const char *pszFilename, char **papszOptions)
- [CPLErr](#) CPL_DLL [CPLWriteFileInZip](#) (void *hZip, const void *pBuffer, int nBufferSize)
- [CPLErr](#) CPL_DLL [CPLCloseFileInZip](#) (void *hZip)
- [CPLErr](#) CPL_DLL [CPLCloseZip](#) (void *hZip)
- void CPL_DLL * [CPLZLibInflate](#) (const void *ptr, size_t nBytes, void *outptr, size_t nOutAvailableBytes, size_t *pnOutBytes)
 - *Uncompress a buffer compressed with ZLib DEFLATE compression.*
- char * [CPLsetlocale](#) (int category, const char *locale)

11.1.1 Detailed Description

Various convenience functions for CPL.

11.1.2 Macro Definition Documentation

11.1.2.1 #define CPLFree VSIFree

Alias of [VSIFree\(\)](#)

11.1.3 Typedef Documentation

11.1.3.1 typedef const char*(*CPLFileFinder)(const char *, const char *)

Callback for [CPLPushFileFinder](#)

11.1.4 Function Documentation

11.1.4.1 `double CPL_DLL CPLAtof (const char * nptr)`

Converts ASCII string to floating point number.

This function converts the initial portion of the string pointed to by *nptr* to double floating point representation. The behaviour is the same as

```
CPLStrtod(nptr, (char **)NULL);
```

This function does the same as standard `atof(3)`, but does not take locale in account. That means, the decimal delimiter is always '.' (decimal point). Use `CPLAtofDelim()` function if you want to specify custom delimiter.

IMPORTANT NOTE:

Existence of this function does not mean you should always use it. Sometimes you should use standard locale aware `atof(3)` and its family. When you need to process the user's input (for example, command line parameters) use `atof(3)`, because the user works in a localized environment and the user's input will be done according to the locale set. In particular that means we should not make assumptions about character used as decimal delimiter, it can be either "." or ",".

But when you are parsing some ASCII file in predefined format, you most likely need `CPLAtof()`, because such files distributed across the systems with different locales and floating point representation should be considered as a part of file format. If the format uses "." as a delimiter the same character must be used when parsing number regardless of actual locale setting.

Parameters

<i>nptr</i>	Pointer to string to convert.
-------------	-------------------------------

Returns

Converted value, if any.

11.1.4.2 `double CPL_DLL CPLAtofDelim (const char * nptr, char point)`

Converts ASCII string to floating point number.

This function converts the initial portion of the string pointed to by *nptr* to double floating point representation. The behaviour is the same as

```
CPLStrtodDelim(nptr, (char **)NULL, point);
```

This function does the same as standard `atof(3)`, but does not take locale in account. Instead of locale defined decimal delimiter you can specify your own one. Also see notes for `CPLAtof()` function.

Parameters

<i>nptr</i>	Pointer to string to convert.
<i>point</i>	Decimal delimiter.

Returns

Converted value, if any.

11.1.4.3 `double CPL_DLL CPLAtofM (const char * nptr)`

Converts ASCII string to floating point number using any numeric locale.

This function converts the initial portion of the string pointed to by *nptr* to double floating point representation. This function does the same as standard `atof()`, but it allows a variety of locale representations. That is it supports numeric values with either a comma or a period for the decimal delimiter.

PS. The M stands for Multi-lingual.

Parameters

<i>nptr</i>	The string to convert.
-------------	------------------------

Returns

Converted value, if any. Zero on failure.

11.1.4.4 **GIntBig CPL_DLL CPLAtoGIntBig (const char * *pszString*)**

Convert a string to a 64 bit signed integer.

Parameters

<i>pszString</i>	String containing 64 bit signed integer.
------------------	--

Returns

64 bit signed integer.

Since

GDAL 2.0

11.1.4.5 **GIntBig CPL_DLL CPLAtoGIntBigEx (const char * *pszString*, int *bWarn*, int * *pbOverflow*)**

Convert a string to a 64 bit signed integer.

Parameters

<i>pszString</i>	String containing 64 bit signed integer.
<i>bWarn</i>	Issue a warning if an overflow occurs during conversion
<i>pbOverflow</i>	Pointer to an integer to store if an overflow occurred, or NULL

Returns

64 bit signed integer.

Since

GDAL 2.0

11.1.4.6 **void CPL_DLL* CPLCalloc (size_t *nCount*, size_t *nSize*)**

Safe version of calloc().

This function is like the C library calloc(), but raises a CE_Fatal error with CPLError() if it fails to allocate the desired memory. It should be used for small memory allocations that are unlikely to fail and for which the application is unwilling to test for out of memory conditions. It uses VSICalloc() to get the memory, so any hooking of VSICalloc() will apply to CPLCalloc() as well. CPLFree() or VSIFree() can be used free memory allocated by CPLCalloc().

Parameters

<i>nCount</i>	number of objects to allocate.
<i>nSize</i>	size (in bytes) of object to allocate.

Returns

pointer to newly allocated memory, only NULL if nSize * nCount is NULL.

11.1.4.7 int CPL_DLL CPLCheckForFile (char * *pszFilename*, char ** *papszSiblingFiles*)

Check for file existence.

The function checks if a named file exists in the filesystem, hopefully in an efficient fashion if a sibling file list is available. It exists primarily to do faster file checking for functions like GDAL open methods that get a list of files from the target directory.

If the sibling file list exists (is not NULL) it is assumed to be a list of files in the same directory as the target file, and it will be checked (case insensitively) for a match. If a match is found, pszFilename is updated with the correct case and TRUE is returned.

If papszSiblingFiles is NULL, a [VSISStatL\(\)](#) is used to test for the files existence, and no case insensitive testing is done.

Parameters

<i>pszFilename</i>	name of file to check for - filename case updated in some cases.
<i>papszSiblingFiles</i>	a list of files in the same directory as pszFilename if available, or NULL. This list should have no path components.

Returns

TRUE if a match is found, or FALSE if not.

11.1.4.8 const char CPL_DLL* CPLCleanTrailingSlash (const char * *pszPath*)

Remove trailing forward/backward slash from the path for UNIX/Windows resp.

Returns a string containing the portion of the passed path string with trailing slash removed. If there is no path in the passed filename an empty string will be returned (not NULL).

```
CPLCleanTrailingSlash( "abc/def/" ) == "abc/def"
CPLCleanTrailingSlash( "abc/def" ) == "abc/def"
CPLCleanTrailingSlash( "c:\abc\def\" ) == "c:\abc\def"
CPLCleanTrailingSlash( "c:\abc\def" ) == "c:\abc\def"
CPLCleanTrailingSlash( "abc" ) == "abc"
```

Parameters

<i>pszPath</i>	the path to be cleaned up
----------------	---------------------------

Returns

Path in an internal string which must not be freed. The string may be destroyed by the next CPL filename handling call.

11.1.4.9 CPLerr CPL_DLL CPLCloseFileInZip (void * *hZip*)

Close current file inside ZIP file

11.1.4.10 void CPL_DLL CPLCloseShared (FILE * *fp*)

Close shared file.

Dereferences the indicated file handle, and closes it if the reference count has dropped to zero. A CPLError() is issued if the file is not in the shared file list.

Parameters

<i>fp</i>	file handle from CPLOpenShared() to deaccess.
-----------	---

11.1.4.11 CPLerr CPL_DLL CPLCloseZip (void * *hZip*)

Close ZIP file

11.1.4.12 int CPL_DLL CPLCopyFile (const char * *pszNewPath*, const char * *pszOldPath*)

Copy a file

11.1.4.13 int CPL_DLL CPLCopyTree (const char * *pszNewPath*, const char * *pszOldPath*)

Recursively copy a tree

11.1.4.14 char CPL_DLL** CPLCorrespondingPaths (const char * *pszOldFilename*, const char * *pszNewFilename*, char ** *papszFileList*)

Identify corresponding paths.

Given a prototype old and new filename this function will attempt to determine corresponding names for a set of other old filenames that will rename them in a similar manner. This correspondence assumes there are two possibly kinds of renaming going on. A change of path, and a change of filename stem.

If a consistent renaming cannot be established for all the files this function will return indicating an error.

The returned file list becomes owned by the caller and should be destroyed with [CSLDestroy\(\)](#).

Parameters

<i>pszOldFilename</i>	path to old prototype file.
<i>pszNew-Filename</i>	path to new prototype file.
<i>papszFileList</i>	list of other files associated with <i>pszOldFilename</i> to rename similarly.

Returns

a list of files corresponding to *papszFileList* but renamed to correspond to *pszNewFilename*.

11.1.4.15 CPLerr CPL_DLL CPLCreateFileInZip (void * *hZip*, const char * *pszFilename*, char ** *papszOptions*)

Create a file in a ZIP file

11.1.4.16 void CPL_DLL* CPLCreateZip (const char * *pszZipFilename*, char ** *papszOptions*)

Create ZIP file

11.1.4.17 `const char CPL_DLL* CPLDecToDMS (double dfAngle, const char * pszAxis, int nPrecision)`

Translate a decimal degrees value to a DMS string with hemisphere.

11.1.4.18 `double CPL_DLL CPLDecToPackedDMS (double dfDec)`

Convert decimal degrees into packed DMS value (DDDMMMSSS.SS).

This function converts a value, specified in decimal degrees into packed DMS angle. The standard packed DMS format is:

degrees * 1000000 + minutes * 1000 + seconds

See also [CPLPackedDMSToDec\(\)](#).

Parameters

<i>dfDec</i>	Angle in decimal degrees.
--------------	---------------------------

Returns

Angle in packed DMS format.

11.1.4.19 `const char CPL_DLL* CPLDefaultFindFile (const char * , const char * pszBasename)`

CPLDefaultFindFile

11.1.4.20 `double CPL_DLL CPLDMSToDec (const char * is)`

CPLDMSToDec

11.1.4.21 `void CPL_DLL CPLDumpSharedList (FILE * fp)`

Report open shared files.

Dumps all open shared files to the indicated file handle. If the file handle is NULL information is sent via the CPLDebug() call.

Parameters

<i>fp</i>	File handle to write to.
-----------	--------------------------

11.1.4.22 `const char CPL_DLL* CPLExpandTilde (const char * pszFilename)`

Expands ~/ at start of filename.

Assumes that the HOME configuration option is defined.

Parameters

<i>pszFilename</i>	filename potentially starting with ~/
--------------------	---------------------------------------

Returns

an expanded filename.

Since

GDAL 2.2

11.1.4.23 `const char CPL_DLL* CPLExtractRelativePath (const char * pszBaseDir, const char * pszTarget, int * pbGotRelative)`

Get relative path from directory to target file.

Computes a relative path for *pszTarget* relative to *pszBaseDir*. Currently this only works if they share a common base path. The returned path is normally into the *pszTarget* string. It should only be considered valid as long as *pszTarget* is valid or till the next call to this function, whichever comes first.

Parameters

<i>pszBaseDir</i>	the name of the directory relative to which the path should be computed. <i>pszBaseDir</i> may be NULL in which case the original target is returned without relativizing.
<i>pszTarget</i>	the filename to be changed to be relative to <i>pszBaseDir</i> .
<i>pbGotRelative</i>	Pointer to location in which a flag is placed indicating that the returned path is relative to the basename (TRUE) or not (FALSE). This pointer may be NULL if flag is not desired.

Returns

an adjusted path or the original if it could not be made relative to the *pszBaseFile*'s path.

11.1.4.24 `char CPL_DLL* CPLFGets (char * pszBuffer, int nBufferSize, FILE * fp)`

Reads in at most one less than *nBufferSize* characters from the *fp* stream and stores them into the buffer pointed to by *pszBuffer*. Reading stops after an EOF or a newline. If a newline is read, it is *not* stored into the buffer. A '\0' is stored after the last character in the buffer. All three types of newline terminators recognized by the [CPLFGets\(\)](#): single '\r' and '\n' and '\r\n' combination.

Parameters

<i>pszBuffer</i>	pointer to the targeting character buffer.
<i>nBufferSize</i>	maximum size of the string to read (not including terminating '\0').
<i>fp</i>	file pointer to read from.

Returns

pointer to the *pszBuffer* containing a string read from the file or NULL if the error or end of file was encountered.

11.1.4.25 `void CPL_DLL CPLFinderClean (void)`

CPLFinderClean

11.1.4.26 `const char CPL_DLL* CPLFindFile (const char * pszClass, const char * pszBasename)`

CPLFindFile

11.1.4.27 `const char CPL_DLL* CPLFormCIFilename (const char * pszPath, const char * pszBasename, const char * pszExtension)`

Case insensitive file searching, returning full path.

This function tries to return the path to a file regardless of whether the file exactly matches the basename, and extension case, or is all upper case, or all lower case. The path is treated as case sensitive. This function is equivalent to [CPLFormFilename\(\)](#) on case insensitive file systems (like Windows).

Parameters

<i>pszPath</i>	directory path to the directory containing the file. This may be relative or absolute, and may have a trailing path separator or not. May be NULL.
<i>pszBasename</i>	file basename. May optionally have path and/or extension. May not be NULL.
<i>pszExtension</i>	file extension, optionally including the period. May be NULL.

Returns

a fully formed filename in an internal static string. Do not modify or free the returned string. The string may be destroyed by the next CPL call.

11.1.4.28 `const char CPL_DLL* CPLFormFilename (const char * pszPath, const char * pszBasename, const char * pszExtension)`

Build a full file path from a passed path, file basename and extension.

The path, and extension are optional. The basename may in fact contain an extension if desired.

```
CPLFormFilename("abc/xyz", "def", ".dat" ) == "abc/xyz/def.dat"
CPLFormFilename(NULL, "def", NULL ) == "def"
CPLFormFilename(NULL, "abc/def.dat", NULL ) == "abc/def.dat"
CPLFormFilename("/abc/xyz/", "def.dat", NULL ) == "/abc/xyz/def.dat"
```

Parameters

<i>pszPath</i>	directory path to the directory containing the file. This may be relative or absolute, and may have a trailing path separator or not. May be NULL.
<i>pszBasename</i>	file basename. May optionally have path and/or extension. Must <i>NOT</i> be NULL.
<i>pszExtension</i>	file extension, optionally including the period. May be NULL.

Returns

a fully formed filename in an internal static string. Do not modify or free the returned string. The string may be destroyed by the next CPL call.

11.1.4.29 `const char CPL_DLL* CPLGenerateTempFilename (const char * pszStem)`

Generate temporary file name.

Returns a filename that may be used for a temporary file. The location of the file tries to follow operating system semantics but may be forced via the CPL_TMPDIR configuration option.

Parameters

<i>pszStem</i>	if non-NULL this will be part of the filename.
----------------	--

Returns

a filename which is valid till the next CPL call in this thread.

11.1.4.30 `const char CPL_DLL* CPLGetBasename (const char * pszFullFilename)`

Extract basename (non-directory, non-extension) portion of filename.

Returns a string containing the file basename portion of the passed name. If there is no basename (passed value ends in trailing directory separator, or filename starts with a dot) an empty string is returned.

```
CPLGetBasename ( "abc/def.xyz" ) == "def"
CPLGetBasename ( "abc/def" ) == "def"
CPLGetBasename ( "abc/def/" ) == ""
```

Parameters

<i>pszFullFilename</i>	the full filename potentially including a path.
------------------------	---

Returns

just the non-directory, non-extension portion of the path in an internal string which must not be freed. The string may be destroyed by the next CPL filename handling call.

11.1.4.31 `CPL_C_START const char CPL_DLL* CPL_STDCALL CPLGetConfigOption (const char * pszKey, const char * pszDefault)`

Get the value of a configuration option.

The value is the value of a (key, value) option set with [CPLSetConfigOption\(\)](#), or [CPLSetThreadLocalConfigOption\(\)](#) of the same thread. If the given option was no defined with [CPLSetConfigOption\(\)](#), it tries to find it in environment variables.

Note: the string returned by [CPLGetConfigOption\(\)](#) might be short-lived, and in particular it will become invalid after a call to [CPLSetConfigOption\(\)](#) with the same key.

To override temporary a potentially existing option with a new value, you can use the following snippet :

```
// backup old value
const char* pszOldValTmp = CPLGetConfigOption(pszKey, NULL);
char* pszOldVal = pszOldValTmp ? CPLStrdup(pszOldValTmp) : NULL;
// override with new value
CPLSetConfigOption(pszKey, pszNewVal);
// do something useful
// restore old value
CPLSetConfigOption(pszKey, pszOldVal);
CPLFree(pszOldVal);
```

Parameters

<i>pszKey</i>	the key of the option to retrieve
<i>pszDefault</i>	a default value if the key does not match existing defined options (may be NULL)

Returns

the value associated to the key, or the default value if not found

See Also

[CPLSetConfigOption\(\)](#), <http://trac.osgeo.org/gdal/wiki/ConfigOptions>

11.1.4.32 `char CPL_DLL** CPLGetConfigOptions (void)`

Return the list of configuration options as KEY=VALUE pairs.

The list is the one set through the [CPLSetConfigOption\(\)](#) API.

Options that through environment variables or with [CPLSetThreadLocalConfigOption\(\)](#) will *not* be listed.

Returns

a copy of the list, to be freed with [CSLDestroy\(\)](#).

Since

GDAL 2.2

11.1.4.33 char CPL_DLL* CPLGetCurrentDir (void)

Get the current working directory name.

Returns

a pointer to buffer, containing current working directory path or NULL in case of error. User is responsible to free that buffer after usage with [CPLFree\(\)](#) function. If HAVE_GETCWD macro is not defined, the function returns NULL.

11.1.4.34 const char CPL_DLL* CPLGetDirname (const char * *pszFilename*)

Extract directory path portion of filename.

Returns a string containing the directory path portion of the passed filename. If there is no path in the passed filename the dot will be returned. It is the only difference from [CPLGetPath\(\)](#).

```
CPLGetDirname( "abc/def.xyz" ) == "abc"
CPLGetDirname( "/abc/def/" ) == "/abc/def"
CPLGetDirname( "/" ) == "/"
CPLGetDirname( "/abc/def" ) == "/abc"
CPLGetDirname( "abc" ) == "."
```

Parameters

<i>pszFilename</i>	the filename potentially including a path.
--------------------	--

Returns

Path in an internal string which must not be freed. The string may be destroyed by the next CPL filename handling call. The returned will generally not contain a trailing path separator.

11.1.4.35 const char CPL_DLL* CPLGetExtension (const char * *pszFullFilename*)

Extract filename extension from full filename.

Returns a string containing the extension portion of the passed name. If there is no extension (the filename has no dot) an empty string is returned. The returned extension will not include the period.

```
CPLGetExtension( "abc/def.xyz" ) == "xyz"
CPLGetExtension( "abc/def" ) == ""
```

Parameters

<i>pszFullFilename</i>	the full filename potentially including a path.
------------------------	---

Returns

just the extension portion of the path in an internal string which must not be freed. The string may be destroyed by the next CPL filename handling call.

11.1.4.36 const char CPL_DLL* CPLGetFilename (const char * *pszFullFilename*)

Extract non-directory portion of filename.

Returns a string containing the bare filename portion of the passed filename. If there is no filename (passed value ends in trailing directory separator) an empty string is returned.

```
CPLGetFilename( "abc/def.xyz" ) == "def.xyz"
CPLGetFilename( "/abc/def/" ) == ""
CPLGetFilename( "abc/def" ) == "def"
```

Parameters

<i>pszFullFilename</i>	the full filename potentially including a path.
------------------------	---

Returns

just the non-directory portion of the path (points back into original string).

11.1.4.37 const char CPL_DLL* CPLGetPath (const char * *pszFilename*)

Extract directory path portion of filename.

Returns a string containing the directory path portion of the passed filename. If there is no path in the passed filename an empty string will be returned (not NULL).

```
CPLGetPath( "abc/def.xyz" ) == "abc"
CPLGetPath( "/abc/def/" ) == "/abc/def"
CPLGetPath( "/" ) == "/"
CPLGetPath( "/abc/def" ) == "/abc"
CPLGetPath( "abc" ) == ""
```

Parameters

<i>pszFilename</i>	the filename potentially including a path.
--------------------	--

Returns

Path in an internal string which must not be freed. The string may be destroyed by the next CPL filename handling call. The returned will generally not contain a trailing path separator.

11.1.4.38 CPLSharedFileInfo CPL_DLL* CPLGetSharedList (int * *pnCount*)

Fetch list of open shared files.

Parameters

<i>pnCount</i>	place to put the count of entries.
----------------	------------------------------------

Returns

the pointer to the first in the array of shared file info structures.

11.1.4.39 void CPL_DLL* CPLGetSymbol (const char * *pszLibrary*, const char * *pszSymbolName*)

Fetch a function pointer from a shared library / DLL.

This function is meant to abstract access to shared libraries and DLLs and performs functions similar to `dlopen()/dlsym()` on Unix and `LoadLibrary() / GetProcAddress()` on Windows.

If no support for loading entry points from a shared library is available this function will always return NULL. Rules on when this function issues a `CPL_Error()` or not are not currently well defined, and will have to be resolved in the future.

Currently [CPLGetSymbol\(\)](#) doesn't try to:

- prevent the reference count on the library from going up for every request, or given any opportunity to unload the library.
- Attempt to look for the library in non-standard locations.
- Attempt to try variations on the symbol name, like pre-pending or post-pending an underscore.

Some of these issues may be worked on in the future.

Parameters

<i>pszLibrary</i>	the name of the shared library or DLL containing the function. May contain path to file. If not system supplies search paths will be used.
<i>pszSymbolName</i>	the name of the function to fetch a pointer to.

Returns

A pointer to the function if found, or NULL if the function isn't found, or the shared library can't be loaded.

11.1.4.40 const char CPL_DLL* CPL_STDCALL CPLGetThreadLocalConfigOption (const char * *pszKey*, const char * *pszDefault*)

Same as [CPLGetConfigOption\(\)](#) but only with options set with [CPLSetThreadLocalConfigOption\(\)](#)

11.1.4.41 char CPL_DLL** CPLGetThreadLocalConfigOptions (void)

Return the list of thread local configuration options as KEY=VALUE pairs.

Options that through environment variables or with [CPLSetConfigOption\(\)](#) will *not* be listed.

Returns

a copy of the list, to be freed with [CSLDestroy\(\)](#).

Since

GDAL 2.2

11.1.4.42 int CPL_DLL CPLIsFilenameRelative (const char * *pszFilename*)

Is filename relative or absolute?

The test is filesystem convention agnostic. That is it will test for Unix style and windows style path conventions regardless of the actual system in use.

Parameters

<i>pszFilename</i>	the filename with path to test.
--------------------	---------------------------------

Returns

TRUE if the filename is relative or FALSE if it is absolute.

11.1.4.43 void CPL_DLL* CPLMalloc (size_t *nSize*)

Safe version of malloc().

This function is like the C library malloc(), but raises a CE_Fatal error with CPLError() if it fails to allocate the desired memory. It should be used for small memory allocations that are unlikely to fail and for which the application is unwilling to test for out of memory conditions. It uses VSIMalloc() to get the memory, so any hooking of VSIMalloc() will apply to CPLMalloc() as well. CPLFree() or VSIFree() can be used free memory allocated by CPLMalloc().

Parameters

<i>nSize</i>	size (in bytes) of memory block to allocate.
--------------	--

Returns

pointer to newly allocated memory, only NULL if *nSize* is zero.

11.1.4.44 int CPL_DLL CPLMoveFile (const char * *pszNewPath*, const char * *pszOldPath*)

Move a file

11.1.4.45 FILE CPL_DLL* CPLOpenShared (const char * *pszFilename*, const char * *pszAccess*, int *bLargeln*)

Open a shared file handle.

Some operating systems have limits on the number of file handles that can be open at one time. This function attempts to maintain a registry of already open file handles, and reuse existing ones if the same file is requested by another part of the application.

Note that access is only shared for access types "r", "rb", "r+" and "rb+". All others will just result in direct VSIOpen() calls. Keep in mind that a file is only reused if the file name is exactly the same. Different names referring to the same file will result in different handles.

The VSIFOpen() or VSIFOpenL() function is used to actually open the file, when an existing file handle can't be shared.

Parameters

<i>pszFilename</i>	the name of the file to open.
<i>pszAccess</i>	the normal fopen()/VSIFOpen() style access string.

<i>bLargeIn</i>	If TRUE VSIFOpenL() (for large files) will be used instead of VSIFOpen().
-----------------	---

Returns

a file handle or NULL if opening fails.

11.1.4.46 double CPL_DLL CPLPackedDMSToDec (double *dfPacked*)

Convert a packed DMS value (DDMMSS.SS) into decimal degrees.

This function converts a packed DMS angle to seconds. The standard packed DMS format is:

degrees * 1000000 + minutes * 1000 + seconds

Example: angle = 120025045.25 yields deg = 120 min = 25 sec = 45.25

The algorithm used for the conversion is as follows:

1. The absolute value of the angle is used.
2. The degrees are separated out: deg = angle/1000000 (fractional portion truncated)
3. The minutes are separated out: min = (angle - deg * 1000000) / 1000 (fractional portion truncated)
4. The seconds are then computed: sec = angle - deg * 1000000 - min * 1000
5. The total angle in seconds is computed: sec = deg * 3600.0 + min * 60.0 + sec
6. The sign of sec is set to that of the input angle.

Packed DMS values used by the USGS GCTP package and probably by other software.

NOTE: This code does not validate input value. If you give the wrong value, you will get the wrong result.

Parameters

<i>dfPacked</i>	Angle in packed DMS format.
-----------------	-----------------------------

Returns

Angle in decimal degrees.

11.1.4.47 CPLFileFinder CPL_DLL CPLPopFileFinder (void)

CPLPopFileFinder

11.1.4.48 void CPL_DLL CPLPopFinderLocation (void)

CPLPopFinderLocation

11.1.4.49 int CPL_DLL CPLPrintInt32 (char * *pszBuffer*, GInt32 *iValue*, int *nMaxLen*)

Print GInt32 value into specified string buffer. This string will not be NULL-terminated.

Parameters

<i>pszBuffer</i>	Pointer to the destination string buffer. Should be large enough to hold the resulting string. Note, that the string will not be NULL-terminated, so user should do this himself, if needed.
<i>iValue</i>	Numerical value to print.
<i>nMaxLen</i>	Maximum length of the resulting string. If string length is greater than <i>nMaxLen</i> , it will be truncated.

Returns

Number of characters printed.

11.1.4.50 `int CPL_DLL CPLPrintPointer (char * pszBuffer, void * pValue, int nMaxLen)`

Print pointer value into specified string buffer. This string will not be NULL-terminated.

Parameters

<i>pszBuffer</i>	Pointer to the destination string buffer. Should be large enough to hold the resulting string. Note, that the string will not be NULL-terminated, so user should do this himself, if needed.
<i>pValue</i>	Pointer to ASCII encode.
<i>nMaxLen</i>	Maximum length of the resulting string. If string length is greater than <i>nMaxLen</i> , it will be truncated.

Returns

Number of characters printed.

11.1.4.51 `int CPL_DLL CPLPrintString (char * pszDest, const char * pszSrc, int nMaxLen)`

Copy the string pointed to by *pszSrc*, NOT including the terminating '\0' character, to the array pointed to by *pszDest*.

Parameters

<i>pszDest</i>	Pointer to the destination string buffer. Should be large enough to hold the resulting string.
<i>pszSrc</i>	Pointer to the source buffer.
<i>nMaxLen</i>	Maximum length of the resulting string. If string length is greater than <i>nMaxLen</i> , it will be truncated.

Returns

Number of characters printed.

11.1.4.52 `int CPL_DLL CPLPrintStringFill (char * pszDest, const char * pszSrc, int nMaxLen)`

Copy the string pointed to by *pszSrc*, NOT including the terminating '\0' character, to the array pointed to by *pszDest*. Remainder of the destination string will be filled with space characters. This is only difference from the `PrintString()`.

Parameters

<i>pszDest</i>	Pointer to the destination string buffer. Should be large enough to hold the resulting string.
<i>pszSrc</i>	Pointer to the source buffer.

<i>nMaxLen</i>	Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.
----------------	---

Returns

Number of characters printed.

11.1.4.53 `int CPL_DLL CPLPrintTime (char * pszBuffer, int nMaxLen, const char * pszFormat, const struct tm * poBrokenTime, const char * pszLocale)`

Print specified time value accordingly to the format options and specified locale name. This function does following:

- if locale parameter is not NULL, the current locale setting will be stored and replaced with the specified one;
- format time value with the `strftime(3)` function;
- restore back current locale, if was saved.

Parameters

<i>pszBuffer</i>	Pointer to the destination string buffer. Should be large enough to hold the resulting string. Note, that the string will not be NULL-terminated, so user should do this himself, if needed.
<i>nMaxLen</i>	Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.
<i>pszFormat</i>	Controls the output format. Options are the same as for <code>strftime(3)</code> function.
<i>poBrokenTime</i>	Pointer to the broken-down time structure. May be requested with the <code>VSIGMTime()</code> and <code>VSILocalTime()</code> functions.
<i>pszLocale</i>	Pointer to a character string containing locale name ("C", "POSIX", "us_US", "ru_RU.KOI8-R" etc.). If NULL we will not manipulate with locale settings and current process locale will be used for printing. Be aware that it may be unsuitable to use current locale for printing time, because all names will be printed in your native language, as well as time format settings also may be adjusted differently from the C/POSIX defaults. To solve these problems this option was introduced.

Returns

Number of characters printed.

11.1.4.54 `int CPL_DLL CPLPrintUIntBig (char * pszBuffer, GUIntBig iValue, int nMaxLen)`

Print `GUIntBig` value into specified string buffer. This string will not be NULL-terminated.

Parameters

<i>pszBuffer</i>	Pointer to the destination string buffer. Should be large enough to hold the resulting string. Note, that the string will not be NULL-terminated, so user should do this himself, if needed.
<i>iValue</i>	Numerical value to print.
<i>nMaxLen</i>	Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.

Returns

Number of characters printed.

11.1.4.55 `const char CPL_DLL* CPLProjectRelativeFilename (const char * pszProjectDir, const char * pszSecondaryFilename)`

Find a file relative to a project file.

Given the path to a "project" directory, and a path to a secondary file referenced from that project, build a path to the secondary file that the current application can use. If the secondary path is already absolute, rather than relative, then it will be returned unaltered.

Examples:

```
CPLProjectRelativeFilename("abc/def", "tmp/abc.gif") == "abc/def/tmp/abc.gif"
CPLProjectRelativeFilename("abc/def", "/tmp/abc.gif") == "/tmp/abc.gif"
CPLProjectRelativeFilename("/xy", "abc.gif") == "/xy/abc.gif"
CPLProjectRelativeFilename("/abc/def", "../abc.gif") == "/abc/def/../abc.gif"
CPLProjectRelativeFilename("C:\\WIN", "abc.gif") == "C:\\WIN\\abc.gif"
```

Parameters

<i>pszProjectDir</i>	the directory relative to which the secondary files path should be interpreted.
<i>pszSecondary-Filename</i>	the filename (potentially with path) that is to be interpreted relative to the project directory.

Returns

a composed path to the secondary file. The returned string is internal and should not be altered, freed, or depending on past the next CPL call.

11.1.4.56 `void CPL_DLL CPLPushFileFinder (CPLFileFinder pfmFinder)`

CPLPushFileFinder

11.1.4.57 `void CPL_DLL CPLPushFinderLocation (const char * pszLocation)`

CPLPushFinderLocation

11.1.4.58 `const char CPL_DLL* CPLReadLine (FILE * fp)`

Simplified line reading from text file.

Read a line of text from the given file handle, taking care to capture CR and/or LF and strip off ... equivalent of DKReadLine(). Pointer to an internal buffer is returned. The application shouldn't free it, or depend on its value past the next call to [CPLReadLine\(\)](#).

Note that [CPLReadLine\(\)](#) uses VSIFGets(), so any hooking of VSI file services should apply to [CPLReadLine\(\)](#) as well.

[CPLReadLine\(\)](#) maintains an internal buffer, which will appear as a single block memory leak in some circumstances. [CPLReadLine\(\)](#) may be called with a NULL FILE * at any time to free this working buffer.

Parameters

<i>fp</i>	file pointer opened with VSIFOpen().
-----------	--------------------------------------

Returns

pointer to an internal buffer containing a line of text read from the file or NULL if the end of file was encountered.

11.1.4.59 `const char CPL_DLL* CPLReadLineL (VSILFILE * fp)`

Simplified line reading from text file.

Similar to [CPLReadLine\(\)](#), but reading from a large file API handle.

Parameters

<i>fp</i>	file pointer opened with VSIFOpenL() .
-----------	--

Returns

pointer to an internal buffer containing a line of text read from the file or NULL if the end of file was encountered.

11.1.4.60 `void CPL_DLL* CPLRealloc (void * pData, size_t nNewSize)`

Safe version of `realloc()`.

This function is like the C library `realloc()`, but raises a `CE_Fatal` error with `CPLError()` if it fails to allocate the desired memory. It should be used for small memory allocations that are unlikely to fail and for which the application is unwilling to test for out of memory conditions. It uses [VSIFRealloc\(\)](#) to get the memory, so any hooking of [VSIFRealloc\(\)](#) will apply to [CPLRealloc\(\)](#) as well. [CPLFree\(\)](#) or [VSIFree\(\)](#) can be used free memory allocated by [CPLRealloc\(\)](#).

It is also safe to pass NULL in as the existing memory block for [CPLRealloc\(\)](#), in which case it uses [VSIMalloc\(\)](#) to allocate a new block.

Parameters

<i>pData</i>	existing memory block which should be copied to the new block.
<i>nNewSize</i>	new size (in bytes) of memory block to allocate.

Returns

pointer to allocated memory, only NULL if `nNewSize` is zero.

11.1.4.61 `const char CPL_DLL* CPLResetExtension (const char * pszPath, const char * pszExt)`

Replace the extension with the provided one.

Parameters

<i>pszPath</i>	the input path, this string is not altered.
<i>pszExt</i>	the new extension to apply to the given path.

Returns

an altered filename with the new extension. Do not modify or free the returned string. The string may be destroyed by the next CPL call.

11.1.4.62 `double CPL_DLL CPLScanDouble (const char * pszString, int nMaxLength)`

Extract double from string.

Scan up to a maximum number of characters from a string and convert the result to a double. This function uses [CPLAtof\(\)](#) to convert string to double value, so it uses a comma as a decimal delimiter.

Parameters

<i>pszString</i>	String containing characters to be scanned. It may be terminated with a null character.
<i>nMaxLength</i>	The maximum number of character to consider as part of the number. Less characters will be considered if a null character is encountered.

Returns

Double value, converted from its ASCII form.

11.1.4.63 long CPL_DLL CPLScanLong (const char * *pszString*, int *nMaxLength*)

Scan up to a maximum number of characters from a string and convert the result to a long.

Parameters

<i>pszString</i>	String containing characters to be scanned. It may be terminated with a null character.
<i>nMaxLength</i>	The maximum number of character to consider as part of the number. Less characters will be considered if a null character is encountered.

Returns

Long value, converted from its ASCII form.

11.1.4.64 void CPL_DLL* CPLScanPointer (const char * *pszString*, int *nMaxLength*)

Extract pointer from string.

Scan up to a maximum number of characters from a string and convert the result to a pointer.

Parameters

<i>pszString</i>	String containing characters to be scanned. It may be terminated with a null character.
<i>nMaxLength</i>	The maximum number of character to consider as part of the number. Less characters will be considered if a null character is encountered.

Returns

pointer value, converted from its ASCII form.

11.1.4.65 char CPL_DLL* CPLScanString (const char * *pszString*, int *nMaxLength*, int *bTrimSpaces*, int *bNormalize*)

Scan up to a maximum number of characters from a given string, allocate a buffer for a new string and fill it with scanned characters.

Parameters

<i>pszString</i>	String containing characters to be scanned. It may be terminated with a null character.
<i>nMaxLength</i>	The maximum number of character to read. Less characters will be read if a null character is encountered.
<i>bTrimSpaces</i>	If TRUE, trim ending spaces from the input string. Character considered as empty using isspace(3) function.

<i>bNormalize</i>	If TRUE, replace ':' symbol with the '_'. It is needed if resulting string will be used in CPL dictionaries.
-------------------	--

Returns

Pointer to the resulting string buffer. Caller responsible to free this buffer with [CPLFree\(\)](#).

11.1.4.66 GUIntBig CPL_DLL CPLScanUIntBig (const char * pszString, int nMaxLength)

Extract big integer from string.

Scan up to a maximum number of characters from a string and convert the result to a GUIntBig.

Parameters

<i>pszString</i>	String containing characters to be scanned. It may be terminated with a null character.
<i>nMaxLength</i>	The maximum number of character to consider as part of the number. Less characters will be considered if a null character is encountered.

Returns

GUIntBig value, converted from its ASCII form.

11.1.4.67 unsigned long CPL_DLL CPLScanULong (const char * pszString, int nMaxLength)

Scan up to a maximum number of characters from a string and convert the result to a unsigned long.

Parameters

<i>pszString</i>	String containing characters to be scanned. It may be terminated with a null character.
<i>nMaxLength</i>	The maximum number of character to consider as part of the number. Less characters will be considered if a null character is encountered.

Returns

Unsigned long value, converted from its ASCII form.

11.1.4.68 void CPL_DLL CPL_STDCALL CPLSetConfigOption (const char * pszKey, const char * pszValue)

Set a configuration option for GDAL/OGR use.

Those options are defined as a (key, value) couple. The value corresponding to a key can be got later with the [CPLGetConfigOption\(\)](#) method.

This mechanism is similar to environment variables, but options set with [CPLSetConfigOption\(\)](#) overrides, for [CPLGetConfigOption\(\)](#) point of view, values defined in the environment.

If [CPLSetConfigOption\(\)](#) is called several times with the same key, the value provided during the last call will be used.

Options can also be passed on the command line of most GDAL utilities with the with '-config KEY VALUE'. For example, ogrinfo -config CPL_DEBUG ON ~/data/test/point.shp

This function can also be used to clear a setting by passing NULL as the value (note: passing NULL will not unset an existing environment variable; it will just unset a value previously set by [CPLSetConfigOption\(\)](#)).

Parameters

<i>pszKey</i>	the key of the option
<i>pszValue</i>	the value of the option, or NULL to clear a setting.

See Also

<http://trac.osgeo.org/gdal/wiki/ConfigOptions>

11.1.4.69 void CPL_DLL CPLSetConfigOptions (const char *const * *papszConfigOptions*)

Replace the full list of configuration options with the passed list of KEY=VALUE pairs.

This has the same effect of clearing the existing list, and setting individually each pair with the [CPLSetConfigOption\(\)](#) API.

This does not affect options set through environment variables or with [CPLSetThreadLocalConfigOption\(\)](#).

The passed list is copied by the function.

Parameters

<i>papszConfig-Options</i>	the new list (or NULL).
----------------------------	-------------------------

Since

GDAL 2.2

11.1.4.70 char* CPLsetlocale (int *category*, const char * *locale*)

Prevents parallel executions of [setlocale\(\)](#).

Calling [setlocale\(\)](#) concurrently from two or more threads is a potential data race. A mutex is used to provide a critical region so that only one thread at a time can be executing [setlocale\(\)](#).

The return should not be freed, and copied quickly as it may be invalidated by a following next call to [CPLsetlocale\(\)](#).

Parameters

<i>category</i>	See your compiler's documentation on setlocale .
<i>locale</i>	See your compiler's documentation on setlocale .

Returns

See your compiler's documentation on [setlocale](#).

11.1.4.71 void CPL_DLL CPL_STDCALL CPLSetThreadLocalConfigOption (const char * *pszKey*, const char * *pszValue*)

Set a configuration option for GDAL/OGR use.

Those options are defined as a (key, value) couple. The value corresponding to a key can be got later with the [CPLGetConfigOption\(\)](#) method.

This function sets the configuration option that only applies in the current thread, as opposed to [CPLSetConfigOption\(\)](#) which sets an option that applies on all threads. [CPLSetThreadLocalConfigOption\(\)](#) will override the effect of [CPLSetConfigOption\(\)](#) for the current thread.

This function can also be used to clear a setting by passing NULL as the value (note: passing NULL will not unset an existing environment variable or a value set through [CPLSetConfigOption\(\)](#); it will just unset a value previously set by [CPLSetThreadLocalConfigOption\(\)](#)).

Parameters

<i>pszKey</i>	the key of the option
<i>pszValue</i>	the value of the option, or NULL to clear a setting.

11.1.4.72 void CPL_DLL CPLSetThreadLocalConfigOptions (const char *const * *papszConfigOptions*)

Replace the full list of thread local configuration options with the passed list of KEY=VALUE pairs.

This has the same effect of clearing the existing list, and setting individually each pair with the [CPLSetThreadLocalConfigOption\(\)](#) API.

This does not affect options set through environment variables or with [CPLSetConfigOption\(\)](#).

The passed list is copied by the function.

Parameters

<i>papszConfigOptions</i>	the new list (or NULL).
---------------------------	-------------------------

Since

GDAL 2.2

11.1.4.73 int CPL_DLL CPLStat (const char * *pszPath*, VSISStatBuf * *psStatBuf*)

Same as VSISStat() except it works on "C:" as if it were "C:\".

11.1.4.74 char CPL_DLL* CPLStrdup (const char * *pszString*)

Safe version of strdup() function.

This function is similar to the C library strdup() function, but if the memory allocation fails it will issue a CE_Fatal error with CPLError() instead of returning NULL. It uses [VSIStrdup\(\)](#), so any hooking of that function will apply to [CPLStrdup\(\)](#) as well. Memory allocated with [CPLStrdup\(\)](#) can be freed with [CPLFree\(\)](#) or [VSIFree\(\)](#).

It is also safe to pass a NULL string into [CPLStrdup\(\)](#). [CPLStrdup\(\)](#) will allocate and return a zero length string (as opposed to a NULL string).

Parameters

<i>pszString</i>	input string to be duplicated. May be NULL.
------------------	---

Returns

pointer to a newly allocated copy of the string. Free with [CPLFree\(\)](#) or [VSIFree\(\)](#).

11.1.4.75 void CPL_DLL CPLStringToComplex (const char * *pszString*, double * *pdfReal*, double * *pdfImag*)

Fetch the real and imaginary part of a serialized complex number

11.1.4.76 char CPL_DLL* CPLStrlwr (char * *pszString*)

Convert each characters of the string to lower case.

For example, "ABcdE" will be converted to "abcde". This function is locale dependent.

Parameters

<i>pszString</i>	input string to be converted.
------------------	-------------------------------

Returns

pointer to the same string, pszString.

11.1.4.77 `double CPL_DLL CPLStrtod (const char * nptr, char ** endptr)`

Converts ASCII string to floating point number.

This function converts the initial portion of the string pointed to by nptr to double floating point representation. This function does the same as standard strtod(3), but does not take locale in account. That means, the decimal delimiter is always '.' (decimal point). Use [CPLStrtodDelim\(\)](#) function if you want to specify custom delimiter. Also see notes for [CPLAtof\(\)](#) function.

Parameters

<i>nptr</i>	Pointer to string to convert.
<i>endptr</i>	If is not NULL, a pointer to the character after the last character used in the conversion is stored in the location referenced by endptr.

Returns

Converted value, if any.

11.1.4.78 `double CPL_DLL CPLStrtodDelim (const char * nptr, char ** endptr, char point)`

Converts ASCII string to floating point number using specified delimiter.

This function converts the initial portion of the string pointed to by nptr to double floating point representation. This function does the same as standard strtod(3), but does not take locale in account. Instead of locale defined decimal delimiter you can specify your own one. Also see notes for [CPLAtof\(\)](#) function.

Parameters

<i>nptr</i>	Pointer to string to convert.
<i>endptr</i>	If is not NULL, a pointer to the character after the last character used in the conversion is stored in the location referenced by endptr.
<i>point</i>	Decimal delimiter.

Returns

Converted value, if any.

11.1.4.79 `float CPL_DLL CPLStrtof (const char * nptr, char ** endptr)`

Converts ASCII string to floating point number.

This function converts the initial portion of the string pointed to by nptr to single floating point representation. This function does the same as standard strtof(3), but does not take locale in account. That means, the decimal delimiter is always '.' (decimal point). Use [CPLStrtofDelim\(\)](#) function if you want to specify custom delimiter. Also see notes for [CPLAtof\(\)](#) function.

Parameters

<i>nptr</i>	Pointer to string to convert.
<i>endptr</i>	If is not NULL, a pointer to the character after the last character used in the conversion is stored in the location referenced by endptr.

Returns

Converted value, if any.

11.1.4.80 float CPL_DLL CPLStrtofDelim (const char * *nptr*, char ** *endptr*, char *point*)

Converts ASCII string to floating point number using specified delimiter.

This function converts the initial portion of the string pointed to by *nptr* to single floating point representation. This function does the same as standard `strtof(3)`, but does not take locale in account. Instead of locale defined decimal delimiter you can specify your own one. Also see notes for [CPLAtof\(\)](#) function.

Parameters

<i>nptr</i>	Pointer to string to convert.
<i>endptr</i>	If is not NULL, a pointer to the character after the last character used in the conversion is stored in the location referenced by endptr.
<i>point</i>	Decimal delimiter.

Returns

Converted value, if any.

11.1.4.81 int CPL_DLL CPLSymlink (const char * *pszOldPath*, const char * *pszNewPath*, char **)

Create a symbolic link

11.1.4.82 int CPL_DLL CPLUnlinkTree (const char * *pszPath*)

Recursively unlink a directory.

Returns

0 on successful completion, -1 if function fails.

11.1.4.83 CPL_ERR CPL_DLL CPLWriteFileInZip (void * *hZip*, const void * *pBuffer*, int *nBufferSize*)

Write in current file inside a ZIP file

11.1.4.84 void CPL_DLL* CPLZLibInflate (const void * *ptr*, size_t *nBytes*, void * *outptr*, size_t *nOutAvailableBytes*, size_t * *pnOutBytes*)

Uncompress a buffer compressed with ZLib DEFLATE compression.

Parameters

<i>ptr</i>	input buffer.
<i>nBytes</i>	size of input buffer in bytes.
<i>outptr</i>	output buffer, or NULL to let the function allocate it.
<i>nOutAvailable-Bytes</i>	size of output buffer if provided, or ignored.
<i>pnOutBytes</i>	pointer to a <code>size_t</code> , where to store the size of the output buffer.

Returns

the output buffer (to be freed with [VSIFree\(\)](#) if not provided) or NULL in case of error.

Since

GDAL 1.10.0

11.2 cpl_error.h File Reference

```
#include "cpl_port.h"
#include <stdarg.h>
#include <stddef.h>
```

Macros

- #define [CPL_EnumNone](#) 0
- #define [CPL_EnumAppDefined](#) 1
- #define [CPL_EnumOutOfMemory](#) 2
- #define [CPL_EnumFileIO](#) 3
- #define [CPL_EnumOpenFailed](#) 4
- #define [CPL_EnumIllegalArg](#) 5
- #define [CPL_EnumNotSupported](#) 6
- #define [CPL_EnumAssertionFailed](#) 7
- #define [CPL_EnumNoWriteAccess](#) 8
- #define [CPL_EnumUserInterrupt](#) 9
- #define [CPL_EnumObjectNull](#) 10
- #define [CPL_EnumHttpResponse](#) 11
- #define [CPL_EnumAWSS3BucketNotFound](#) 12
- #define [CPL_EnumAWSObjectNotFound](#) 13
- #define [CPL_EnumAWSAccessDenied](#) 14
- #define [CPL_EnumAWSInvalidCredentials](#) 15
- #define [CPL_EnumAWSSignatureDoesNotMatch](#) 16
- #define [CPLAssert](#)(expr)
- #define [VALIDATE_POINTER0](#)(ptr, func)
- #define [VALIDATE_POINTER1](#)(ptr, func, rc)

Typedefs

- typedef int [CPLErrorNum](#)
- typedef void([CPL_STDCALL](#) * [CPLErrorHandler](#))([CPLerr](#), [CPLErrorNum](#), const char *)

Enumerations

- enum [CPLErr](#)

Functions

- void CPL_DLL void CPL_DLL [CPLErrorV](#) ([CPLErr](#), [CPLErrorNum](#), const char *, va_list)
- void CPL_DLL [CPLEmergencyError](#) (const char *) [CPL_NO_RETURN](#)
- void CPL_DLL CPL_STDCALL [CPLErrorReset](#) (void)
- [CPLErrorNum](#) CPL_DLL CPL_STDCALL [CPLGetLastErrorNo](#) (void)
- [CPLErr](#) CPL_DLL CPL_STDCALL [CPLGetLastErrorType](#) (void)
- const char CPL_DLL *CPL_STDCALL [CPLGetLastErrorMsg](#) (void)
- void CPL_DLL *CPL_STDCALL [CPLGetErrorHandlerUserData](#) (void)
- void CPL_DLL [CPLErrorSetState](#) ([CPLErr](#) eErrClass, [CPLErrorNum](#) err_no, const char *pszMsg)
- void CPL_DLL CPL_STDCALL [CPLLoggingErrorHandler](#) ([CPLErr](#), [CPLErrorNum](#), const char *)
- void CPL_DLL CPL_STDCALL [CPLDefaultErrorHandler](#) ([CPLErr](#), [CPLErrorNum](#), const char *)
- void CPL_DLL CPL_STDCALL [CPLQuietErrorHandler](#) ([CPLErr](#), [CPLErrorNum](#), const char *)
- void [CPLTurnFailureIntoWarning](#) (int bOn)
- [CPLErrorHandler](#) CPL_DLL CPL_STDCALL [CPLSetErrorHandler](#) ([CPLErrorHandler](#))
- [CPLErrorHandler](#) CPL_DLL CPL_STDCALL [CPLSetErrorHandlerEx](#) ([CPLErrorHandler](#), void *)
- void CPL_DLL CPL_STDCALL [CPLPushErrorHandler](#) ([CPLErrorHandler](#))
- void CPL_DLL CPL_STDCALL [CPLPushErrorHandlerEx](#) ([CPLErrorHandler](#), void *)
- void CPL_DLL CPL_STDCALL [CPLSetCurrentErrorHandlerCatchDebug](#) (int bCatchDebug)
- void CPL_DLL CPL_STDCALL [CPLPopErrorHandler](#) (void)
- void CPL_DLL CPL_STDCALL void
CPL_DLL CPL_STDCALL [_CPLAssert](#) (const char *, const char *, int) [CPL_NO_RETURN](#)

11.2.1 Detailed Description

CPL error handling services.

11.2.2 Macro Definition Documentation

11.2.2.1 #define CPLAssert(expr)

Assert on an expression. Only enabled in DEBUG mode

11.2.2.2 #define CPLE_AppDefined 1

Application defined error

11.2.2.3 #define CPLE_AssertionFailed 7

Assertion failed

11.2.2.4 #define CPLE_AWSAccessDenied 14

AWSAccessDenied

11.2.2.5 #define CPLE_AWSBucketNotFound 12

AWSBucketNotFound

11.2.2.6 `#define CPLE_AWSInvalidCredentials 15`

AWSInvalidCredentials

11.2.2.7 `#define CPLE_AWSObjectNotFound 13`

AWSObjectNotFound

11.2.2.8 `#define CPLE_AWSSignatureDoesNotMatch 16`

AWSSignatureDoesNotMatch

11.2.2.9 `#define CPLE_FileIO 3`

File I/O error

11.2.2.10 `#define CPLE_HttpResponse 11`

HTTP response

11.2.2.11 `#define CPLE_IllegalArg 5`

Illegal argument

11.2.2.12 `#define CPLE_None 0`

No error

11.2.2.13 `#define CPLE_NotSupported 6`

Not supported

11.2.2.14 `#define CPLE_NoWriteAccess 8`

No write access

11.2.2.15 `#define CPLE_ObjectNull 10`

NULL object

11.2.2.16 `#define CPLE_OpenFailed 4`

Open failed

11.2.2.17 `#define CPLE_OutOfMemory 2`

Out of memory error

11.2.2.18 #define CPLE_UserInterrupt 9

User interrupted

11.2.2.19 #define VALIDATE_POINTER0(ptr, func)

Value:

```
do { if( NULL == ptr ) \
    { \
      CPLErr const ret = VALIDATE_POINTER_ERR; \
      CPLError( ret, CPLE_ObjectNull, \
        "Pointer '%s' is NULL in '%s'.\n", #ptr, (func)); \
      return; } } while(0)
```

Validate that a pointer is not NULL

11.2.2.20 #define VALIDATE_POINTER1(ptr, func, rc)

Value:

```
do { if( NULL == ptr ) \
    { \
      CPLErr const ret = VALIDATE_POINTER_ERR; \
      CPLError( ret, CPLE_ObjectNull, \
        "Pointer '%s' is NULL in '%s'.\n", #ptr, (func)); \
      return (rc); } } while(0)
```

Validate that a pointer is not NULL, and return rc if it is NULL

11.2.3 Typedef Documentation

11.2.3.1 typedef void(CPL_STDCALL * CPLErrorHandler)(CPLErr, CPLErrorNum, const char *)

Callback for a custom error handler

11.2.3.2 typedef int CPLErrorNum

Error number

11.2.4 Enumeration Type Documentation

11.2.4.1 enum CPLErr

Error category

11.2.5 Function Documentation

11.2.5.1 void CPL_DLL CPL_STDCALL void CPL_DLL CPL_STDCALL _CPLAssert (const char * pszExpression, const char * pszFile, int iLine)

Report failure of a logical assertion.

Applications would normally use the [CPLAssert\(\)](#) macro which expands into code calling [_CPLAssert\(\)](#) only if the condition fails. [_CPLAssert\(\)](#) will generate a CE_Fatal error call to [CPLError\(\)](#), indicating the file name, and line number of the failed assertion, as well as containing the assertion itself.

There is no reason for application code to call [_CPLAssert\(\)](#) directly.

11.2.5.2 void CPL_DLL CPL_STDCALL CPLDefaultErrorHandler (CPLErr eErrClass, CPLErrorNum nError, const char * pszErrorMsg)

Default error handler.

11.2.5.3 void CPL_DLL CPLEmergencyError (const char * pszMessage)

Fatal error when things are bad.

This function should be called in an emergency situation where it is unlikely that a regular error report would work. This would include in the case of heap exhaustion for even small allocations, or any failure in the process of reporting an error (such as TLS allocations).

This function should never return. After the error message has been reported as best possible, the application will abort() similarly to how CPLError() aborts on CE_Fatal class errors.

Parameters

<i>pszMessage</i>	the error message to report.
-------------------	------------------------------

11.2.5.4 void CPL_DLL CPL_STDCALL CPLErrorReset (void)

Erase any traces of previous errors.

This is normally used to ensure that an error which has been recovered from does not appear to be still in play with high level functions.

11.2.5.5 void CPL_DLL CPLErrorSetState (CPLErr eErrClass, CPLErrorNum err_no, const char * pszMsg)

Restore an error state, without emitting an error.

Can be useful if a routine might call [CPLErrorReset\(\)](#) and one wants to preserve the previous error state.

Since

GDAL 2.0

11.2.5.6 void CPL_DLL void CPL_DLL CPLErrorV (CPLErr eErrClass, CPLErrorNum err_no, const char * fmt, va_list args)

Same as CPLError() but with a va_list

11.2.5.7 void CPL_DLL* CPL_STDCALL CPLGetErrorHandlerUserData (void)

Fetch the user data for the error context

Fetches the user data for the current error context. You can set the user data for the error context when you add your handler by issuing [CPLSetErrorHandlerEx\(\)](#) and [CPLPushErrorHandlerEx\(\)](#). Note that user data is primarily intended for providing context within error handlers themselves, but they could potentially be abused in other useful ways with the usual caveat emptor understanding.

Returns

the user data pointer for the error context

11.2.5.8 `const char CPL_DLL* CPL_STDCALL CPLGetLastErrorMsg (void)`

Get the last error message.

Fetches the last error message posted with `CPL_Error()`, that hasn't been cleared by `CPL_ErrorReset()`. The returned pointer is to an internal string that should not be altered or freed.

Returns

the last error message, or `NULL` if there is no posted error message.

11.2.5.9 `CPL_ErrorNum CPL_DLL CPL_STDCALL CPLGetLastErrorNo (void)`

Fetch the last error number.

Fetches the last error number posted with `CPL_Error()`, that hasn't been cleared by `CPL_ErrorReset()`. This is the error number, not the error class.

Returns

the error number of the last error to occur, or `CPL_None (0)` if there are no posted errors.

11.2.5.10 `CPL_Error CPL_DLL CPL_STDCALL CPLGetLastErrorType (void)`

Fetch the last error type.

Fetches the last error type posted with `CPL_Error()`, that hasn't been cleared by `CPL_ErrorReset()`. This is the error class, not the error number.

Returns

the error type of the last error to occur, or `CE_None (0)` if there are no posted errors.

11.2.5.11 `void CPL_DLL CPL_STDCALL CPLLoggingErrorHandler (CPL_Error eErrClass, CPL_ErrorNum nError, const char * pszErrorMsg)`

Error handler that logs into the file defined by the `CPL_LOG` configuration option, or `stderr` otherwise.

11.2.5.12 `void CPL_DLL CPL_STDCALL CPLPopErrorHandler (void)`

Pop error handler off stack.

Discards the current error handler on the error handler stack, and restores the one in use before the last `CPL_PushErrorHandler()` call. This method has no effect if there are no error handlers on the current threads error handler stack.

11.2.5.13 `void CPL_DLL CPL_STDCALL CPLPushErrorHandler (CPL_ErrorHandler pfnErrorHandlerNew)`

Push a new `CPL_Error` handler.

This pushes a new error handler on the thread-local error handler stack. This handler will be used until removed with `CPL_PopErrorHandler()`.

The `CPL_SetErrorHandler()` docs have further information on how `CPL_Error` handlers work.

Parameters

<i>pfnErrorHandlerNew</i>	new error handler function.
---------------------------	-----------------------------

11.2.5.14 `void CPL_DLL CPL_STDCALL CPLPushErrorHandlerEx (CPLErrorHandler pfnErrorHandlerNew, void * pUserData)`

Push a new CPLError handler with user data on the error context.

This pushes a new error handler on the thread-local error handler stack. This handler will be used until removed with [CPLPopErrorHandler\(\)](#). Obtain the user data back by using [CPLGetErrorContext\(\)](#).

The [CPLSetErrorHandler\(\)](#) docs have further information on how CPLError handlers work.

Parameters

<i>pfnErrorHandlerNew</i>	new error handler function.
<i>pUserData</i>	User data to put on the error context.

11.2.5.15 `void CPL_DLL CPL_STDCALL CPLQuietErrorHandler (CPLErr eErrClass, CPLErrorNum nError, const char * pszErrorMsg)`

Error handler that does not do anything, except for debug messages.

11.2.5.16 `void CPL_DLL CPL_STDCALL CPLSetCurrentErrorHandlerCatchDebug (int bCatchDebug)`

Set if the current error handler should intercept debug messages, or if they should be processed by the previous handler.

By default when installing a custom error handler, this one intercepts debug messages. In some cases, this might not be desirable and the user would prefer that the previous installed handler (or the default one if no previous installed handler exists in the stack) deal with it. In which case, this function should be called with `bCatchDebug = FALSE`.

Parameters

<i>bCatchDebug</i>	FALSE if the current error handler should not intercept debug messages
--------------------	--

Since

GDAL 2.1

11.2.5.17 `CPLErrorHandler CPL_DLL CPL_STDCALL CPLSetErrorHandler (CPLErrorHandler pfnErrorHandlerNew)`

Install custom error handler.

Allow the library's user to specify an error handler function. A valid error handler is a C function with the following prototype:

```
void MyErrorHandler(CPLErr eErrClass, int err_no, const char *msg)
```

Pass NULL to come back to the default behavior. The default behaviour ([CPLDefaultErrorHandler\(\)](#)) is to write the message to stderr.

The msg will be a partially formatted error message not containing the "ERROR %d:" portion emitted by the default handler. Message formatting is handled by [CPLError\(\)](#) before calling the handler. If the error handler function is

passed a `CE_Fatal` class error and returns, then `CPL_Error()` will call `abort()`. Applications wanting to interrupt this fatal behaviour will have to use `longjmp()`, or a C++ exception to indirectly exit the function.

Another standard error handler is `CPL_QuietErrorHandler()` which doesn't make any attempt to report the passed error or warning messages but will process debug messages via `CPL_DefaultErrorHandler()`.

Note that error handlers set with `CPL_SetErrorHandler()` apply to all threads in an application, while error handlers set with `CPL_PushErrorHandler()` are thread-local. However, any error handlers pushed with `CPL_PushErrorHandler()` (and not removed with `CPL_PopErrorHandler()`) take precedence over the global error handlers set with `CPL_SetErrorHandler()`. Generally speaking `CPL_SetErrorHandler()` would be used to set a desired global error handler, while `CPL_PushErrorHandler()` would be used to install a temporary local error handler, such as `CPL_QuietErrorHandler()` to suppress error reporting in a limited segment of code.

Parameters

<i>pfnErrorHandlerNew</i>	new error handler function.
---------------------------	-----------------------------

Returns

returns the previously installed error handler.

11.2.5.18 `CPL_ErrorHandler CPL_DLL CPL_STDCALL CPL_SetErrorHandlerEx (CPL_ErrorHandler pfnErrorHandlerNew, void * pUserData)`

Install custom error handle with user's data. This method is essentially `CPL_SetErrorHandler()` with an added pointer to `pUserData`. The `pUserData` is not returned in the `CPL_ErrorHandler`, however, and must be fetched via `CPL_GetErrorHandlerUserData()`.

Parameters

<i>pfnErrorHandlerNew</i>	new error handler function.
<i>pUserData</i>	User data to carry along with the error context.

Returns

returns the previously installed error handler.

11.2.5.19 `void CPL_TurnFailureIntoWarning (int bOn)`

Whether failures should be turned into warnings.

11.3 cpl_hash_set.h File Reference

```
#include "cpl_port.h"
```

Typedefs

- typedef typedefCPL_C_START
struct `_CPLHashSet` `CPLHashSet`
- typedef unsigned long(* `CPLHashSetHashFunc`)(const void *elt)
- typedef int(* `CPLHashSetEqualFunc`)(const void *elt1, const void *elt2)
- typedef void(* `CPLHashSetFreeEltFunc`)(void *elt)
- typedef int(* `CPLHashSetIterEltFunc`)(void *elt, void *user_data)

Functions

- [CPLHashSet](#) CPL_DLL * [CPLHashSetNew](#) ([CPLHashSetHashFunc](#) fnHashFunc, [CPLHashSetEqualFunc](#) fnEqualFunc, [CPLHashSetFreeEltFunc](#) fnFreeEltFunc)
- void CPL_DLL [CPLHashSetDestroy](#) ([CPLHashSet](#) *set)
- void CPL_DLL [CPLHashSetClear](#) ([CPLHashSet](#) *set)
- int CPL_DLL [CPLHashSetSize](#) (const [CPLHashSet](#) *set)
- void CPL_DLL [CPLHashSetForeach](#) ([CPLHashSet](#) *set, [CPLHashSetIterEltFunc](#) fnIterFunc, void *user_data)
- int CPL_DLL [CPLHashSetInsert](#) ([CPLHashSet](#) *set, void *elt)
- void CPL_DLL * [CPLHashSetLookup](#) ([CPLHashSet](#) *set, const void *elt)
- int CPL_DLL [CPLHashSetRemove](#) ([CPLHashSet](#) *set, const void *elt)
- int CPL_DLL [CPLHashSetRemoveDeferRehash](#) ([CPLHashSet](#) *set, const void *elt)
- unsigned long CPL_DLL [CPLHashSetHashPointer](#) (const void *elt)
- int CPL_DLL [CPLHashSetEqualPointer](#) (const void *elt1, const void *elt2)
- unsigned long CPL_DLL [CPLHashSetHashStr](#) (const void *pszStr)
- int CPL_DLL [CPLHashSetEqualStr](#) (const void *pszStr1, const void *pszStr2)

11.3.1 Detailed Description

Hash set implementation.

An hash set is a data structure that holds elements that are unique according to a comparison function. Operations on the hash set, such as insertion, removal or lookup, are supposed to be fast if an efficient "hash" function is provided.

11.3.2 Typedef Documentation

11.3.2.1 typedef typedefCPL_C_START struct _CPLHashSet CPLHashSet

Opaque type for a hash set

11.3.2.2 typedef int(*CPLHashSetEqualFunc)(const void *elt1, const void *elt2)

CPLHashSetEqualFunc

11.3.2.3 typedef void(*CPLHashSetFreeEltFunc)(void *elt)

CPLHashSetFreeEltFunc

11.3.2.4 typedef unsigned long(*CPLHashSetHashFunc)(const void *elt)

CPLHashSetHashFunc

11.3.2.5 typedef int(*CPLHashSetIterEltFunc)(void *elt, void *user_data)

CPLHashSetIterEltFunc

11.3.3 Function Documentation

11.3.3.1 void CPL_DLL CPLHashSetClear (CPLHashSet * set)

Clear all elements from a hash set.

This function also frees the elements if a free function was provided at the creation of the hash set.

Parameters

<i>set</i>	the hash set
------------	--------------

Since

GDAL 2.1

11.3.3.2 void CPL_DLL CPLHashSetDestroy (CPLHashSet * *set*)

Destroys an allocated hash set.

This function also frees the elements if a free function was provided at the creation of the hash set.

Parameters

<i>set</i>	the hash set
------------	--------------

11.3.3.3 int CPL_DLL CPLHashSetEqualPointer (const void * *elt1*, const void * *elt2*)

Equality function for arbitrary pointers

Parameters

<i>elt1</i>	the first arbitrary pointer to compare
<i>elt2</i>	the second arbitrary pointer to compare

Returns

TRUE if the pointers are equal

11.3.3.4 int CPL_DLL CPLHashSetEqualStr (const void * *elt1*, const void * *elt2*)

Equality function for strings

Parameters

<i>elt1</i>	the first string to compare. May be NULL.
<i>elt2</i>	the second string to compare. May be NULL.

Returns

TRUE if the strings are equal

11.3.3.5 void CPL_DLL CPLHashSetForeach (CPLHashSet * *set*, CPLHashSetIterEltFunc *fnIterFunc*, void * *user_data*)

Walk through the hash set and runs the provided function on all the elements

This function is provided the *user_data* argument of CPLHashSetForeach. It must return TRUE to go on the walk through the hash set, or FALSE to make it stop.

Note : the structure of the hash set must *NOT* be modified during the walk.

Parameters

<i>set</i>	the hash set.
<i>fnIterFunc</i>	the function called on each element.
<i>user_data</i>	the user data provided to the function.

11.3.3.6 unsigned long CPL_DLL CPLHashSetHashPointer (const void * *elt*)

Hash function for an arbitrary pointer

Parameters

<i>elt</i>	the arbitrary pointer to hash
------------	-------------------------------

Returns

the hash value of the pointer

11.3.3.7 unsigned long CPL_DLL CPLHashSetHashStr (const void * *elt*)

Hash function for a zero-terminated string

Parameters

<i>elt</i>	the string to hash. May be NULL.
------------	----------------------------------

Returns

the hash value of the string

11.3.3.8 int CPL_DLL CPLHashSetInsert (CPLHashSet * *set*, void * *elt*)

Inserts an element into a hash set.

If the element was already inserted in the hash set, the previous element is replaced by the new element. If a free function was provided, it is used to free the previously inserted element

Parameters

<i>set</i>	the hash set
<i>elt</i>	the new element to insert in the hash set

Returns

TRUE if the element was not already in the hash set

11.3.3.9 void CPL_DLL* CPLHashSetLookup (CPLHashSet * *set*, const void * *elt*)

Returns the element found in the hash set corresponding to the element to look up The element must not be modified.

Parameters

<i>set</i>	the hash set
<i>elt</i>	the element to look up in the hash set

Returns

the element found in the hash set or NULL

11.3.3.10 `CPLHashSet CPL_DLL* CPLHashSetNew (CPLHashSetHashFunc fnHashFunc, CPLHashSetEqualFunc fnEqualFunc, CPLHashSetFreeEltFunc fnFreeEltFunc)`

Creates a new hash set

The hash function must return a hash value for the elements to insert. If *fnHashFunc* is NULL, `CPLHashSetHashPointer` will be used.

The equal function must return if two elements are equal. If *fnEqualFunc* is NULL, `CPLHashSetEqualPointer` will be used.

The free function is used to free elements inserted in the hash set, when the hash set is destroyed, when elements are removed or replaced. If *fnFreeEltFunc* is NULL, elements inserted into the hash set will not be freed.

Parameters

<i>fnHashFunc</i>	hash function. May be NULL.
<i>fnEqualFunc</i>	equal function. May be NULL.
<i>fnFreeEltFunc</i>	element free function. May be NULL.

Returns

a new hash set

11.3.3.11 `int CPL_DLL CPLHashSetRemove (CPLHashSet * set, const void * elt)`

Removes an element from a hash set

Parameters

<i>set</i>	the hash set
<i>elt</i>	the new element to remove from the hash set

Returns

TRUE if the element was in the hash set

11.3.3.12 `int CPL_DLL CPLHashSetRemoveDeferRehash (CPLHashSet * set, const void * elt)`

Removes an element from a hash set.

This will defer potential rehashing of the set to later calls to [CPLHashSetInsert\(\)](#) or [CPLHashSetRemove\(\)](#).

Parameters

<i>set</i>	the hash set
<i>elt</i>	the new element to remove from the hash set

Returns

TRUE if the element was in the hash set

Since

GDAL 2.1

11.3.3.13 int CPL_DLL CPLHashSetSize (const CPLHashSet * set)

Returns the number of elements inserted in the hash set

Note: this is not the internal size of the hash set

Parameters

set	the hash set
-----	--------------

Returns

the number of elements in the hash set

11.4 cpl_http.h File Reference

```
#include "cpl_conv.h"
#include "cpl_string.h"
#include "cpl_vsi.h"
```

Classes

- struct [CPLMimePart](#)
- struct [CPLHTTPResult](#)

Functions

- int CPL_DLL [CPLHTTPEnabled](#) (void)
Return if CPLHTTP services can be useful.
- [CPLHTTPResult](#) CPL_DLL * [CPLHTTPFetch](#) (const char *pszURL, char **papszOptions)
Fetch a document from an url and return in a string.
- void CPL_DLL [CPLHTTPCleanup](#) (void)
Cleanup function to call at application termination.
- void CPL_DLL [CPLHTTPDestroyResult](#) ([CPLHTTPResult](#) *psResult)
Clean the memory associated with the return value of [CPLHTTPFetch\(\)](#)
- int CPL_DLL [CPLHTTPParseMultipartMime](#) ([CPLHTTPResult](#) *psResult)
Parses a MIME multipart message.
- char CPL_DLL * [GOA2GetAuthorizationURL](#) (const char *pszScope)
- char CPL_DLL * [GOA2GetRefreshToken](#) (const char *pszAuthToken, const char *pszScope)

11.4.1 Detailed Description

Interface for downloading HTTP, FTP documents

11.4.2 Function Documentation

11.4.2.1 void CPL_DLL CPLHTTPDestroyResult (CPLHTTPResult * *psResult*)

Clean the memory associated with the return value of [CPLHTTPFetch\(\)](#)

Parameters

<i>psResult</i>	pointer to the return value of CPLHTTPFetch()
-----------------	---

11.4.2.2 int CPL_DLL CPLHTTPEnabled (void)

Return if CPLHTTP services can be useful.

Those services depend on GDAL being build with libcurl support.

Returns

TRUE if libcurl support is enabled

11.4.2.3 CPLHTTPResult CPL_DLL* CPLHTTPFetch (const char * *pszURL*, char ** *papszOptions*)

Fetch a document from an url and return in a string.

Parameters

<i>pszURL</i>	valid URL recognized by underlying download library (libcurl)
<i>papszOptions</i>	<p>option list as a NULL-terminated array of strings. May be NULL. The following options are handled :</p> <ul style="list-style-type: none"> • CONNECTTIMEOUT=val, where val is in seconds (possibly with decimals). This is the maximum delay for the connection to be established before being aborted (GDAL >= 2.2). • TIMEOUT=val, where val is in seconds. This is the maximum delay for the whole request to complete before being aborted. • LOW_SPEED_TIME=val, where val is in seconds. This is the maximum time where the transfer speed should be below the LOW_SPEED_LIMIT (if not specified 1b/s), before the transfer to be considered too slow and aborted. (GDAL >= 2.1) • LOW_SPEED_LIMIT=val, where val is in bytes/second. See LOW_SPEED_TIME. Has only effect if LOW_SPEED_TIME is specified too. (GDAL >= 2.1) • HEADERS=val, where val is an extra header to use when getting a web page. For example "Accept: application/x-ogcwkkt" • HEADER_FILE=filename: filename of a text file with "key: value" headers. (GDAL >= 2.2) • HTTPAUTH=[BASIC/NTLM/GSSNEGOTIATE/ANY] to specify an authentication scheme to use. • USERPWD=userid:password to specify a user and password for authentication • POSTFIELDS=val, where val is a nul-terminated string to be passed to the server with a POST request. • PROXY=val, to make requests go through a proxy server, where val is of the form proxy.server.com:port_number • PROXYUSERPWD=val, where val is of the form username:password • PROXYAUTH=[BASIC/NTLM/DIGEST/ANY] to specify an proxy authentication scheme to use. • NETRC=[YES/NO] to enable or disable use of \$HOME/.netrc, default YES. • CUSTOMREQUEST=val, where val is GET, PUT, POST, DELETE, etc.. (GDAL >= 1.9.0) • COOKIE=val, where val is formatted as COOKIE1=VALUE1; COOKIE2=VALUE2; ... • MAX_RETRY=val, where val is the maximum number of retry attempts if a 503 or 504 HTTP error occurs. Default is 0. (GDAL >= 2.0) • RETRY_DELAY=val, where val is the number of seconds between retry attempts. Default is 30. (GDAL >= 2.0) • MAX_FILE_SIZE=val, where val is a number of bytes (GDAL >= 2.2) • CAINFO=/path/to/bundle.crt. This is path to Certificate Authority (CA) bundle file. By default, it will be looked in a system location. If the CAINFO options is not defined, GDAL will also look if the CURL_CA_BUNDLE environment variable is defined to use it as the CAINFO value, and as a fallback to the SSL_CERT_FILE environment variable. (GDAL >= 2.1.3)

Alternatively, if not defined in the papszOptions arguments, the CONNECTTIMEOUT, TIMEOUT, LOW_SPEED_TIME, LOW_SPEED_LIMIT, PROXY, PROXYUSERPWD, PROXYAUTH, NETRC, MAX_RETRY and RETRY_DE-

LAY, HEADER_FILE values are searched in the configuration options named GDAL_HTTP_CONNECTTIMEOUT, GDAL_HTTP_TIMEOUT, GDAL_HTTP_LOW_SPEED_TIME, GDAL_HTTP_LOW_SPEED_LIMIT, GDAL_HTTP_PROXY, GDAL_HTTP_PROXYUSERPWD, GDAL_PROXY_AUTH, GDAL_HTTP_NETRC, GDAL_HTTP_MAX_RETRY, GDAL_HTTP_RETRY_DELAY, GDAL_HTTP_HEADER_FILE.

Returns

a CPLHTTPResult* structure that must be freed by [CPLHTTPDestroyResult\(\)](#), or NULL if libcurl support is disabled

11.4.2.4 int CPL_DLL CPLHTTTParseMultipartMime (CPLHTTPResult * *psResult*)

Parses a MIME multipart message.

This function will iterate over each part and put it in a separate element of the pasMimePart array of the provided psResult structure.

Parameters

<i>psResult</i>	pointer to the return value of CPLHTTPFetch()
-----------------	---

Returns

TRUE if the message contains MIME multipart message.

11.4.2.5 char CPL_DLL* GOA2GetAuthorizationURL (const char * *pszScope*)

Return authorization url for a given scope.

Returns the URL that a user should visit, and use for authentication in order to get an "auth token" indicating their willingness to use a service.

Note that when the user visits this url they will be asked to login (using a google/gmail/etc) account, and to authorize use of the requested scope for the application "GDAL/OGR". Once they have done so, they will be presented with a lengthy string they should "enter into their application". This is the "auth token" to be passed to [GOA2GetRefreshToken\(\)](#). The "auth token" can only be used once.

This function should never fail.

Parameters

<i>pszScope</i>	the service being requested, not yet URL encoded, such as "https://www.googleapis.com/auth/fusiontables".
-----------------	---

Returns

the URL to visit - should be freed with [CPLFree\(\)](#).

11.4.2.6 char CPL_DLL* GOA2GetRefreshToken (const char * *pszAuthToken*, const char * *pszScope*)

Turn Auth Token into a Refresh Token.

A one time "auth token" provided by the user is turned into a reusable "refresh token" using a google oauth2 web service.

A CPLError will be reported if the translation fails for some reason. Common reasons include the auth token already having been used before, it not being appropriate for the passed scope and configured client api or http connection problems. NULL is returned on error.

Parameters

<i>pszAuthToken</i>	the authorization token from the user.
<i>pszScope</i>	the scope for which it is valid.

Returns

refresh token, to be freed with [CPLFree\(\)](#), null on failure.

11.5 cpl_list.h File Reference

```
#include "cpl_port.h"
```

Classes

- [struct _CPLList](#)

Typedefs

- typedef typedefCPL_C_START
struct [_CPLList](#) [CPLList](#)

Functions

- [CPLList](#) [CPL_DLL](#) * [CPLListAppend](#) ([CPLList](#) *psList, void *pData)
- [CPLList](#) [CPL_DLL](#) * [CPLListInsert](#) ([CPLList](#) *psList, void *pData, int nPosition)
- [CPLList](#) [CPL_DLL](#) * [CPLListGetLast](#) ([CPLList](#) *psList)
- [CPLList](#) [CPL_DLL](#) * [CPLListGet](#) ([CPLList](#) *const psList, int nPosition)
- int [CPL_DLL](#) [CPLListCount](#) (const [CPLList](#) *psList)
- [CPLList](#) [CPL_DLL](#) * [CPLListRemove](#) ([CPLList](#) *psList, int nPosition)
- void [CPL_DLL](#) [CPLListDestroy](#) ([CPLList](#) *psList)
- [CPLList](#) [CPL_DLL](#) * [CPLListGetNext](#) (const [CPLList](#) *psElement)
- void [CPL_DLL](#) * [CPLListGetData](#) (const [CPLList](#) *psElement)

11.5.1 Detailed Description

Simplest list implementation. List contains only pointers to stored objects, not objects itself. All operations regarding allocation and freeing memory for objects should be performed by the caller.

11.5.2 Typedef Documentation

11.5.2.1 typedef typedefCPL_C_START struct _CPLList CPLList

List element structure.

11.5.3 Function Documentation

11.5.3.1 [CPLList](#) [CPL_DLL](#)* [CPLListAppend](#) ([CPLList](#) * *psList*, void * *pData*)

Append an object list and return a pointer to the modified list. If the input list is NULL, then a new list is created.

Parameters

<i>psList</i>	pointer to list head.
<i>pData</i>	pointer to inserted data object. May be NULL.

Returns

pointer to the head of modified list.

11.5.3.2 int CPL_DLL CPLListCount (const CPLList * *psList*)

Return the number of elements in a list.

Parameters

<i>psList</i>	pointer to list head.
---------------	-----------------------

Returns

number of elements in a list.

11.5.3.3 void CPL_DLL CPLListDestroy (CPLList * *psList*)

Destroy a list. Caller responsible for freeing data objects contained in list elements.

Parameters

<i>psList</i>	pointer to list head.
---------------	-----------------------

11.5.3.4 CPLList CPL_DLL* CPLListGet (CPLList * *psList*, int *nPosition*)

Return the pointer to the specified element in a list.

Parameters

<i>psList</i>	pointer to list head.
<i>nPosition</i>	the index of the element in the list, 0 being the first element.

Returns

pointer to the specified element in a list.

11.5.3.5 void CPL_DLL* CPLListGetData (const CPLList * *psElement*)

Return pointer to the data object contained in given list element.

Parameters

<i>psElement</i>	pointer to list element.
------------------	--------------------------

Returns

pointer to the data object contained in given list element.

11.5.3.6 CPLList CPL_DLL* CPLListGetLast (CPLList *const *psList*)

Return the pointer to last element in a list.

Parameters

<i>psList</i>	pointer to list head.
---------------	-----------------------

Returns

pointer to last element in a list.

11.5.3.7 CPLLlist CPL_DLL* CPLLlistGetNext (const CPLLlist * *psElement*)

Return the pointer to next element in a list.

Parameters

<i>psElement</i>	pointer to list element.
------------------	--------------------------

Returns

pointer to the list element preceded by the given element.

11.5.3.8 CPLLlist CPL_DLL* CPLLlistInsert (CPLLlist * *psList*, void * *pData*, int *nPosition*)

Insert an object into list at specified position (zero based). If the input list is NULL, then a new list is created.

Parameters

<i>psList</i>	pointer to list head.
<i>pData</i>	pointer to inserted data object. May be NULL.
<i>nPosition</i>	position number to insert an object.

Returns

pointer to the head of modified list.

11.5.3.9 CPLLlist CPL_DLL* CPLLlistRemove (CPLLlist * *psList*, int *nPosition*)

Remove the element from the specified position (zero based) in a list. Data object contained in removed element must be freed by the caller first.

Parameters

<i>psList</i>	pointer to list head.
<i>nPosition</i>	position number to delete an element.

Returns

pointer to the head of modified list.

11.6 cpl_minixml.h File Reference

```
#include "cpl_port.h"
```

Classes

- struct [CPLXMLNode](#)

Typedefs

- typedef struct [CPLXMLNode](#) [CPLXMLNode](#)

Enumerations

- enum [CPLXMLNodeType](#) {
[CXT_Element](#) = 0, [CXT_Text](#) = 1, [CXT_Attribute](#) = 2, [CXT_Comment](#) = 3,
[CXT_Literal](#) = 4 }

Functions

- [CPLXMLNode](#) [CPL_DLL](#) * [CPLParseXMLString](#) (const char *)
Parse an XML string into tree form.
- void [CPL_DLL](#) [CPLDestroyXMLNode](#) ([CPLXMLNode](#) *)
Destroy a tree.
- [CPLXMLNode](#) [CPL_DLL](#) * [CPLGetXMLNode](#) ([CPLXMLNode](#) *poRoot, const char *pszPath)
Find node by path.
- [CPLXMLNode](#) [CPL_DLL](#) * [CPLSearchXMLNode](#) ([CPLXMLNode](#) *poRoot, const char *pszTarget)
Search for a node in document.
- const char [CPL_DLL](#) * [CPLGetXMLValue](#) ([CPLXMLNode](#) *poRoot, const char *pszPath, const char *psz-Default)
Fetch element/attribute value.
- [CPLXMLNode](#) [CPL_DLL](#) * [CPLCreateXMLNode](#) ([CPLXMLNode](#) *poParent, [CPLXMLNodeType](#) eType, const char *pszText)
Create an document tree item.
- char [CPL_DLL](#) * [CPLSerializeXMLTree](#) (const [CPLXMLNode](#) *psNode)
Convert tree into string document.
- void [CPL_DLL](#) [CPLAddXMLChild](#) ([CPLXMLNode](#) *psParent, [CPLXMLNode](#) *psChild)
Add child node to parent.
- int [CPL_DLL](#) [CPLRemoveXMLChild](#) ([CPLXMLNode](#) *psParent, [CPLXMLNode](#) *psChild)
Remove child node from parent.
- void [CPL_DLL](#) [CPLAddXMLSibling](#) ([CPLXMLNode](#) *psOlderSibling, [CPLXMLNode](#) *psNewSibling)
Add new sibling.
- [CPLXMLNode](#) [CPL_DLL](#) * [CPLCreateXMLElementAndValue](#) ([CPLXMLNode](#) *psParent, const char *psz-Name, const char *pszValue)
Create an element and text value.
- void [CPL_DLL](#) [CPLAddXMLAttributeAndValue](#) ([CPLXMLNode](#) *psParent, const char *pszName, const char *pszValue)
Create an attribute and text value.
- [CPLXMLNode](#) [CPL_DLL](#) * [CPLCloneXMLTree](#) ([CPLXMLNode](#) *psTree)
Copy tree.
- int [CPL_DLL](#) [CPLSetXMLValue](#) ([CPLXMLNode](#) *psRoot, const char *pszPath, const char *pszValue)
Set element value by path.
- void [CPL_DLL](#) [CPLStripXMLNamespace](#) ([CPLXMLNode](#) *psRoot, const char *pszNameSpace, int b-Recurse)
Strip indicated namespaces.
- void [CPL_DLL](#) [CPLCleanXMLElementName](#) (char *)
Make string into safe XML token.
- [CPLXMLNode](#) [CPL_DLL](#) * [CPLParseXMLFile](#) (const char *pszFilename)
Parse XML file into tree.
- int [CPL_DLL](#) [CPLSerializeXMLTreeToFile](#) (const [CPLXMLNode](#) *psTree, const char *pszFilename)
Write document tree to a file.

11.6.1 Detailed Description

Definitions for CPL mini XML Parser/Serializer.

11.6.2 Typedef Documentation

11.6.2.1 typedef struct CPLXMLNode CPLXMLNode

Document node structure.

This C structure is used to hold a single text fragment representing a component of the document when parsed. It should be allocated with the appropriate CPL function, and freed with [CPLDestroyXMLNode\(\)](#). The structure contents should not normally be altered by application code, but may be freely examined by application code.

Using the psChild and psNext pointers, a hierarchical tree structure for a document can be represented as a tree of [CPLXMLNode](#) structures.

11.6.3 Enumeration Type Documentation

11.6.3.1 enum CPLXMLNodeType

XML node type

Enumerator

- CXT_Element** Node is an element
- CXT_Text** Node is a raw text value
- CXT_Attribute** Node is attribute
- CXT_Comment** Node is an XML comment.
- CXT_Literal** Node is a special literal

11.6.4 Function Documentation

11.6.4.1 void CPL_DLL CPLAddXMLAttributeAndValue (CPLXMLNode * psParent, const char * pszName, const char * pszValue)

Create an attribute and text value.

This function is a convenient short form for:

```
* CPLXMLNode *psAttributeNode;
*
* psAttributeNode = CPLCreateXMLNode( psParent, CXT_Attribute, pszName );
* CPLCreateXMLNode( psAttributeNode, CXT_Text, pszValue );
*
```

It creates a CXT_Attribute node, with a CXT_Text child, and attaches the element to the passed parent.

Parameters

<i>psParent</i>	the parent node to which the resulting node should be attached. Must not be NULL.
<i>pszName</i>	the attribute name to create.
<i>pszValue</i>	the text to attach to the attribute. Must not be NULL.

Since

GDAL 2.0

11.6.4.2 void CPL_DLL CPLAddXMLChild (CPLXMLNode * *psParent*, CPLXMLNode * *psChild*)

Add child node to parent.

The passed child is added to the list of children of the indicated parent. Normally the child is added at the end of the parents child list, but attributes (CXT_Attribute) will be inserted after any other attributes but before any other element type. Ownership of the child node is effectively assumed by the parent node. If the child has siblings (its psNext is not NULL) they will be trimmed, but if the child has children they are carried with it.

Parameters

<i>psParent</i>	the node to attach the child to. May not be NULL.
<i>psChild</i>	the child to add to the parent. May not be NULL. Should not be a child of any other parent.

11.6.4.3 void CPL_DLL CPLAddXMLSibling (CPLXMLNode * *psOlderSibling*, CPLXMLNode * *psNewSibling*)

Add new sibling.

The passed psNewSibling is added to the end of siblings of the psOlderSibling node. That is, it is added to the end of the psNext chain. There is no special handling if psNewSibling is an attribute. If this is required, use [CPLAddXMLChild\(\)](#).

Parameters

<i>psOlderSibling</i>	the node to attach the sibling after.
<i>psNewSibling</i>	the node to add at the end of psOlderSiblings psNext chain.

11.6.4.4 void CPL_DLL CPLCleanXMLElementName (char * *pszTarget*)

Make string into safe XML token.

Modifies a string in place to try and make it into a legal XML token that can be used as an element name. This is accomplished by changing any characters not legal in a token into an underscore.

NOTE: This function should implement the rules in section 2.3 of <http://www.w3.org/TR/xml11/> but it doesn't yet do that properly. We only do a rough approximation of that.

Parameters

<i>pszTarget</i>	the string to be adjusted. It is altered in place.
------------------	--

11.6.4.5 CPLXMLNode CPL_DLL* CPLCloneXMLTree (CPLXMLNode * *psTree*)

Copy tree.

Creates a deep copy of a [CPLXMLNode](#) tree.

Parameters

<i>psTree</i>	the tree to duplicate.
---------------	------------------------

Returns

a copy of the whole tree.

11.6.4.6 **CPLXMLNode CPL_DLL* CPLCreateXMLElementAndValue (CPLXMLNode * *psParent*, const char * *pszName*, const char * *pszValue*)**

Create an element and text value.

This is function is a convenient short form for:

```
*   CPLXMLNode *psTextNode;
*   CPLXMLNode *psElementNode;
*
*   psElementNode = CPLCreateXMLNode( psParent, CXT_Element, pszName );
*   psTextNode = CPLCreateXMLNode( psElementNode, CXT_Text, pszValue );
*
*   return psElementNode;
*
```

It creates a CXT_Element node, with a CXT_Text child, and attaches the element to the passed parent.

Parameters

<i>psParent</i>	the parent node to which the resulting node should be attached. May be NULL to keep as freestanding.
<i>pszName</i>	the element name to create.
<i>pszValue</i>	the text to attach to the element. Must not be NULL.

Returns

the pointer to the new element node.

11.6.4.7 **CPLXMLNode CPL_DLL* CPLCreateXMLNode (CPLXMLNode * *poParent*, CPLXMLNodeType *eType*, const char * *pszText*)**

Create an document tree item.

Create a single [CPLXMLNode](#) object with the desired value and type, and attach it as a child of the indicated parent.

Parameters

<i>poParent</i>	the parent to which this node should be attached as a child. May be NULL to keep as free standing.
<i>eType</i>	the type of the newly created node
<i>pszText</i>	the value of the newly created node

Returns

the newly created node, now owned by the caller (or parent node).

11.6.4.8 **void CPL_DLL CPLDestroyXMLNode (CPLXMLNode * *psNode*)**

Destroy a tree.

This function frees resources associated with a [CPLXMLNode](#) and all its children nodes.

Parameters

<i>psNode</i>	the tree to free.
---------------	-------------------

11.6.4.9 CPLXMLNode CPL_DLL* CPLGetXMLNode (CPLXMLNode * *psRoot*, const char * *pszPath*)

Find node by path.

Searches the document or subdocument indicated by *psRoot* for an element (or attribute) with the given path. The path should consist of a set of element names separated by dots, not including the name of the root element (*psRoot*). If the requested element is not found NULL is returned.

Attribute names may only appear as the last item in the path.

The search is done from the root nodes children, but all intermediate nodes in the path must be specified. Searching for "name" would only find a name element or attribute if it is a direct child of the root, not at any level in the subdocument.

If the *pszPath* is prefixed by "=" then the search will begin with the root node, and its siblings, instead of the root nodes children. This is particularly useful when searching within a whole document which is often prefixed by one or more "junk" nodes like the <?xml> declaration.

Parameters

<i>psRoot</i>	the subtree in which to search. This should be a node of type CXT_Element. NULL is safe.
<i>pszPath</i>	the list of element names in the path (dot separated).

Returns

the requested element node, or NULL if not found.

11.6.4.10 const char CPL_DLL* CPLGetXMLValue (CPLXMLNode * *psRoot*, const char * *pszPath*, const char * *pszDefault*)

Fetch element/attribute value.

Searches the document for the element/attribute value associated with the path. The corresponding node is internally found with [CPLGetXMLNode\(\)](#) (see there for details on path handling). Once found, the value is considered to be the first CXT_Text child of the node.

If the attribute/element search fails, or if the found node has no value then the passed default value is returned.

The returned value points to memory within the document tree, and should not be altered or freed.

Parameters

<i>psRoot</i>	the subtree in which to search. This should be a node of type CXT_Element. NULL is safe.
<i>pszPath</i>	the list of element names in the path (dot separated). An empty path means get the value of the <i>psRoot</i> node.
<i>pszDefault</i>	the value to return if a corresponding value is not found, may be NULL.

Returns

the requested value or *pszDefault* if not found.

11.6.4.11 CPLXMLNode CPL_DLL* CPLParseXMLFile (const char * *pszFilename*)

Parse XML file into tree.

The named file is opened, loaded into memory as a big string, and parsed with [CPLParseXMLString\(\)](#). Errors in reading the file or parsing the XML will be reported by [CPL_Error\(\)](#).

The "large file" API is used, so XML files can come from virtualized files.

Parameters

<i>pszFilename</i>	the file to open.
--------------------	-------------------

Returns

NULL on failure, or the document tree on success.

11.6.4.12 `CPLXMLNode CPL_DLL* CPLParseXMLString (const char * pszString)`

Parse an XML string into tree form.

The passed document is parsed into a [CPLXMLNode](#) tree representation. If the document is not well formed XML then NULL is returned, and errors are reported via `CPL_Error()`. No validation beyond wellformedness is done. The [CPLParseXMLFile\(\)](#) convenience function can be used to parse from a file.

The returned document tree is owned by the caller and should be freed with [CPL_DestroyXMLNode\(\)](#) when no longer needed.

If the document has more than one "root level" element then those after the first will be attached to the first as siblings (via the `psNext` pointers) even though there is no common parent. A document with no XML structure (no angle brackets for instance) would be considered well formed, and returned as a single `CXT_Text` node.

Parameters

<i>pszString</i>	the document to parse.
------------------	------------------------

Returns

parsed tree or NULL on error.

11.6.4.13 `int CPL_DLL CPLRemoveXMLChild (CPLXMLNode * psParent, CPLXMLNode * psChild)`

Remove child node from parent.

The passed child is removed from the child list of the passed parent, but the child is not destroyed. The child retains ownership of its own children, but is cleanly removed from the child list of the parent.

Parameters

<i>psParent</i>	the node to the child is attached to.
<i>psChild</i>	the child to remove.

Returns

TRUE on success or FALSE if the child was not found.

11.6.4.14 `CPLXMLNode CPL_DLL* CPLSearchXMLNode (CPLXMLNode * psRoot, const char * pszElement)`

Search for a node in document.

Searches the children (and potentially siblings) of the documented passed in for the named element or attribute. To search following siblings as well as children, prefix the `pszElement` name with an equal sign. This function does an in-order traversal of the document tree. So it will first match against the current node, then its first child, that child's first child, and so on.

Use [CPL_GetXMLNode\(\)](#) to find a specific child, or along a specific node path.

Parameters

<i>psRoot</i>	the subtree to search. This should be a node of type CXT_Element. NULL is safe.
<i>pszElement</i>	the name of the element or attribute to search for.

Returns

The matching node or NULL on failure.

11.6.4.15 char CPL_DLL* CPLSerializeXMLTree (const CPLXMLNode * *psNode*)

Convert tree into string document.

This function converts a [CPLXMLNode](#) tree representation of a document into a flat string representation. White space indentation is used visually preserve the tree structure of the document. The returned document becomes owned by the caller and should be freed with [CPLFree\(\)](#) when no longer needed.

Parameters

<i>psNode</i>	the node to serialize.
---------------	------------------------

Returns

the document on success or NULL on failure.

11.6.4.16 int CPL_DLL CPLSerializeXMLTreeToFile (const CPLXMLNode * *psTree*, const char * *pszFilename*)

Write document tree to a file.

The passed document tree is converted into one big string (with [CPLSerializeXMLTree\(\)](#)) and then written to the named file. Errors writing the file will be reported by [CPLError\(\)](#). The source document tree is not altered. If the output file already exists it will be overwritten.

Parameters

<i>psTree</i>	the document tree to write.
<i>pszFilename</i>	the name of the file to write to.

Returns

TRUE on success, FALSE otherwise.

11.6.4.17 int CPL_DLL CPLSetXMLValue (CPLXMLNode * *psRoot*, const char * *pszPath*, const char * *pszValue*)

Set element value by path.

Find (or create) the target element or attribute specified in the path, and assign it the indicated value.

Any path elements that do not already exist will be created. The target nodes value (the first CXT_Text child) will be replaced with the provided value.

If the target node is an attribute instead of an element, the name should be prefixed with a #.

Example: `CPLSetXMLValue("Citation.Id.Description", "DOQ dataset"); CPLSetXMLValue("Citation.Id.-Description.#name", "doq");`

Parameters

<i>psRoot</i>	the subdocument to be updated.
<i>pszPath</i>	the dot separated path to the target element/attribute.
<i>pszValue</i>	the text value to assign.

Returns

TRUE on success.

11.6.4.18 void CPL_DLL CPLStripXMLNamespace (CPLXMLNode * *psRoot*, const char * *pszNamespace*, int *bRecurse*)

Strip indicated namespaces.

The subdocument (*psRoot*) is recursively examined, and any elements with the indicated namespace prefix will have the namespace prefix stripped from the element names. If the passed namespace is NULL, then all namespace prefixes will be stripped.

Nodes other than elements should remain unaffected. The changes are made "in place", and should not alter any node locations, only the *pszValue* field of affected nodes.

Parameters

<i>psRoot</i>	the document to operate on.
<i>pszNamespace</i>	the name space prefix (not including colon), or NULL.
<i>bRecurse</i>	TRUE to recurse over whole document, or FALSE to only operate on the passed node.

11.7 cpl_odbc.h File Reference

```
#include "cpl_port.h"
#include <sql.h>
#include <sqlext.h>
#include <odbcinst.h>
#include "cpl_string.h"
```

Classes

- class [CPLODBCDriverInstaller](#)
- class [CPLODBCSession](#)
- class [CPLODBCStatement](#)

11.7.1 Detailed Description

ODBC Abstraction Layer (C++).

11.8 cpl_port.h File Reference

```
#include "cpl_config.h"
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
#include <stdarg.h>
#include <string.h>
#include <ctype.h>
#include <limits.h>
#include <time.h>
#include <errno.h>
#include <locale.h>
#include <strings.h>
```

Macros

- #define [GINTBIG_MIN](#) (((GIntBig)(0x80000000) << 32)
- #define [GINTBIG_MAX](#) (((GIntBig)(0x7FFFFFFF) << 32) | 0xFFFFFFFFU)
- #define [GUINTBIG_MAX](#) (((GUIntBig)(0xFFFFFFFFU) << 32) | 0xFFFFFFFFU)
- #define [GINT64_MIN](#) GINTBIG_MIN
- #define [GINT64_MAX](#) GINTBIG_MAX
- #define [GUINT64_MAX](#) GUINTBIG_MAX
- #define [CPL_FRMT_GB_WITHOUT_PREFIX](#) "l"
- #define [CPL_FRMT_GIB](#) "%" CPL_FRMT_GB_WITHOUT_PREFIX "d"
- #define [CPL_FRMT_GUIB](#) "%" CPL_FRMT_GB_WITHOUT_PREFIX "u"
- #define [MIN](#)(a, b) (((a)<(b)) ? (a) : (b))
- #define [MAX](#)(a, b) (((a)>(b)) ? (a) : (b))
- #define [ABS](#)(x) (((x)<0) ? (-1*(x)) : (x))
- #define [M_PI](#) 3.14159265358979323846
- #define [STRCASECMP](#)(a, b) (strcasecmp(a,b))
- #define [STRNCASECMP](#)(a, b, n) (strncasecmp(a,b,n))
- #define [EQUALN](#)(a, b, n) (STRNCASECMP(a,b,n)==0)
- #define [EQUAL](#)(a, b) (STRCASECMP(a,b)==0)
- #define [STARTS_WITH](#)(a, b) (strncmp(a,b,strlen(b)) == 0)
- #define [STARTS_WITH_CI](#)(a, b) EQUALN(a,b,strlen(b))
- #define [CPLIsNan](#)(x) isnan(x)
- #define [CPL_SWAP16](#)(x) ((GUInt16)((GUInt16)(x) << 8) | ((GUInt16)(x) >> 8))
- #define [CPL_SWAP32](#)(x)
- #define [CPL_SWAP64](#)(x)
- #define [CPL_SWAP16PTR](#)(x)
- #define [CPL_SWAP32PTR](#)(x)
- #define [CPL_SWAP64PTR](#)(x)
- #define [CPL_SWAPDOUBLE](#)(p) CPL_SWAP64PTR(p)
- #define [CPL_LSBWORD16](#)(x) (x)
- #define [CPL_MSBWORD16](#)(x) CPL_SWAP16(x)
- #define [CPL_LSBWORD32](#)(x) (x)
- #define [CPL_MSBWORD32](#)(x) CPL_SWAP32(x)
- #define [CPL_LSBPTR16](#)(x) CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*(x)) == 1 || sizeof(*(x)) == 2)
- #define [CPL_MSBPTR16](#)(x) CPL_SWAP16PTR(x)
- #define [CPL_LSBPTR32](#)(x) CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*(x)) == 1 || sizeof(*(x)) == 4)
- #define [CPL_MSBPTR32](#)(x) CPL_SWAP32PTR(x)
- #define [CPL_LSBPTR64](#)(x) CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*(x)) == 1 || sizeof(*(x)) == 8)
- #define [CPL_MSBPTR64](#)(x) CPL_SWAP64PTR(x)

- #define `CPL_LSBINT16PTR(x)` (`((*(GByte*)(x)) | (*((GByte*)(x))+1) << 8)`)
- #define `CPL_LSBINT32PTR(x)`
- #define `CPL_LSBSINT16PTR(x)` (`((GInt16) CPL_LSBINT16PTR(x))`)
- #define `CPL_LSBUINT16PTR(x)` (`((GUInt16)CPL_LSBINT16PTR(x))`)
- #define `CPL_LSBSINT32PTR(x)` (`((GInt32) CPL_LSBINT32PTR(x))`)
- #define `CPL_LSBUINT32PTR(x)` (`((GUInt32)CPL_LSBINT32PTR(x))`)
- #define `CPL_NULL_TERMINATED`
- #define `CPL_PRINT_FUNC_FORMAT(format_idx, arg_idx)`
- #define `CPL_SCAN_FUNC_FORMAT(format_idx, arg_idx)`
- #define `CPL_FORMAT_STRING(arg) arg`
- #define `CPL_SCANF_FORMAT_STRING(arg) arg`
- #define `CPL_WARN_UNUSED_RESULT`
- #define `CPL_UNUSED`
- #define `CPL_NO_RETURN`
- #define `CPL_RETURNS_NONNULL`
- #define `CPL_RESTRICT`
- #define `CPL_FALLTHROUGH`

Typedefs

- typedef int `GInt32`
- typedef unsigned int `GUInt32`
- typedef short `GInt16`
- typedef unsigned short `GUInt16`
- typedef unsigned char `GByte`
- typedef int `GBool`
- typedef long long `GIntBig`
- typedef unsigned long long `GUIntBig`
- typedef `GIntBig GInt64`
- typedef `GUIntBig GUInt64`
- typedef `GIntBig GPtrDiff_t`

11.8.1 Detailed Description

Core portability definitions for CPL.

11.8.2 Macro Definition Documentation

11.8.2.1 #define `ABS(x)` (`((x)<0) ? (-1*(x)) : (x)`)

Macro to compute the absolute value

11.8.2.2 #define `CPL_FALLTHROUGH`

Macro for fallthrough in a switch case construct

11.8.2.3 #define `CPL_FORMAT_STRING(arg) arg`

Macro into which to wrap the format argument of a printf-like function

11.8.2.4 `#define CPL_FRMT_GB_WITHOUT_PREFIX "l"`

Printf formatting suffix for GIntBig

11.8.2.5 `#define CPL_FRMT_GIB "%" CPL_FRMT_GB_WITHOUT_PREFIX "d"`

Printf formatting for GIntBig

11.8.2.6 `#define CPL_FRMT_GUIB "%" CPL_FRMT_GB_WITHOUT_PREFIX "u"`

Printf formatting for GUIntBig

11.8.2.7 `#define CPL_LSBINT16PTR(x) (((GByte*)(x)) | (((GByte*)(x))+1) << 8))`

Return a Int16 from the 2 bytes ordered in LSB order at address x.

Deprecated Use rather CPL_LSBSINT16PTR or CPL_LSBUINT16PTR for explicit signedness.

11.8.2.8 `#define CPL_LSBINT32PTR(x)`

Value:

```
((*(GByte*)(x)) | (*((GByte*)(x))+1) << 8) | \
      (*((GByte*)(x))+2) << 16) | (*((GByte*)(x))+3) << 24))
```

Return a Int32 from the 4 bytes ordered in LSB order at address x.

Deprecated Use rather CPL_LSBSINT32PTR or CPL_LSBUINT32PTR for explicit signedness.

11.8.2.9 `#define CPL_LSBPTR16(x) CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*(x)) == 1 || sizeof(*(x)) == 2)`

Byte-swap if necessary a 16bit word at the location pointed from a originally LSB ordered pointer

11.8.2.10 `#define CPL_LSBPTR32(x) CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*(x)) == 1 || sizeof(*(x)) == 4)`

Byte-swap if necessary a 32bit word at the location pointed from a originally LSB ordered pointer

11.8.2.11 `#define CPL_LSBPTR64(x) CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*(x)) == 1 || sizeof(*(x)) == 8)`

Byte-swap if necessary a 64bit word at the location pointed from a originally LSB ordered pointer

11.8.2.12 `#define CPL_LSBSINT16PTR(x) ((GInt16) CPL_LSBINT16PTR(x))`

Return a signed Int16 from the 2 bytes ordered in LSB order at address x

11.8.2.13 `#define CPL_LSBSINT32PTR(x) ((GInt32) CPL_LSBINT32PTR(x))`

Return a signed Int32 from the 4 bytes ordered in LSB order at address x

11.8.2.14 `#define CPL_LSBUINT16PTR(x)((GUInt16)CPL_LSBINT16PTR(x))`

Return a unsigned Int16 from the 2 bytes ordered in LSB order at address x

11.8.2.15 `#define CPL_LSBUINT32PTR(x)((GUInt32)CPL_LSBINT32PTR(x))`

Return a unsigned Int32 from the 4 bytes ordered in LSB order at address x

11.8.2.16 `#define CPL_LSBWORD16(x)(x)`

Return a 16bit word from a originally LSB ordered word

11.8.2.17 `#define CPL_LSBWORD32(x)(x)`

Return a 32bit word from a originally LSB ordered word

11.8.2.18 `#define CPL_MSBPTR16(x) CPL_SWAP16PTR(x)`

Byte-swap if necessary a 16bit word at the location pointed from a originally MSB ordered pointer

11.8.2.19 `#define CPL_MSBPTR32(x) CPL_SWAP32PTR(x)`

Byte-swap if necessary a 32bit word at the location pointed from a originally MSB ordered pointer

11.8.2.20 `#define CPL_MSBPTR64(x) CPL_SWAP64PTR(x)`

Byte-swap if necessary a 64bit word at the location pointed from a originally MSB ordered pointer

11.8.2.21 `#define CPL_MSBWORD16(x) CPL_SWAP16(x)`

Return a 16bit word from a originally MSB ordered word

11.8.2.22 `#define CPL_MSBWORD32(x) CPL_SWAP32(x)`

Return a 32bit word from a originally MSB ordered word

11.8.2.23 `#define CPL_NO_RETURN`

Qualifier for a function that does not return at all (terminates the process)

11.8.2.24 `#define CPL_NULL_TERMINATED`

Null terminated variadic

11.8.2.25 `#define CPL_PRINT_FUNC_FORMAT(format_idx, arg_idx)`

Tag a function to have printf() formatting

11.8.2.26 #define CPL_RESTRICT

restrict keyword to declare that pointers do not alias

11.8.2.27 #define CPL_RETURNS_NONNULL

Qualifier for a function that does not return NULL

11.8.2.28 #define CPL_SCAN_FUNC_FORMAT(*format_idx*, *arg_idx*)

Tag a function to have scanf() formatting

11.8.2.29 #define CPL_SCANF_FORMAT_STRING(*arg*) *arg*

Macro into which to wrap the format argument of a sscanf-like function.

11.8.2.30 #define CPL_SWAP16(*x*) ((GUInt16)((GUInt16)(*x*) << 8) | ((GUInt16)(*x*) >> 8))

Byte-swap a 16bit unsigned integer

11.8.2.31 #define CPL_SWAP16PTR(*x*)

Value:

```
{
    GByte      byTemp, *_pabyDataT = (GByte *) (x);
    CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*x) == 1 || sizeof(*x) == 2); \
    byTemp = _pabyDataT[0];
    _pabyDataT[0] = _pabyDataT[1];
    _pabyDataT[1] = byTemp;
}
```

Byte-swap a 16 bit pointer

11.8.2.32 #define CPL_SWAP32(*x*)

Value:

```
((GUInt32) ( \
    (((GUInt32)(x) & (GUInt32)0x000000ffUL) << 24) | \
    (((GUInt32)(x) & (GUInt32)0x0000ff00UL) << 8) | \
    (((GUInt32)(x) & (GUInt32)0x00ff0000UL) >> 8) | \
    (((GUInt32)(x) & (GUInt32)0xff000000UL) >> 24) ))
```

Byte-swap a 32bit unsigned integer

11.8.2.33 #define CPL_SWAP32PTR(*x*)

Value:

```
{
    GByte      byTemp, *_pabyDataT = (GByte *) (x);
    CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*x) == 1 || sizeof(*x) == 4); \
    byTemp = _pabyDataT[0];
    _pabyDataT[0] = _pabyDataT[3];
    _pabyDataT[3] = byTemp;
}
```

```

    byTemp = _pabyDataT[1];
    _pabyDataT[1] = _pabyDataT[2];
    _pabyDataT[2] = byTemp;
}

```

Byte-swap a 32 bit pointer

11.8.2.34 #define CPL_SWAP64(x)

Value:

```

(((GUInt64) (CPL_SWAP32((GUInt32) (x))) << 32) | \
 (GUInt64) (CPL_SWAP32((GUInt32) ((GUInt64) (x) >> 32))))

```

Byte-swap a 64bit unsigned integer

11.8.2.35 #define CPL_SWAP64PTR(x)

Value:

```

{
    GByte      byTemp, *_pabyDataT = (GByte *) (x);
    CPL_STATIC_ASSERT_IF_AVAILABLE(sizeof(*x) == 1 || sizeof(*x) == 8); \

    byTemp = _pabyDataT[0];
    _pabyDataT[0] = _pabyDataT[7];
    _pabyDataT[7] = byTemp;
    byTemp = _pabyDataT[1];
    _pabyDataT[1] = _pabyDataT[6];
    _pabyDataT[6] = byTemp;
    byTemp = _pabyDataT[2];
    _pabyDataT[2] = _pabyDataT[5];
    _pabyDataT[5] = byTemp;
    byTemp = _pabyDataT[3];
    _pabyDataT[3] = _pabyDataT[4];
    _pabyDataT[4] = byTemp;
}

```

Byte-swap a 64 bit pointer

11.8.2.36 #define CPL_SWAPDOUBLE(p) CPL_SWAP64PTR(p)

Byte-swap a 64 bit pointer

11.8.2.37 #define CPL_UNUSED

Qualifier for an argument that is unused

11.8.2.38 char CPL_DLL CPL_WARN_UNUSED_RESULT

Qualifier to warn when the return value of a function is not used

11.8.2.39 #define CPLIsNan(x) isnan(x)

Return whether a floating-point number is NaN

11.8.2.40 #define EQUAL(a, b) (STRCASECMP(a,b)==0)

Alias for strcasecmp() == 0

11.8.2.41 `#define EQUALN(a, b, n)(STRNCASECMP(a,b,n)==0)`

Alias for `strncasecmp()` == 0

11.8.2.42 `#define GINT64_MAX GINTBIG_MAX`

Maximum `GInt64` value

11.8.2.43 `#define GINT64_MIN GINTBIG_MIN`

Minimum `GInt64` value

11.8.2.44 `#define GINTBIG_MAX (((GIntBig)(0x7FFFFFFF) << 32) | 0xFFFFFFFFU)`

Maximum `GIntBig` value

11.8.2.45 `#define GINTBIG_MIN ((GIntBig)(0x80000000) << 32)`

Minimum `GIntBig` value

11.8.2.46 `#define GUINT64_MAX GUINTBIG_MAX`

Minimum `GUInt64` value

11.8.2.47 `#define GUINTBIG_MAX (((GUIntBig)(0xFFFFFFFFU) << 32) | 0xFFFFFFFFFU)`

Maximum `GUIntBig` value

11.8.2.48 `#define M_PI 3.14159265358979323846`

PI definition

11.8.2.49 `#define MAX(a, b)(((a)>(b)) ? (a) : (b))`

Macro to compute the maximum of 2 values

11.8.2.50 `#define MIN(a, b)(((a)<(b)) ? (a) : (b))`

Macro to compute the minimum of 2 values

11.8.2.51 `#define STARTS_WITH(a, b) (strcmp(a,b,strlen(b)) == 0)`

Returns whether a starts with b

11.8.2.52 `#define STARTS_WITH_CI(a, b) EQUALN(a,b,strlen(b))`

Returns whether a starts with b (case insensitive comparison)

11.8.2.53 `#define STRCASECMP(a, b) (strcasemp(a,b))`

Alias for `strcasemp()`

11.8.2.54 `#define STRNCASECMP(a, b, n) (strncasemp(a,b,n))`

Alias for `strncasemp()`

11.8.3 Typedef Documentation

11.8.3.1 `typedef int GBool`

Type for boolean values (alias to `int`)

11.8.3.2 `typedef unsigned char GByte`

Unsigned byte type

11.8.3.3 `typedef short GInt16`

Int16 type

11.8.3.4 `typedef int GInt32`

Int32 type

11.8.3.5 `typedef GIntBig GInt64`

Signed 64 bit integer type

11.8.3.6 `typedef long long GIntBig`

Large signed integer type (generally 64-bit integer type). Use `GInt64` when exactly 64 bit is needed

11.8.3.7 `typedef GIntBig GPtrDiff_t`

Integer type large enough to hold the difference between 2 addresses

11.8.3.8 `typedef unsigned short GUInt16`

Unsigned int16 type

11.8.3.9 `typedef unsigned int GUInt32`

Unsigned int32 type

11.8.3.10 `typedef GUIntBig GUInt64`

Unsigned 64 bit integer type

11.8.3.11 typedef unsigned long long GUIntBig

Large unsigned integer type (generally 64-bit unsigned integer type). Use GUInt64 when exactly 64 bit is needed

11.9 cpl_quad_tree.h File Reference

```
#include "cpl_port.h"
```

Classes

- struct [CPLRectObj](#)

Typedefs

- typedef struct [_CPLQuadTree](#) [CPLQuadTree](#)
- typedef void(* [CPLQuadTreeGetBoundsFunc](#))(const void *hFeature, [CPLRectObj](#) *pBounds)
- typedef int(* [CPLQuadTreeForeachFunc](#))(void *pElt, void *pUserData)
- typedef void(* [CPLQuadTreeDumpFeatureFunc](#))(const void *hFeature, int nIndentLevel, void *pUserData)

Functions

- [CPLQuadTree](#) [CPL_DLL](#) * [CPLQuadTreeCreate](#) (const [CPLRectObj](#) *pGlobalBounds, [CPLQuadTreeGetBoundsFunc](#) pfnGetBounds)
- void [CPL_DLL](#) [CPLQuadTreeDestroy](#) ([CPLQuadTree](#) *hQuadtree)
- void [CPL_DLL](#) [CPLQuadTreeSetBucketCapacity](#) ([CPLQuadTree](#) *hQuadtree, int nBucketCapacity)
- int [CPL_DLL](#) [CPLQuadTreeGetAdvisedMaxDepth](#) (int nExpectedFeatures)
- void [CPL_DLL](#) [CPLQuadTreeSetMaxDepth](#) ([CPLQuadTree](#) *hQuadtree, int nMaxDepth)
- void [CPL_DLL](#) [CPLQuadTreeInsert](#) ([CPLQuadTree](#) *hQuadtree, void *hFeature)
- void [CPL_DLL](#) [CPLQuadTreeInsertWithBounds](#) ([CPLQuadTree](#) *hQuadtree, void *hFeature, const [CPLRectObj](#) *psBounds)
- void [CPL_DLL](#) ** [CPLQuadTreeSearch](#) (const [CPLQuadTree](#) *hQuadtree, const [CPLRectObj](#) *pAoi, int *pnFeatureCount)
- void [CPL_DLL](#) [CPLQuadTreeForeach](#) (const [CPLQuadTree](#) *hQuadtree, [CPLQuadTreeForeachFunc](#) pfnForeach, void *pUserData)
- void [CPL_DLL](#) [CPLQuadTreeDump](#) (const [CPLQuadTree](#) *hQuadtree, [CPLQuadTreeDumpFeatureFunc](#) pfnDumpFeatureFunc, void *pUserData)
- void [CPL_DLL](#) [CPLQuadTreeGetStats](#) (const [CPLQuadTree](#) *hQuadtree, int *pnFeatureCount, int *pnNodeCount, int *pnMaxDepth, int *pnMaxBucketCapacity)

11.9.1 Detailed Description

Quad tree implementation.

A quadtree is a tree data structure in which each internal node has up to four children. Quadtrees are most often used to partition a two dimensional space by recursively subdividing it into four quadrants or regions

11.9.2 Typedef Documentation

11.9.2.1 typedef struct [_CPLQuadTree](#) [CPLQuadTree](#)

Opaque type for a quad tree

11.9.2.2 `typedef void(* CPLQuadTreeDumpFeatureFunc)(const void *hFeature, int nIndentLevel, void *pUserData)`

CPLQuadTreeDumpFeatureFunc

11.9.2.3 `typedef int(* CPLQuadTreeForeachFunc)(void *pElt, void *pUserData)`

CPLQuadTreeForeachFunc

11.9.2.4 `typedef void(* CPLQuadTreeGetBoundsFunc)(const void *hFeature, CPLRectObj *pBounds)`

CPLQuadTreeGetBoundsFunc

11.9.3 Function Documentation

11.9.3.1 `CPL_DLL* CPLQuadTreeCreate (const CPLRectObj * pGlobalBounds, CPLQuadTreeGetBoundsFunc pfnGetBounds)`

Create a new quadtree

Parameters

<i>pGlobalBounds</i>	a pointer to the global extent of all the elements that will be inserted
<i>pfnGetBounds</i>	a user provided function to get the bounding box of the inserted elements. If it is set to NULL, then CPLQuadTreeInsertWithBounds() must be used, and extra memory will be used to keep features bounds in the quad tree.

Returns

a newly allocated quadtree

11.9.3.2 `void CPL_DLL CPLQuadTreeDestroy (CPLQuadTree * hQuadTree)`

Destroy a quadtree

Parameters

<i>hQuadTree</i>	the quad tree to destroy
------------------	--------------------------

11.9.3.3 `void CPL_DLL CPLQuadTreeDump (const CPLQuadTree * hQuadTree, CPLQuadTreeDumpFeatureFunc pfnDumpFeatureFunc, void * pUserData)`

Dump quad tree

11.9.3.4 `void CPL_DLL CPLQuadTreeForeach (const CPLQuadTree * hQuadTree, CPLQuadTreeForeachFunc pfnForeach, void * pUserData)`

Walk through the quadtree and runs the provided function on all the elements

This function is provided with the user_data argument of pfnForeach. It must return TRUE to go on the walk through the hash set, or FALSE to make it stop.

Note : the structure of the quadtree must *NOT* be modified during the walk.

Parameters

<i>hQuadTree</i>	the quad tree
<i>pfnForeach</i>	the function called on each element.
<i>pUserData</i>	the user data provided to the function.

11.9.3.5 int CPL_DLL CPLQuadTreeGetAdvisedMaxDepth (int *nExpectedFeatures*)

Returns the optimal depth of a quadtree to hold *nExpectedFeatures*

Parameters

<i>nExpectedFeatures</i>	the expected maximum number of elements to be inserted.
--------------------------	---

Returns

the optimal depth of a quadtree to hold *nExpectedFeatures*

11.9.3.6 void CPL_DLL CPLQuadTreeGetStats (const CPLQuadTree * *hQuadTree*, int * *pnFeatureCount*, int * *pnNodeCount*, int * *pnMaxDepth*, int * *pnMaxBucketCapacity*)

Get stats

11.9.3.7 void CPL_DLL CPLQuadTreeInsert (CPLQuadTree * *hQuadTree*, void * *hFeature*)

Insert a feature into a quadtree

Parameters

<i>hQuadTree</i>	the quad tree
<i>hFeature</i>	the feature to insert

11.9.3.8 void CPL_DLL CPLQuadTreeInsertWithBounds (CPLQuadTree * *hQuadTree*, void * *hFeature*, const CPLRectObj * *psBounds*)

Insert a feature into a quadtree

Parameters

<i>hQuadTree</i>	the quad tree
<i>hFeature</i>	the feature to insert
<i>psBounds</i>	bounds of the feature

11.9.3.9 void CPL_DLL** CPLQuadTreeSearch (const CPLQuadTree * *hQuadTree*, const CPLRectObj * *pAoi*, int * *pnFeatureCount*)

Returns all the elements inserted whose bounding box intersects the provided area of interest

Parameters

<i>hQuadTree</i>	the quad tree
<i>pAoi</i>	the pointer to the area of interest
<i>pnFeatureCount</i>	the user data provided to the function.

Returns

an array of features that must be freed with CPLFree

11.9.3.10 void CPL_DLL CPLQuadTreeSetBucketCapacity (CPLQuadTree * *hQuadTree*, int *nBucketCapacity*)

Set the maximum capacity of a node of a quadtree. The default value is 8. Note that the maximum capacity will only be honoured if the features inserted have a point geometry. Otherwise it may be exceeded.

Parameters

<i>hQuadTree</i>	the quad tree
<i>nBucketCapacity</i>	the maximum capacity of a node of a quadtree

11.9.3.11 void CPL_DLL CPLQuadTreeSetMaxDepth (CPLQuadTree * *hQuadTree*, int *nMaxDepth*)

Set the maximum depth of a quadtree. By default, quad trees have no maximum depth, but a maximum bucket capacity.

Parameters

<i>hQuadTree</i>	the quad tree
<i>nMaxDepth</i>	the maximum depth allowed

11.10 cpl_string.h File Reference

```
#include "cpl_error.h"
#include "cpl_conv.h"
#include "cpl_vsi.h"
```

Macros

- #define CSLT_HONOURSTRINGS 0x0001
- #define CSLT_ALLOWEMPTYTOKENS 0x0002
- #define CSLT_PRESERVEQUOTES 0x0004
- #define CSLT_PRESERVEESCAPES 0x0008
- #define CSLT_STRIPLEADSPACES 0x0010
- #define CSLT_STRIPENDSPACES 0x0020
- #define CPLES_BackslashQuotable 0
- #define CPLES_XML 1
- #define CPLES_URL 2
- #define CPLES_SQL 3
- #define CPLES_CSV 4
- #define CPLES_XML_BUT_QUOTES 5
- #define CPL_ENC_LOCALE ""
- #define CPL_ENC_UTF8 "UTF-8"
- #define CPL_ENC_UTF16 "UTF-16"

- #define `CPL_ENC_UCS2` "UCS-2"
- #define `CPL_ENC_UCS4` "UCS-4"
- #define `CPL_ENC_ASCII` "ASCII"
- #define `CPL_ENC_ISO8859_1` "ISO-8859-1"

Enumerations

- enum `CPLValueType` { `CPL_VALUE_STRING`, `CPL_VALUE_REAL`, `CPL_VALUE_INTEGER` }

Functions

- `CPL_C_START` char `CPL_DLL` ** `CSLAddString` (char **papszStrList, const char *pszNewString) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` ** `CSLAddStringMayFail` (char **papszStrList, const char *pszNewString) `CPL_WARN_UNUSED_RESULT`
- const char `CPL_DLL` * `CSLGetField` (char **, int)
- void `CPL_DLL` `CPL_STDCALL` `CSLDestroy` (char **papszStrList)
- char `CPL_DLL` ** `CSLDuplicate` (char **papszStrList) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` ** `CSLMerge` (char **papszOrig, char **papszOverride) `CPL_WARN_UNUSED_RESULT`
Merge two lists.
- char `CPL_DLL` ** `CSLTokenizeString` (const char *pszString) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` ** `CSLTokenizeStringComplex` (const char *pszString, const char *pszDelimiter, int bHonourStrings, int bAllowEmptyTokens) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` ** `CSLTokenizeString2` (const char *pszString, const char *pszDelimiter, int nCSLFlags) `CPL_WARN_UNUSED_RESULT`
- int `CPL_DLL` `CSLPrint` (char **papszStrList, FILE *fpOut)
- char `CPL_DLL` ** `CSLLoad` (const char *pszFname) `CPL_WARN_UNUSED_RESULT`
- int `CPL_DLL` `CSLSave` (char **papszStrList, const char *pszFname)
- char `CPL_DLL` ** `CSLInsertStrings` (char **papszStrList, int nInsertAtLineNo, char **papszNewLines) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` ** `CSLInsertString` (char **papszStrList, int nInsertAtLineNo, const char *pszNewLine) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` ** `CSLRemoveStrings` (char **papszStrList, int nFirstLineToDelete, int nNumToRemove, char ***ppapszRetStrings) `CPL_WARN_UNUSED_RESULT`
- int `CPL_DLL` `CSLFindName` (char **papszStrList, const char *pszName)
- int `CPL_DLL` `CSLFetchBoolean` (char **papszStrList, const char *pszKey, int bDefault)
- int `CPL_DLL` `CSLTestBoolean` (const char *pszValue)
- int `CPL_DLL` `CPLTestBoolean` (const char *pszValue)
- const char `CPL_DLL` * `CPLParseNameValue` (const char *pszNameValue, char **ppszKey)
- char `CPL_DLL` ** `CSLFetchNameValueMultiple` (char **papszStrList, const char *pszName)
- char `CPL_DLL` ** `CSLAddNameValue` (char **papszStrList, const char *pszName, const char *pszValue) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` ** `CSLSetNameValue` (char **papszStrList, const char *pszName, const char *pszValue) `CPL_WARN_UNUSED_RESULT`
- void `CPL_DLL` `CSLSetNameValueSeparator` (char **papszStrList, const char *pszSeparator)
- char `CPL_DLL` ** `CSLParseCommandLine` (const char *pszCommandLine)
- char `CPL_DLL` * `CPLEscapeString` (const char *pszString, int nLength, int nScheme) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` * `CPLUnescapeString` (const char *pszString, int *pnLength, int nScheme) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` * `CPLBinaryToHex` (int nBytes, const `GByte` *pabyData) `CPL_WARN_UNUSED_RESULT`
- `GByte` `CPL_DLL` * `CPLHexToBinary` (const char *pszHex, int *pnBytes) `CPL_WARN_UNUSED_RESULT`
- char `CPL_DLL` * `CPLBase64Encode` (int nBytes, const `GByte` *pabyData) `CPL_WARN_UNUSED_RESULT`
- int `CPL_DLL` `CPLBase64DecodeInPlace` (`GByte` *pszBase64)

- [CPLValueType](#) `CPL_DLL CPLGetValueType (const char *pszValue)`
- `size_t CPL_DLL CPLStrncpy (char *pszDest, const char *pszSrc, size_t nDestSize)`
- `size_t CPL_DLL CPLStrncat (char *pszDest, const char *pszSrc, size_t nDestSize)`
- `size_t CPL_DLL CPLStrnlen (const char *pszStr, size_t nMaxLen)`
- `int CPL_DLL CPLEncodingCharSize (const char *pszEncoding)`
- `char CPL_DLL * CPLRecode (const char *pszSource, const char *pszSrcEncoding, const char *pszDstEncoding) CPL_WARN_UNUSED_RESULT CPL_RETURNS_NONNULL`
- `char CPL_DLL * CPLRecodeFromWChar (const wchar_t *pwszSource, const char *pszSrcEncoding, const char *pszDstEncoding) CPL_WARN_UNUSED_RESULT`
- `wchar_t CPL_DLL * CPLRecodeToWChar (const char *pszSource, const char *pszSrcEncoding, const char *pszDstEncoding) CPL_WARN_UNUSED_RESULT`
- `int CPL_DLL CPLIsUTF8 (const char *pabyData, int nLen)`
- `char CPL_DLL * CPLForceToASCII (const char *pabyData, int nLen, char chReplacementChar) CPL_WARN_UNUSED_RESULT`
- `int CPL_DLL CPLStrlenUTF8 (const char *pszUTF8Str)`

11.10.1 Detailed Description

Various convenience functions for working with strings and string lists.

A `StringList` is just an array of strings with the last pointer being `NULL`. An empty `StringList` may be either a `NULL` pointer, or a pointer to a pointer memory location with a `NULL` value.

A common convention for `StringLists` is to use them to store name/value lists. In this case the contents are treated like a dictionary of name/value pairs. The actual data is formatted with each string having the format "`<name>-<value>`" (though "=" is also an acceptable separator). A number of the functions in the file operate on name/value style string lists (such as [CSLSetNameValue\(\)](#), and [CSLFetchNameValue\(\)](#)).

To some extent the `CPLStringList C++` class can be used to abstract managing string lists a bit but still be able to return them from C functions.

11.10.2 Macro Definition Documentation

11.10.2.1 `#define CPL_ENC_ASCII "ASCII"`

ASCII encoding

11.10.2.2 `#define CPL_ENC_ISO8859_1 "ISO-8859-1"`

ISO-8859-1 (LATIN1) encoding

11.10.2.3 `#define CPL_ENC_LOCALE ""`

Encoding of the current locale

11.10.2.4 `#define CPL_ENC_UCS2 "UCS-2"`

UCS-2 encoding

11.10.2.5 `#define CPL_ENC_UCS4 "UCS-4"`

UCS-4 encoding

11.10.2.6 `#define CPL_ENC_UTF16 "UTF-16"`

UTF-16 encoding

11.10.2.7 `#define CPL_ENC_UTF8 "UTF-8"`

UTF-8 encoding

11.10.2.8 `#define CPLES_BackslashQuotable 0`

Scheme for [CPLEscapeString\(\)](#)/[CPLUnescapeString\(\)](#) for backlash quoting

11.10.2.9 `#define CPLES_CSV 4`

Scheme for [CPLEscapeString\(\)](#)/[CPLUnescapeString\(\)](#) for CSV

11.10.2.10 `#define CPLES_SQL 3`

Scheme for [CPLEscapeString\(\)](#)/[CPLUnescapeString\(\)](#) for SQL

11.10.2.11 `#define CPLES_URL 2`

Scheme for [CPLEscapeString\(\)](#)/[CPLUnescapeString\(\)](#) for URL

11.10.2.12 `#define CPLES_XML 1`

Scheme for [CPLEscapeString\(\)](#)/[CPLUnescapeString\(\)](#) for XML

11.10.2.13 `#define CPLES_XML_BUT_QUOTES 5`

Scheme for [CPLEscapeString\(\)](#)/[CPLUnescapeString\(\)](#) for XML (preserves quotes)

11.10.2.14 `#define CSLT_ALLOWEMPTYTOKENS 0x0002`

Flag for [CSLTokenizeString2\(\)](#) to allow empty tokens

11.10.2.15 `#define CSLT_HONOURSTRINGS 0x0001`

Flag for [CSLTokenizeString2\(\)](#) to honour strings

11.10.2.16 `#define CSLT_PRESERVEESCAPES 0x0008`

Flag for [CSLTokenizeString2\(\)](#) to preserve escape characters

11.10.2.17 `#define CSLT_PRESERVEQUOTES 0x0004`

Flag for [CSLTokenizeString2\(\)](#) to preserve quotes

11.10.2.18 #define CSLT_STRIPENDSPACES 0x0020

Flag for [CSLTokenizeString2\(\)](#) to strip trailing spaces

11.10.2.19 #define CSLT_STRIPLEADSPACES 0x0010

Flag for [CSLTokenizeString2\(\)](#) to strip leading spaces

11.10.3 Enumeration Type Documentation

11.10.3.1 enum CPLValueType

Type of value

Enumerator

CPL_VALUE_STRING String

CPL_VALUE_REAL Real number

CPL_VALUE_INTEGER Integer

11.10.4 Function Documentation

11.10.4.1 int CPL_DLL CPLBase64DecodeInPlace (GByte * *pszBase64*)

Decode base64 string "*pszBase64*" (null terminated) in place.

Returns length of decoded array or 0 on failure.

11.10.4.2 char CPL_DLL* CPLBase64Encode (int *nDataLen*, const GByte * *pabyBytesToEncode*)

Base64 encode a buffer.

11.10.4.3 char CPL_DLL* CPLBinaryToHex (int *nBytes*, const GByte * *pabyData*)

Binary to hexadecimal translation.

Parameters

<i>nBytes</i>	number of bytes of binary data in <i>pabyData</i> .
<i>pabyData</i>	array of data bytes to translate.

Returns

hexadecimal translation, zero terminated. Free with [CPLFree\(\)](#).

11.10.4.4 int CPL_DLL CPLEncodingCharSize (const char * *pszEncoding*)

Return bytes per character for encoding.

This function returns the size in bytes of the smallest character in this encoding. For fixed width encodings (ASCII, UCS-2, UCS-4) this is straight forward. For encodings like UTF8 and UTF16 which represent some characters as a sequence of atomic character sizes the function still returns the atomic character size (1 for UTF8, 2 for UTF16).

This function will return the correct value for well known encodings with corresponding CPL_ENC_ values. It may not return the correct value for other encodings even if they are supported by the underlying iconv or windows transliteration services. Hopefully it will improve over time.

Parameters

<i>pszEncoding</i>	the name of the encoding.
--------------------	---------------------------

Returns

the size of a minimal character in bytes or -1 if the size is unknown.

11.10.4.5 char CPL_DLL* CPLEscapeString (const char * *pszInput*, int *nLength*, int *nScheme*)

Apply escaping to string to preserve special characters.

This function will "escape" a variety of special characters to make the string suitable to embed within a string constant or to write within a text stream but in a form that can be reconstituted to its original form. The escaping will even preserve zero bytes allowing preservation of raw binary data.

[CPLES_BackslashQuotable\(0\)](#): This scheme turns a binary string into a form suitable to be placed within double quotes as a string constant. The backslash, quote, '\0' and newline characters are all escaped in the usual C style.

[CPLES_XML\(1\)](#): This scheme converts the '<', '>', '"' and '&' characters into their XML/HTML equivalent (<, >, " and &) making a string safe to embed as CDATA within an XML element. The '\0' is not escaped and should not be included in the input.

[CPLES_URL\(2\)](#): Everything except alphanumerics and the characters '\$', '-', '_', ':', '+', '!', '*', '"', '(', ')', and ',' (see RFC1738) are converted to a percent followed by a two digit hex encoding of the character (leading zero supplied if needed). This is the mechanism used for encoding values to be passed in URLs.

[CPLES_SQL\(3\)](#): All single quotes are replaced with two single quotes. Suitable for use when constructing literal values for SQL commands where the literal will be enclosed in single quotes.

[CPLES_CSV\(4\)](#): If the values contains commas, semicolons, tabs, double quotes, or newlines it placed in double quotes, and double quotes in the value are doubled. Suitable for use when constructing field values for .csv files. Note that [CPLUnescapeString\(\)](#) currently does not support this format, only [CPLEscapeString\(\)](#). See `cpl_csv.cpp` for CSV parsing support.

Parameters

<i>pszInput</i>	the string to escape.
<i>nLength</i>	The number of bytes of data to preserve. If this is -1 the <code>strlen(pszString)</code> function will be used to compute the length.
<i>nScheme</i>	the encoding scheme to use.

Returns

an escaped, zero terminated string that should be freed with [CPLFree\(\)](#) when no longer needed.

11.10.4.6 char CPL_DLL* CPLForceToASCII (const char * *pabyData*, int *nLen*, char *chReplacementChar*)

Return a new string that is made only of ASCII characters. If non-ASCII characters are found in the input string, they will be replaced by the provided replacement character.

Parameters

<i>pabyData</i>	input string to test
<i>nLen</i>	length of the input string, or -1 if the function must compute the string length. In which case it must be null terminated.

<i>chReplacement-Char</i>	character which will be used when the input stream contains a non ASCII character. Must be valid ASCII!
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Returns

a new string that must be freed with [CPLFree\(\)](#).

Since

GDAL 1.7.0

11.10.4.7 CPLValueType CPL_DLL CPLGetValueType (const char * *pszValue*)

Detect the type of the value contained in a string, whether it is a real, an integer or a string. Leading and trailing spaces are skipped in the analysis.

Note: in the context of this function, integer must be understood in a broad sense. It does not mean that the value can fit into a 32 bit integer for example. It might be larger.

Parameters

<i>pszValue</i>	the string to analyze
-----------------	-----------------------

Returns

returns the type of the value contained in the string.

11.10.4.8 GByte CPL_DLL* CPLHexToBinary (const char * *pszHex*, int * *pnBytes*)

Hexadecimal to binary translation

Parameters

<i>pszHex</i>	the input hex encoded string.
<i>pnBytes</i>	the returned count of decoded bytes placed here.

Returns

returns binary buffer of data - free with [CPLFree\(\)](#).

11.10.4.9 int CPL_DLL CPLIsUTF8 (const char * *pabyData*, int *nLen*)

Test if a string is encoded as UTF-8.

Parameters

<i>pabyData</i>	input string to test
<i>nLen</i>	length of the input string, or -1 if the function must compute the string length. In which case it must be null terminated.

Returns

TRUE if the string is encoded as UTF-8. FALSE otherwise

Since

GDAL 1.7.0

11.10.4.10 `const char CPL_DLL* CPLParseNameValue (const char * pszNameValue, char ** ppszKey)`

Parse NAME=VALUE string into name and value components.

Note that if ppszKey is non-NULL, the key (or name) portion will be allocated using [VSIMalloc\(\)](#), and returned in that pointer. It is the applications responsibility to free this string, but the application should not modify or free the returned value portion.

This function also support "NAME:VALUE" strings and will strip white space from around the delimiter when forming name and value strings.

Eventually CSLFetchNameValue() and friends may be modified to use [CPLParseNameValue\(\)](#).

Parameters

<i>pszNameValue</i>	string in "NAME=VALUE" format.
<i>ppszKey</i>	optional pointer though which to return the name portion.

Returns

the value portion (pointing into original string).

11.10.4.11 `char CPL_DLL* CPLRecode (const char * pszSource, const char * pszSrcEncoding, const char * pszDstEncoding)`

Convert a string from a source encoding to a destination encoding.

The only guaranteed supported encodings are CPL_ENC_UTF8, CPL_ENC_ASCII and CPL_ENC_ISO8859_1. Currently, the following conversions are supported :

- CPL_ENC_ASCII -> CPL_ENC_UTF8 or CPL_ENC_ISO8859_1 (no conversion in fact)
- CPL_ENC_ISO8859_1 -> CPL_ENC_UTF8
- CPL_ENC_UTF8 -> CPL_ENC_ISO8859_1

If an error occurs an error may, or may not be posted with [CPLError\(\)](#).

Parameters

<i>pszSource</i>	a NULL terminated string.
<i>pszSrcEncoding</i>	the source encoding.
<i>pszDstEncoding</i>	the destination encoding.

Returns

a NULL terminated string which should be freed with [CPLFree\(\)](#).

Since

GDAL 1.6.0

11.10.4.12 `char CPL_DLL* CPLRecodeFromWChar (const wchar_t * pwszSource, const char * pszSrcEncoding, const char * pszDstEncoding)`

Convert wchar_t string to UTF-8.

Convert a wchar_t string into a multibyte utf-8 string. The only guaranteed supported source encoding is CPL_ENC_UCS2, and the only guaranteed supported destination encodings are CPL_ENC_UTF8, CPL_ENC_ASCII and CPL_ENC_ISO8859_1. In some cases (i.e. using [iconv\(\)](#)) other encodings may also be supported.

Note that the wchar_t type varies in size on different systems. On win32 it is normally 2 bytes, and on UNIX 4 bytes.

If an error occurs an error may, or may not be posted with [CPLError\(\)](#).

Parameters

<i>pszSource</i>	the source <code>wchar_t</code> string, terminated with a 0 <code>wchar_t</code> .
<i>pszSrcEncoding</i>	the source encoding, typically <code>CPL_ENC_UCS2</code> .
<i>pszDstEncoding</i>	the destination encoding, typically <code>CPL_ENC_UTF8</code> .

Returns

a zero terminated multi-byte string which should be freed with `CPLFree()`, or `NULL` if an error occurs.

Since

GDAL 1.6.0

11.10.4.13 `wchar_t CPL_DLL* CPLRecodeToWChar (const char * pszSource, const char * pszSrcEncoding, const char * pszDstEncoding)`

Convert UTF-8 string to a `wchar_t` string.

Convert a 8bit, multi-byte per character input string into a wide character (`wchar_t`) string. The only guaranteed supported source encodings are `CPL_ENC_UTF8`, `CPL_ENC_ASCII` and `CPL_ENC_ISO8869_1` (LATIN1). The only guaranteed supported destination encoding is `CPL_ENC_UCS2`. Other source and destination encodings may be supported depending on the underlying implementation.

Note that the `wchar_t` type varies in size on different systems. On win32 it is normally 2 bytes, and on UNIX 4 bytes.

If an error occurs an error may, or may not be posted with `CPLError()`.

Parameters

<i>pszSource</i>	input multi-byte character string.
<i>pszSrcEncoding</i>	source encoding, typically <code>CPL_ENC_UTF8</code> .
<i>pszDstEncoding</i>	destination encoding, typically <code>CPL_ENC_UCS2</code> .

Returns

the zero terminated `wchar_t` string (to be freed with `CPLFree()`) or `NULL` on error.

Since

GDAL 1.6.0

11.10.4.14 `size_t CPL_DLL CPLStrlcat (char * pszDest, const char * pszSrc, size_t nDestSize)`

Appends a source string to a destination buffer.

This function ensures that the destination buffer is always NUL terminated (provided that its length is at least 1 and that there is at least one byte free in `pszDest`, that is to say `strlen(pszDest_before) < nDestSize`)

This function is designed to be a safer, more consistent, and less error prone replacement for `strncat`. Its contract is identical to `libbsd's strlcat`.

Truncation can be detected by testing if the return value of `CPLStrlcat` is greater or equal to `nDestSize`.

```
char szDest[5] = {};
CPLStrlcpy(szDest, "ab", sizeof(szDest));
if( CPLStrlcat(szDest, "cde", sizeof(szDest)) >= sizeof(szDest) )
    fprintf(stderr, "truncation occurred !\n");
```

Parameters

<i>pszDest</i>	destination buffer. Must be NUL terminated before running CPLStrcat
<i>pszSrc</i>	source string. Must be NUL terminated
<i>nDestSize</i>	size of destination buffer (including space for the NUL terminator character)

Returns

the theoretical length of the destination string after concatenation (=strlen(pszDest_before) + strlen(pszSrc)).
If strlen(pszDest_before) >= nDestSize, then it returns nDestSize + strlen(pszSrc)

Since

GDAL 1.7.0

11.10.4.15 size_t CPL_DLL CPLStrncpy (char * *pszDest*, const char * *pszSrc*, size_t *nDestSize*)

Copy source string to a destination buffer.

This function ensures that the destination buffer is always NUL terminated (provided that its length is at least 1).

This function is designed to be a safer, more consistent, and less error prone replacement for strncpy. Its contract is identical to libbsd's strlcpy.

Truncation can be detected by testing if the return value of CPLStrncpy is greater or equal to nDestSize.

```
char szDest[5] = {};
if( CPLStrncpy(szDest, "abcde", sizeof(szDest)) >= sizeof(szDest) )
    fprintf(stderr, "truncation occurred !\n");
```

Parameters

<i>pszDest</i>	destination buffer
<i>pszSrc</i>	source string. Must be NUL terminated
<i>nDestSize</i>	size of destination buffer (including space for the NUL terminator character)

Returns

the length of the source string (=strlen(pszSrc))

Since

GDAL 1.7.0

11.10.4.16 int CPL_DLL CPLStrlenUTF8 (const char * *pszUTF8Str*)

Return the number of UTF-8 characters of a nul-terminated string.

This is different from strlen() which returns the number of bytes.

Parameters

<i>pszUTF8Str</i>	a nul-terminated UTF-8 string
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Returns

the number of UTF-8 characters.

11.10.4.17 `size_t CPL_DLL CPLStrnlen (const char * pszStr, size_t nMaxLen)`

Returns the length of a NUL terminated string by reading at most the specified number of bytes.

The [CPLStrnlen\(\)](#) function returns `min(strlen(pszStr), nMaxLen)`. Only the first `nMaxLen` bytes of the string will be read. Useful to test if a string contains at least `nMaxLen` characters without reading the full string up to the NUL terminating character.

Parameters

<i>pszStr</i>	a NUL terminated string
<i>nMaxLen</i>	maximum number of bytes to read in <i>pszStr</i>

Returns

`strlen(pszStr)` if the length is lesser than `nMaxLen`, otherwise `nMaxLen` if the NUL character has not been found in the first `nMaxLen` bytes.

Since

GDAL 1.7.0

11.10.4.18 `int CPL_DLL CPLTestBoolean (const char * pszValue)`

Test what boolean value contained in the string.

If *pszValue* is "NO", "FALSE", "OFF" or "0" will be returned FALSE. Otherwise, TRUE will be returned.

Use this only in C code. In C++, prefer `CPLTestBool()`.

Parameters

<i>pszValue</i>	the string should be tested.
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Returns

TRUE or FALSE.

11.10.4.19 `char CPL_DLL* CPLUnescapeString (const char * pszInput, int * pnLength, int nScheme)`

Unescape a string.

This function does the opposite of [CPLEscapeString\(\)](#). Given a string with special values escaped according to some scheme, it will return a new copy of the string returned to its original form.

Parameters

<i>pszInput</i>	the input string. This is a zero terminated string.
<i>pnLength</i>	location to return the length of the unescaped string, which may in some cases include embedded '\0' characters.
<i>nScheme</i>	the escaped scheme to undo (see CPLEscapeString() for a list). Does not yet support CSV.

Returns

a copy of the unescaped string that should be freed by the application using [CPLFree\(\)](#) when no longer needed.

11.10.4.20 `char CPL_DLL** CSLAddNameValue (char ** papszStrList, const char * pszName, const char * pszValue)`

Add a new entry to a StringList of "Name=Value" pairs, ("Name:Value" pairs are also supported for backward compatibility with older stuff.)

This function does not check if a "Name=Value" pair already exists for that name and can generate multiple entries for the same name. Use [CSLSetNameValue\(\)](#) if you want each name to have only one value.

Returns the modified StringList.

11.10.4.21 `CPL_C_START char CPL_DLL** CSLAddString (char ** papszStrList, const char * pszNewString)`

Append a string to a StringList and return a pointer to the modified StringList.

If the input StringList is NULL, then a new StringList is created. Note that CSLAddString performance when building a list is in $O(n^2)$ which can cause noticeable slow down when $n > 10000$.

11.10.4.22 `char CPL_DLL** CSLAddStringMayFail (char ** papszStrList, const char * pszNewString)`

Same as [CSLAddString\(\)](#) but may return NULL in case of (memory) failure

11.10.4.23 `void CPL_DLL CPL_STDCALL CSLDestroy (char ** papszStrList)`

Free string list.

Frees the passed string list (null terminated array of strings). It is safe to pass NULL.

Parameters

<i>papszStrList</i>	the list to free.
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11.10.4.24 `char CPL_DLL** CSLDuplicate (char ** papszStrList)`

Clone a string list.

Efficiently allocates a copy of a string list. The returned list is owned by the caller and should be freed with [CSL-Destroy\(\)](#).

Parameters

<i>papszStrList</i>	the input string list.
---------------------	------------------------

Returns

newly allocated copy.

11.10.4.25 `int CPL_DLL CSLFetchBoolean (char ** papszStrList, const char * pszKey, int bDefault)`

DEPRECATED. Check for boolean key value.

In a StringList of "Name=Value" pairs, look to see if there is a key with the given name, and if it can be interpreted as being TRUE. If the key appears without any "=Value" portion it will be considered true. If the value is NO, FALSE or 0 it will be considered FALSE otherwise if the key appears in the list it will be considered TRUE. If the key doesn't appear at all, the indicated default value will be returned.

Parameters

<i>papszStrList</i>	the string list to search.
<i>pszKey</i>	the key value to look for (case insensitive).
<i>bDefault</i>	the value to return if the key isn't found at all.

Returns

TRUE or FALSE

11.10.4.26 `char CPL_DLL** CSLFetchNameValueMultiple (char ** papszStrList, const char * pszName)`

In a StringList of "Name=Value" pairs, look for all the values with the specified name. The search is not case sensitive. ("Name:Value" pairs are also supported for backward compatibility with older stuff.)

Returns StringList with one entry for each occurrence of the specified name. The StringList should eventually be destroyed by calling [CSLDestroy\(\)](#).

Returns NULL if the name is not found.

11.10.4.27 `int CPL_DLL CSLFindName (char ** papszStrList, const char * pszName)`

Find StringList entry with given key name.

Parameters

<i>papszStrList</i>	the string list to search.
<i>pszName</i>	the key value to look for (case insensitive).

Returns

-1 on failure or the list index of the first occurrence matching the given key.

11.10.4.28 `const char CPL_DLL* CSLGetField (char ** papszStrList, int iField)`

Fetches the indicated field, being careful not to crash if the field doesn't exist within this string list.

The returned pointer should not be freed, and doesn't necessarily last long.

11.10.4.29 `char CPL_DLL** CSLInsertString (char ** papszStrList, int nInsertAtLineNo, const char * pszNewLine)`

Insert a string at a given line number inside a StringList

nInsertAtLineNo is a 0-based line index before which the new string should be inserted. If this value is -1 or is larger than the actual number of strings in the list then the string is added at the end of the source StringList.

Returns the modified StringList.

11.10.4.30 `char CPL_DLL** CSLInsertStrings (char ** papszStrList, int nInsertAtLineNo, char ** papszNewLines)`

Copies the contents of a StringList inside another StringList before the specified line.

nInsertAtLineNo is a 0-based line index before which the new strings should be inserted. If this value is -1 or is larger than the actual number of strings in the list then the strings are added at the end of the source StringList.

Returns the modified StringList.

11.10.4.31 char CPL_DLL** CSLoad (const char * *pszFname*)

Load a text file into a string list.

The VSI*L API is used, so [VSIFOpenL\(\)](#) supported objects that aren't physical files can also be accessed. Files are returned as a string list, with one item in the string list per line. End of line markers are stripped (by [CPLReadLineL\(\)](#)).

If reading the file fails a [CPLError\(\)](#) will be issued and NULL returned.

Parameters

<i>pszFname</i>	the name of the file to read.
-----------------	-------------------------------

Returns

a string list with the files lines, now owned by caller. To be freed with [CSLDestroy\(\)](#)

11.10.4.32 char CPL_DLL** CSLMerge (char ** *papszOrig*, char ** *papszOverride*)

Merge two lists.

The two lists are merged, ensuring that if any keys appear in both that the value from the second (*papszOverride*) list take precedence.

Parameters

<i>papszOrig</i>	the original list, being modified.
<i>papszOverride</i>	the list of items being merged in. This list is unaltered and remains owned by the caller.

Returns

updated list.

11.10.4.33 char CPL_DLL** CSLParseCommandLine (const char * *pszCommandLine*)

Tokenize command line arguments in a list of strings.

Parameters

<i>pszCommand-Line</i>	command line
------------------------	--------------

Returns

NULL terminated list of strings to free with [CSLDestroy\(\)](#)

Since

GDAL 2.1

11.10.4.34 int CPL_DLL CSLPrint (char ** *papszStrList*, FILE * *fpOut*)

Print a StringList to *fpOut*. If *fpOut*==NULL, then output is sent to stdout.

Returns the number of lines printed.

11.10.4.35 `char CPL_DLL** CSLRemoveStrings (char ** papszStrList, int nFirstLineToDelete, int nNumToRemove, char *** ppapszRetStrings)`

Remove strings inside a StringList

nFirstLineToDelete is the 0-based line index of the first line to remove. If this value is -1 or is larger than the actual number of strings in list then the nNumToRemove last strings are removed.

If ppapszRetStrings != NULL then the deleted strings won't be free'd, they will be stored in a new StringList and the pointer to this new list will be returned in *ppapszRetStrings.

Returns the modified StringList.

11.10.4.36 `int CPL_DLL CSLSave (char ** papszStrList, const char * pszFname)`

Write a StringList to a text file.

Returns the number of lines written, or 0 if the file could not be written.

11.10.4.37 `char CPL_DLL** CSLSetNameValue (char ** papszList, const char * pszName, const char * pszValue)`

Assign value to name in StringList.

Set the value for a given name in a StringList of "Name=Value" pairs ("Name:Value" pairs are also supported for backward compatibility with older stuff.)

If there is already a value for that name in the list then the value is changed, otherwise a new "Name=Value" pair is added.

Parameters

<i>papszList</i>	the original list, the modified version is returned.
<i>pszName</i>	the name to be assigned a value. This should be a well formed token (no spaces or very special characters).
<i>pszValue</i>	the value to assign to the name. This should not contain any newlines (CR or LF) but is otherwise pretty much unconstrained. If NULL any corresponding value will be removed.

Returns

modified StringList.

11.10.4.38 `void CPL_DLL CSLSetNameValueSeparator (char ** papszList, const char * pszSeparator)`

Replace the default separator (":" or "=") with the passed separator in the given name/value list.

Note that if a separator other than ":" or "=" is used, the resulting list will not be manipulable by the CSL name/value functions any more.

The [CPLParseNameValue\(\)](#) function is used to break the existing lines, and it also strips white space from around the existing delimiter, thus the old separator, and any white space will be replaced by the new separator. For formatting purposes it may be desirable to include some white space in the new separator. e.g. ": " or " = ".

Parameters

<i>papszList</i>	the list to update. Component strings may be freed but the list array will remain at the same location.
------------------	---

<i>pszSeparator</i>	the new separator string to insert.
---------------------	-------------------------------------

11.10.4.39 int CPL_DLL CSLTestBoolean (const char * *pszValue*)

Test what boolean value contained in the string.

If *pszValue* is "NO", "FALSE", "OFF" or "0" will be returned FALSE. Otherwise, TRUE will be returned.

Deprecated. Removed in GDAL 3.x.

Use [CPLTestBoolean\(\)](#) for C and [CPLTestBool\(\)](#) for C++.

Parameters

<i>pszValue</i>	the string should be tested.
-----------------	------------------------------

Returns

TRUE or FALSE.

11.10.4.40 char CPL_DLL** CSLTokenizeString (const char * *pszString*)

Tokenizes a string and returns a StringList with one string for each token.

11.10.4.41 char CPL_DLL** CSLTokenizeString2 (const char * *pszString*, const char * *pszDelimiters*, int *nCSLTFlags*)

Tokenize a string.

This function will split a string into tokens based on specified' delimiter(s) with a variety of options. The returned result is a string list that should be freed with [CSLDestroy\(\)](#) when no longer needed.

The available parsing options are:

- CSLT_ALLOWEMPTYTOKENS: allow the return of empty tokens when two delimiters in a row occur with no other text between them. If not set, empty tokens will be discarded;
- CSLT_STRIPLEADSPACES: strip leading space characters from the token (as reported by isspace());
- CSLT_STRIPENDSPACES: strip ending space characters from the token (as reported by isspace());
- CSLT_HONOURSTRINGS: double quotes can be used to hold values that should not be broken into multiple tokens;
- CSLT_PRESERVEQUOTES: string quotes are carried into the tokens when this is set, otherwise they are removed;
- CSLT_PRESERVEESCAPES: if set backslash escapes (for backslash itself, and for literal double quotes) will be preserved in the tokens, otherwise the backslashes will be removed in processing.

Example:

Parse a string into tokens based on various white space (space, newline, tab) and then print out results and cleanup. Quotes may be used to hold white space in tokens.

```
char **papszTokens =
    CSLTokenizeString2( pszCommand, " \t\n",
                      CSLT_HONOURSTRINGS |
                      CSLT_ALLOWEMPTYTOKENS );

for( int i = 0; papszTokens != NULL && papszTokens[i] != NULL; ++i )
    printf( "arg %d: '%s'", papszTokens[i] ); // ok

CSLDestroy( papszTokens );
```

Parameters

<i>pszString</i>	the string to be split into tokens.
<i>pszDelimiters</i>	one or more characters to be used as token delimiters.
<i>nCSLTFlags</i>	an ORing of one or more of the CSLT_ flag values.

Returns

a string list of tokens owned by the caller.

11.10.4.42 `char CPL_DLL** CSLTokenizeStringComplex (const char * pszString, const char * pszDelimiters, int bHonourStrings, int bAllowEmptyTokens)`

Obsolete tokenizing api. Use [CSLTokenizeString2\(\)](#)

11.11 cpl_virtualmem.h File Reference

```
#include <stddef.h>
#include "cpl_port.h"
#include "cpl_vsi.h"
```

Typedefs

- typedef struct [CPLVirtualMem](#) [CPLVirtualMem](#)
- typedef void(* [CPLVirtualMemCachePageCbK](#))(CPLVirtualMem *ctxt, size_t nOffset, void *pPageToFill, size_t nToFill, void *pUserData)
- typedef void(* [CPLVirtualMemUnCachePageCbK](#))(CPLVirtualMem *ctxt, size_t nOffset, const void *pPageToBeEvicted, size_t nToBeEvicted, void *pUserData)
- typedef void(* [CPLVirtualMemFreeUserData](#))(void *pUserData)

Enumerations

- enum [CPLVirtualMemAccessMode](#) { [VIRTUALMEM_READONLY](#), [VIRTUALMEM_READONLY_ENFORCED](#), [VIRTUALMEM_READWRITE](#) }

Functions

- size_t CPL_DLL [CPLGetPageSize](#) (void)
- [CPLVirtualMem](#) CPL_DLL * [CPLVirtualMemNew](#) (size_t nSize, size_t nCacheSize, size_t nPageSizeHint, int bSingleThreadUsage, [CPLVirtualMemAccessMode](#) eAccessMode, [CPLVirtualMemCachePageCbK](#) pfnCachePage, [CPLVirtualMemUnCachePageCbK](#) pfnUnCachePage, [CPLVirtualMemFreeUserData](#) pfnFreeUserData, void *pCbKUserData)
- int CPL_DLL [CPLIsVirtualMemFileMapAvailable](#) (void)
- [CPLVirtualMem](#) CPL_DLL * [CPLVirtualMemFileMapNew](#) (VSILFILE *fp, vsi_l_offset nOffset, vsi_l_offset nLength, [CPLVirtualMemAccessMode](#) eAccessMode, [CPLVirtualMemFreeUserData](#) pfnFreeUserData, void *pCbKUserData)
- [CPLVirtualMem](#) CPL_DLL * [CPLVirtualMemDerivedNew](#) ([CPLVirtualMem](#) *pVMemBase, vsi_l_offset nOffset, vsi_l_offset nSize, [CPLVirtualMemFreeUserData](#) pfnFreeUserData, void *pCbKUserData)
- void CPL_DLL [CPLVirtualMemFree](#) ([CPLVirtualMem](#) *ctxt)
- void CPL_DLL * [CPLVirtualMemGetAddr](#) ([CPLVirtualMem](#) *ctxt)
- size_t CPL_DLL [CPLVirtualMemGetSize](#) ([CPLVirtualMem](#) *ctxt)

- int CPL_DLL [CPLVirtualMemIsFileMapping](#) (CPLVirtualMem *ctxt)
- [CPLVirtualMemAccessMode](#) CPL_DLL [CPLVirtualMemGetAccessMode](#) (CPLVirtualMem *ctxt)
- size_t CPL_DLL [CPLVirtualMemGetPageSize](#) (CPLVirtualMem *ctxt)
- int CPL_DLL [CPLVirtualMemIsAccessThreadSafe](#) (CPLVirtualMem *ctxt)
- void CPL_DLL [CPLVirtualMemDeclareThread](#) (CPLVirtualMem *ctxt)
- void CPL_DLL [CPLVirtualMemUnDeclareThread](#) (CPLVirtualMem *ctxt)
- void CPL_DLL [CPLVirtualMemPin](#) (CPLVirtualMem *ctxt, void *pAddr, size_t nSize, int bWriteOp)
- void CPL_DLL [CPLVirtualMemManagerTerminate](#) (void)

11.11.1 Detailed Description

Virtual memory management.

This file provides mechanism to define virtual memory mappings, whose content is allocated transparently and filled on-the-fly. Those virtual memory mappings can be much larger than the available RAM, but only parts of the virtual memory mapping, in the limit of the allowed the cache size, will actually be physically allocated.

This exploits low-level mechanisms of the operating system (virtual memory allocation, page protection and handler of virtual memory exceptions).

It is also possible to create a virtual memory mapping from a file or part of a file.

The current implementation is Linux only.

11.11.2 Typedef Documentation

11.11.2.1 typedef struct CPLVirtualMem CPLVirtualMem

Opaque type that represents a virtual memory mapping.

11.11.2.2 typedef void(* CPLVirtualMemCachePageCbk)(CPLVirtualMem *ctxt, size_t nOffset, void *pPageToFill, size_t nToFill, void *pUserData)

Callback triggered when a still unmapped page of virtual memory is accessed. The callback has the responsibility of filling the page with relevant values

Parameters

<i>ctxt</i>	virtual memory handle.
<i>nOffset</i>	offset of the page in the memory mapping.
<i>pPageToFill</i>	address of the page to fill. Note that the address might be a temporary location, and not at CPLVirtualMemGetAddr() + nOffset.
<i>nToFill</i>	number of bytes of the page.
<i>pUserData</i>	user data that was passed to CPLVirtualMemNew() .

11.11.2.3 typedef void(* CPLVirtualMemFreeUserData)(void *pUserData)

Callback triggered when a virtual memory mapping is destroyed.

Parameters

<i>pUserData</i>	user data that was passed to CPLVirtualMemNew() .
------------------	---

```
11.11.2.4 typedef void(* CPLVirtualMemUnCachePageCbk)(CPLVirtualMem *ctxt, size_t nOffset, const void
*pPageToBeEvicted, size_t nToBeEvicted, void *pUserData)
```

Callback triggered when a dirty mapped page is going to be freed. (saturation of cache, or termination of the virtual memory mapping).

Parameters

<i>ctxt</i>	virtual memory handle.
<i>nOffset</i>	offset of the page in the memory mapping.
<i>pPageToBeEvicted</i>	address of the page that will be flushed. Note that the address might be a temporary location, and not at CPLVirtualMemGetAddr() + <i>nOffset</i> .
<i>nToBeEvicted</i>	number of bytes of the page.
<i>pUserData</i>	user data that was passed to CPLVirtualMemNew() .

11.11.3 Enumeration Type Documentation

11.11.3.1 enum CPLVirtualMemAccessMode

Access mode of a virtual memory mapping.

Enumerator

VIRTUALMEM_READONLY The mapping is meant at being read-only, but writes will not be prevented. Note that any content written will be lost.

VIRTUALMEM_READONLY_ENFORCED The mapping is meant at being read-only, and this will be enforced through the operating system page protection mechanism.

VIRTUALMEM_READWRITE The mapping is meant at being read-write, and modified pages can be saved thanks to the `pfnUnCachePage` callback

11.11.4 Function Documentation

11.11.4.1 `size_t CPL_DLL CPLGetPageSize (void)`

Return the size of a page of virtual memory.

Returns

the page size.

Since

GDAL 1.11

11.11.4.2 `int CPL_DLL CPLIsVirtualMemFileMapAvailable (void)`

Return if virtual memory mapping of a file is available.

Returns

TRUE if virtual memory mapping of a file is available.

Since

GDAL 1.11

11.11.4.3 `void CPL_DLL CPLVirtualMemDeclareThread (CPLVirtualMem * ctxt)`

Declare that a thread will access a virtual memory mapping.

This function must be called by a thread that wants to access the content of a virtual memory mapping, except if the virtual memory mapping has been created with `bSingleThreadUsage = TRUE`.

This function must be paired with [CPLVirtualMemUnDeclareThread\(\)](#).

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Since

GDAL 1.11

11.11.4.4 **CPLVirtualMem CPL_DLL* CPLVirtualMemDerivedNew (CPLVirtualMem * *pVMemBase*, vsi_I_offset *nOffset*, vsi_I_offset *nSize*, CPLVirtualMemFreeUserData *pfnFreeUserData*, void * *pCbkJUserData*)**

Create a new virtual memory mapping derived from an other virtual memory mapping.

This may be useful in case of creating mapping for pixel interleaved data.

The new mapping takes a reference on the base mapping.

Parameters

<i>pVMemBase</i>	Base virtual memory mapping
<i>nOffset</i>	Offset in the base virtual memory mapping from which to start the new mapping.
<i>nSize</i>	Size of the base virtual memory mapping to expose in the the new mapping.
<i>pfnFreeUserData</i>	callback that is called when the object is destroyed.
<i>pCbkJUserData</i>	user data passed to <i>pfnFreeUserData</i> .

Returns

a virtual memory object that must be freed by [CPLVirtualMemFree\(\)](#), or NULL in case of failure.

Since

GDAL 1.11

11.11.4.5 **CPLVirtualMem CPL_DLL* CPLVirtualMemFileMapNew (VSILFILE * *fp*, vsi_I_offset *nOffset*, vsi_I_offset *nLength*, CPLVirtualMemAccessMode *eAccessMode*, CPLVirtualMemFreeUserData *pfnFreeUserData*, void * *pCbkJUserData*)**

Create a new virtual memory mapping from a file.

The file must be a "real" file recognized by the operating system, and not a VSI extended virtual file.

In VIRTUALLMEM_READWRITE mode, updates to the memory mapping will be written in the file.

On Linux AMD64 platforms, the maximum value for *nLength* is 128 TB. On Linux x86 platforms, the maximum value for *nLength* is 2 GB.

Supported on Linux only in GDAL <= 2.0, and all POSIX systems supporting `mmap()` in GDAL >= 2.1

Parameters

<i>fp</i>	Virtual file handle.
<i>nOffset</i>	Offset in the file to start the mapping from.
<i>nLength</i>	Length of the portion of the file to map into memory.
<i>eAccessMode</i>	Permission to use for the virtual memory mapping. This must be consistent with how the file has been opened.

<i>pfnFreeUserData</i>	callback that is called when the object is destroyed.
<i>pCbkUserData</i>	user data passed to pfnFreeUserData.

Returns

a virtual memory object that must be freed by [CPLVirtualMemFree\(\)](#), or NULL in case of failure.

Since

GDAL 1.11

11.11.4.6 void CPL_DLL CPLVirtualMemFree (CPLVirtualMem * ctxt)

Free a virtual memory mapping.

The pointer returned by [CPLVirtualMemGetAddr\(\)](#) will no longer be valid. If the virtual memory mapping was created with read/write permissions and that they are dirty (i.e. modified) pages, they will be flushed through the pfnUnCachePage callback before being freed.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Since

GDAL 1.11

11.11.4.7 CPLVirtualMemAccessMode CPL_DLL CPLVirtualMemGetAccessMode (CPLVirtualMem * ctxt)

Return the access mode of the virtual memory mapping.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Returns

the access mode of the virtual memory mapping.

Since

GDAL 1.11

11.11.4.8 void CPL_DLL* CPLVirtualMemGetAddr (CPLVirtualMem * ctxt)

Return the pointer to the start of a virtual memory mapping.

The bytes in the range [p:p+CPLVirtualMemGetSize()-1] where p is the pointer returned by this function will be valid, until [CPLVirtualMemFree\(\)](#) is called.

Note that if a range of bytes used as an argument of a system call (such as read() or write()) contains pages that have not been "realized", the system call will fail with EFAULT. [CPLVirtualMemPin\(\)](#) can be used to work around this issue.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Returns

the pointer to the start of a virtual memory mapping.

Since

GDAL 1.11

11.11.4.9 `size_t CPL_DLL CPLVirtualMemGetPageSize (CPLVirtualMem * ctxt)`

Return the page size associated to a virtual memory mapping.

The value returned will be at least [CPLGetPageSize\(\)](#), but potentially larger.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Returns

the page size

Since

GDAL 1.11

11.11.4.10 `size_t CPL_DLL CPLVirtualMemGetSize (CPLVirtualMem * ctxt)`

Return the size of the virtual memory mapping.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Returns

the size of the virtual memory mapping.

Since

GDAL 1.11

11.11.4.11 `int CPL_DLL CPLVirtualMemIsAccessThreadSafe (CPLVirtualMem * ctxt)`

Return TRUE if this memory mapping can be accessed safely from concurrent threads.

The situation that can cause problems is when several threads try to access a page of the mapping that is not yet mapped.

The return value of this function depends on whether `bSingleThreadUsage` has been set or not in [CPLVirtualMemNew\(\)](#) and/or the implementation.

On Linux, this will always return TRUE if `bSingleThreadUsage = FALSE`.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Returns

TRUE if this memory mapping can be accessed safely from concurrent threads.

Since

GDAL 1.11

11.11.4.12 int CPL_DLL CPLVirtualMemIsFileMapping (CPLVirtualMem * *ctxt*)

Return if the virtual memory mapping is a direct file mapping.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Returns

TRUE if the virtual memory mapping is a direct file mapping.

Since

GDAL 1.11

11.11.4.13 void CPL_DLL CPLVirtualMemManagerTerminate (void)

Cleanup any resource and handlers related to virtual memory.

This function must be called after the last [CPLVirtualMem](#) object has been freed.

Since

GDAL 2.0

11.11.4.14 **CPLVirtualMem CPL_DLL* CPLVirtualMemNew (size_t *nSize*, size_t *nCacheSize*, size_t *nPageSizeHint*, int *bSingleThreadUsage*, CPLVirtualMemAccessMode *eAccessMode*, CPLVirtualMemCachePageCbK *pfnCachePage*, CPLVirtualMemUnCachePageCbK *pfnUnCachePage*, CPLVirtualMemFreeUserData *pfnFreeUserData*, void * *pCbKUserData*)**

Create a new virtual memory mapping.

This will reserve an area of virtual memory of size *nSize*, whose size might be potentially much larger than the physical memory available. Initially, no physical memory will be allocated. As soon as memory pages will be accessed, they will be allocated transparently and filled with the *pfnCachePage* callback. When the allowed cache size is reached, the least recently used pages will be unallocated.

On Linux AMD64 platforms, the maximum value for *nSize* is 128 TB. On Linux x86 platforms, the maximum value for *nSize* is 2 GB.

Only supported on Linux for now.

Note that on Linux, this function will install a SIGSEGV handler. The original handler will be restored by [CPLVirtualMemManagerTerminate\(\)](#).

Parameters

<i>nSize</i>	size in bytes of the virtual memory mapping.
<i>nCacheSize</i>	size in bytes of the maximum memory that will be really allocated (must ideally fit into RAM).
<i>nPageSizeHint</i>	hint for the page size. Must be a multiple of the system page size, returned by CPLGetPageSize() . Minimum value is generally 4096. Might be set to 0 to let the function determine a default page size.
<i>bSingleThreadUsage</i>	set to TRUE if there will be no concurrent threads that will access the virtual memory mapping. This can optimize performance a bit.
<i>eAccessMode</i>	permission to use for the virtual memory mapping.
<i>pfnCachePage</i>	callback triggered when a still unmapped page of virtual memory is accessed. The callback has the responsibility of filling the page with relevant values.
<i>pfnUnCachePage</i>	callback triggered when a dirty mapped page is going to be freed (saturation of cache, or termination of the virtual memory mapping). Might be NULL.
<i>pfnFreeUserData</i>	callback that can be used to free pCbkUserData. Might be NULL
<i>pCbkUserData</i>	user data passed to pfnCachePage and pfnUnCachePage.

Returns

a virtual memory object that must be freed by [CPLVirtualMemFree\(\)](#), or NULL in case of failure.

Since

GDAL 1.11

11.11.4.15 `void CPL_DLL CPLVirtualMemPin (CPLVirtualMem * ctxt, void * pAddr, size_t nSize, int bWriteOp)`

Make sure that a region of virtual memory will be realized.

Calling this function is not required, but might be useful when debugging a process with tools like gdb or valgrind that do not naturally like segmentation fault signals.

It is also needed when wanting to provide part of virtual memory mapping to a system call such as read() or write(). If read() or write() is called on a memory region not yet realized, the call will fail with EFAULT.

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
<i>pAddr</i>	the memory region to pin.
<i>nSize</i>	the size of the memory region.
<i>bWriteOp</i>	set to TRUE if the memory are will be accessed in write mode.

Since

GDAL 1.11

11.11.4.16 `void CPL_DLL CPLVirtualMemUnDeclareThread (CPLVirtualMem * ctxt)`

Declare that a thread will stop accessing a virtual memory mapping.

This function must be called by a thread that will no longer access the content of a virtual memory mapping, except if the virtual memory mapping has been created with bSingleThreadUsage = TRUE.

This function must be paired with [CPLVirtualMemDeclareThread\(\)](#).

Parameters

<i>ctxt</i>	context returned by CPLVirtualMemNew() .
-------------	--

Since

GDAL 1.11

11.12 cpl_vsi.h File Reference

```
#include "cpl_port.h"
#include <unistd.h>
#include <sys/stat.h>
```

Macros

- `#define VSI_ISLNK(x) S_ISLNK(x)`
- `#define VSI_ISREG(x) S_ISREG(x)`
- `#define VSI_ISDIR(x) S_ISDIR(x)`
- `#define VSI_L_OFFSET_MAX GUINTBIG_MAX`
- `#define VSI_STAT_EXISTS_FLAG 0x1`
- `#define VSI_STAT_NATURE_FLAG 0x2`
- `#define VSI_STAT_SIZE_FLAG 0x4`
- `#define VSI_STAT_SET_ERROR_FLAG 0x8`
- `#define VSI_MALLOC_ALIGNED_AUTO_VERBOSE(size) VSIMallocAlignedAutoVerbose(size, __FILE__, __LINE__)`
- `#define VSI_MALLOC_VERBOSE(size) VSIMallocVerbose(size, __FILE__, __LINE__)`
- `#define VSI_MALLOC2_VERBOSE(nSize1, nSize2) VSIMalloc2Verbose(nSize1, nSize2, __FILE__, __LINE__)`
- `#define VSI_MALLOC3_VERBOSE(nSize1, nSize2, nSize3) VSIMalloc3Verbose(nSize1, nSize2, nSize3, __FILE__, __LINE__)`
- `#define VSI_CALLOC_VERBOSE(nCount, nSize) VSICallocVerbose(nCount, nSize, __FILE__, __LINE__)`
- `#define VSI_REALLOC_VERBOSE(pOldPtr, nNewSize) VSIReallocVerbose(pOldPtr, nNewSize, __FILE__, __LINE__)`
- `#define VSI_STRDUP_VERBOSE(pszStr) VSIStrdupVerbose(pszStr, __FILE__, __LINE__)`
- `#define CPLReadDir VSIReadDir`

Typedefs

- `typedef GUIntBig vsi_l_offset`
- `typedef FILE VSILFILE`
- `typedef struct VSI_STAT64_T VSIStatBufL`
- `typedef size_t(* VSIWriteFunction)(const void *ptr, size_t size, size_t nmemb, FILE *stream)`

Enumerations

- `enum VSIRangeStatus { VSI_RANGE_STATUS_UNKNOWN, VSI_RANGE_STATUS_DATA, VSI_RANGE_STATUS_HOLE }`

Functions

- [VSILFILE CPL_DLL * VSIFOpenL](#) (const char *, const char *) [CPL_WARN_UNUSED_RESULT](#)
Open file.
- [VSILFILE CPL_DLL * VSIFOpenExL](#) (const char *, const char *, int) [CPL_WARN_UNUSED_RESULT](#)
Open file.
- int CPL_DLL [VSIFCloseL](#) ([VSILFILE *](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Close file.
- int CPL_DLL [VSIFSeekL](#) ([VSILFILE *](#), [vsi_l_offset](#), int) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Seek to requested offset.
- [vsi_l_offset CPL_DLL VSIFTellL](#) ([VSILFILE *](#)) [CPL_WARN_UNUSED_RESULT](#)
Tell current file offset.
- void CPL_DLL [VSIRewindL](#) ([VSILFILE *](#))
Rewind the file pointer to the beginning of the file.
- size_t CPL_DLL [VSIFReadL](#) (void *, size_t, size_t, [VSILFILE *](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Read bytes from file.
- int CPL_DLL [VSIFReadMultiRangeL](#) (int nRanges, void **ppData, const [vsi_l_offset](#) *panOffsets, const size_t *panSizes, [VSILFILE *](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Read several ranges of bytes from file.
- size_t CPL_DLL [VSIFWriteL](#) (const void *, size_t, size_t, [VSILFILE *](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Write bytes to file.
- int CPL_DLL [VSIFEOF](#) ([VSILFILE *](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Test for end of file.
- int CPL_DLL [VSIFTruncateL](#) ([VSILFILE *](#), [vsi_l_offset](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Truncate/expand the file to the specified size.
- int CPL_DLL [VSIFFlushL](#) ([VSILFILE *](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Flush pending writes to disk.
- int CPL_DLL int CPL_DLL [VSIFPutcL](#) (int, [VSILFILE *](#)) [EXPERIMENTAL_CPL_WARN_UNUSED_RESULT](#)
Write a single byte to the file.
- [VSIRangeStatus CPL_DLL VSIFGetRangeStatusL](#) ([VSILFILE *fp](#), [vsi_l_offset](#) nStart, [vsi_l_offset](#) nLength)
Return if a given file range contains data or holes filled with zeroes.
- int CPL_DLL [VSIIngestFile](#) ([VSILFILE *fp](#), const char *pszFilename, [GByte](#) **ppabyRet, [vsi_l_offset](#) *pnSize, [GIntBig](#) nMaxSize) [CPL_WARN_UNUSED_RESULT](#)
Ingest a file into memory.
- int CPL_DLL [VSIStatL](#) (const char *, [VSIStatBufL *](#)) [CPL_WARN_UNUSED_RESULT](#)
Get filesystem object info.
- int CPL_DLL [VSIStatExL](#) (const char *pszFilename, [VSIStatBufL](#) *psStatBuf, int nFlags) [CPL_WARN_UNUSED_RESULT](#)
Get filesystem object info.
- int CPL_DLL [VSIIsCaseSensitiveFS](#) (const char *pszFilename)
Returns if the filenames of the filesystem are case sensitive.
- int CPL_DLL [VSI SupportsSparseFiles](#) (const char *pszPath)
Returns if the filesystem supports sparse files.
- void CPL_DLL * [VSIFGetNativeFileDescriptorL](#) ([VSILFILE *](#))
Returns the "native" file descriptor for the virtual handle.
- void CPL_DLL * [VSI Calloc](#) (size_t, size_t) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSI Malloc](#) (size_t) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL [VSIFree](#) (void *)
- void CPL_DLL * [VSI Realloc](#) (void *, size_t) [CPL_WARN_UNUSED_RESULT](#)
- char CPL_DLL * [VSI Strdup](#) (const char *) [CPL_WARN_UNUSED_RESULT](#)

- void CPL_DLL * [VSIMallocAligned](#) (size_t nAlignment, size_t nSize) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIMallocAlignedAuto](#) (size_t nSize) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL [VSIFreeAligned](#) (void *ptr)
- void CPL_DLL * [VSIMallocAlignedAutoVerbose](#) (size_t nSize, const char *pszFile, int nLine) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIMalloc2](#) (size_t nSize1, size_t nSize2) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIMalloc3](#) (size_t nSize1, size_t nSize2, size_t nSize3) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIMallocVerbose](#) (size_t nSize, const char *pszFile, int nLine) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIMalloc2Verbose](#) (size_t nSize1, size_t nSize2, const char *pszFile, int nLine) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIMalloc3Verbose](#) (size_t nSize1, size_t nSize2, size_t nSize3, const char *pszFile, int nLine) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIAllocVerbose](#) (size_t nCount, size_t nSize, const char *pszFile, int nLine) [CPL_WARN_UNUSED_RESULT](#)
- void CPL_DLL * [VSIReallocVerbose](#) (void *pOldPtr, size_t nNewSize, const char *pszFile, int nLine) [CPL_WARN_UNUSED_RESULT](#)
- char CPL_DLL * [VSIStrdupVerbose](#) (const char *pszStr, const char *pszFile, int nLine) [CPL_WARN_UNUSED_RESULT](#)
- [GIntBig](#) CPL_DLL [CPLGetPhysicalRAM](#) (void)
- [GIntBig](#) CPL_DLL [CPLGetUsablePhysicalRAM](#) (void)
- char CPL_DLL ** [VSIReadDir](#) (const char *)
 - Read names in a directory.*
- char CPL_DLL ** [VSIReadDirRecursive](#) (const char *pszPath)
 - Read names in a directory recursively.*
- char CPL_DLL ** [VSIReadDirEx](#) (const char *pszPath, int nMaxFiles)
 - Read names in a directory.*
- int CPL_DLL [VSIMkdir](#) (const char *pathname, long mode)
 - Create a directory.*
- int CPL_DLL [VSIrmdir](#) (const char *pathname)
 - Delete a directory.*
- int CPL_DLL [VSIUnlink](#) (const char *pathname)
 - Delete a file.*
- int CPL_DLL [VSIRename](#) (const char *oldpath, const char *newpath)
 - Rename a file.*
- char CPL_DLL * [VSISterror](#) (int)
- [GIntBig](#) CPL_DLL [VSIGetDiskFreeSpace](#) (const char *pszDirname)
 - Return free disk space available on the filesystem.*
- void CPL_DLL [VSIInstallMemFileHandler](#) (void)
 - Install "memory" file system handler.*
- void CPL_DLL [VSIInstallSubFileHandler](#) (void)
- void [VSIInstallGZipFileHandler](#) (void)
 - Install GZip file system handler.*
- void [VSIInstallZipFileHandler](#) (void)
 - Install ZIP file system handler.*
- void [VSIInstallStdinHandler](#) (void)
 - Install /vsistdin/ file system handler.*
- void [VSIInstallStdoutHandler](#) (void)
 - Install /vsistdout/ file system handler.*
- void CPL_DLL [VSIInstallSparseFileHandler](#) (void)
- void [VSIInstallTarFileHandler](#) (void)
 - Install /vsitar/ file system handler.*

- VSILFILE CPL_DLL * VSIFileFromMemBuffer (const char *pszFilename, GByte *pabyData, vsi_l_offset n-DataLength, int bTakeOwnership) CPL_WARN_UNUSED_RESULT
Create memory "file" from a buffer.
- GByte CPL_DLL * VSIGetMemFileBuffer (const char *pszFilename, vsi_l_offset *pnDataLength, int bUnlink-AndSeize)
Fetch buffer underlying memory file.
- void CPL_DLL VSISTdoutSetRedirection (VSIWriteFunction pFct, FILE *stream)

11.12.1 Detailed Description

Standard C Covers

The VSI functions are intended to be hookable aliases for Standard C I/O, memory allocation and other system functions. They are intended to allow virtualization of disk I/O so that non file data sources can be made to appear as files, and so that additional error trapping and reporting can be interested. The memory access API is aliased so that special application memory management services can be used.

It is intended that each of these functions retains exactly the same calling pattern as the original Standard C functions they relate to. This means we don't have to provide custom documentation, and also means that the default implementation is very simple.

11.12.2 Macro Definition Documentation

11.12.2.1 #define CPLReadDir VSIReadDir

Alias of [VSIReadDir\(\)](#)

11.12.2.2 #define VSI_CALLOC_VERBOSE(nCount, nSize) VSICallocVerbose(nCount,nSize, __FILE__, __LINE__)

VSI_CALLOC_VERBOSE

11.12.2.3 #define VSI_ISDIR(x) S_ISDIR(x)

Test if the file is a directory

11.12.2.4 #define VSI_ISLNK(x) S_ISLNK(x)

Test if the file is a symbolic link

11.12.2.5 #define VSI_ISREG(x) S_ISREG(x)

Test if the file is a regular file

11.12.2.6 #define VSI_L_OFFSET_MAX GUINTBIG_MAX

Maximum value for a file offset

11.12.2.7 #define VSI_MALLOC2_VERBOSE(nSize1, nSize2) VSIMalloc2Verbose(nSize1,nSize2, __FILE__, __LINE__)

VSI_MALLOC2_VERBOSE

11.12.2.8 `#define VSI_MALLOC3_VERBOSE(nSize1, nSize2, nSize3) VSIMalloc3Verbose(nSize1,nSize2,nSize3, __FILE__, __LINE__)`

VSI_MALLOC3_VERBOSE

11.12.2.9 `#define VSI_MALLOC_ALIGNED_AUTO_VERBOSE(size) VSIMallocAlignedAutoVerbose(size, __FILE__, __LINE__)`

[VSIMallocAlignedAutoVerbose\(\)](#) with FILE and LINE reporting

11.12.2.10 `#define VSI_MALLOC_VERBOSE(size) VSIMallocVerbose(size, __FILE__, __LINE__)`

VSI_MALLOC_VERBOSE

11.12.2.11 `#define VSI_REALLOC_VERBOSE(pOldPtr, nNewSize) VSIReallocVerbose(pOldPtr,nNewSize, __FILE__, __LINE__)`

VSI_REALLOC_VERBOSE

11.12.2.12 `#define VSI_STAT_EXISTS_FLAG 0x1`

Flag provided to [VSIStatExL\(\)](#) to test if the file exists

11.12.2.13 `#define VSI_STAT_NATURE_FLAG 0x2`

Flag provided to [VSIStatExL\(\)](#) to query the nature (file/dir) of the file

11.12.2.14 `#define VSI_STAT_SET_ERROR_FLAG 0x8`

Flag provided to [VSIStatExL\(\)](#) to issue a VSSError in case of failure

11.12.2.15 `#define VSI_STAT_SIZE_FLAG 0x4`

Flag provided to [VSIStatExL\(\)](#) to query the file size

11.12.2.16 `#define VSI_STRDUP_VERBOSE(pszStr) VSIStrdupVerbose(pszStr, __FILE__, __LINE__)`

VSI_STRDUP_VERBOSE

11.12.3 Typedef Documentation

11.12.3.1 `typedef GUIntBig vsi_i_offset`

Type for a file offset

11.12.3.2 `typedef FILE VSILFILE`

Opaque type for a FILE that implements the [VSIVirtualHandle](#) API

11.12.3.3 typedef struct VSI_STAT64_T VSISatBufL

Type for [VSISatL\(\)](#)

11.12.3.4 typedef size_t(* VSIWriteFunction)(const void *ptr, size_t size, size_t nmem, FILE *stream)

Callback used by [VSIStdoutSetRedirection\(\)](#)

11.12.4 Enumeration Type Documentation

11.12.4.1 enum VSIRangeStatus

Range status

Enumerator

VSI_RANGE_STATUS_UNKNOWN Unknown

VSI_RANGE_STATUS_DATA Data present

VSI_RANGE_STATUS_HOLE Hole

11.12.5 Function Documentation

11.12.5.1 GIntBig CPL_DLL CPLGetPhysicalRAM (void)

Return the total physical RAM in bytes.

Returns

the total physical RAM in bytes (or 0 in case of failure).

Since

GDAL 2.0

11.12.5.2 GIntBig CPL_DLL CPLGetUsablePhysicalRAM (void)

Return the total physical RAM, usable by a process, in bytes.

This is the same as [CPLGetPhysicalRAM\(\)](#) except it will limit to 2 GB for 32 bit processes.

Note: This memory may already be partly used by other processes.

Returns

the total physical RAM, usable by a process, in bytes (or 0 in case of failure).

Since

GDAL 2.0

11.12.5.3 void CPL_DLL* VSICalloc (size_t nCount, size_t nSize)

Analog of `calloc()`. Use [VSIFree\(\)](#) to free

11.12.5.4 void CPL_DLL* VSICallocVerbose (size_t *nCount*, size_t *nSize*, const char * *pszFile*, int *nLine*)

VSICallocVerbose

11.12.5.5 int CPL_DLL VSIFcloseL (VSILFILE * *fp*)

Close file.

This function closes the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fclose() function.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() . Passing a nullptr produces undefined behavior.
-----------	--

Returns

0 on success or -1 on failure.

11.12.5.6 int CPL_DLL VSIFEofL (VSILFILE * *fp*)

Test for end of file.

Returns TRUE (non-zero) if an end-of-file condition occurred during the previous read operation. The end-of-file flag is cleared by a successful [VSIFSeekL\(\)](#) call.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX feof() call.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
-----------	---

Returns

TRUE if at EOF else FALSE.

11.12.5.7 int CPL_DLL VSIFflushL (VSILFILE * *fp*)

Flush pending writes to disk.

For files in write or update mode and on filesystem types where it is applicable, all pending output on the file is flushed to the physical disk.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fflush() call.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
-----------	---

Returns

0 on success or -1 on error.

11.12.5.8 void CPL_DLL* VSIFGetNativeFileDescriptorL (VSILFILE * fp)

Returns the "native" file descriptor for the virtual handle.

This will only return a non-NULL value for "real" files handled by the operating system (to be opposed to GDAL virtual file systems).

On POSIX systems, this will be a integer value ("fd") cast as a void*. On Windows systems, this will be the HANDLE.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
-----------	---

Returns

the native file descriptor, or NULL.

11.12.5.9 VSIRangeStatus CPL_DLL VSIFGetRangeStatusL (VSILFILE * fp, vsi_l_offset nOffset, vsi_l_offset nLength)

Return if a given file range contains data or holes filled with zeroes.

This uses the filesystem capabilities of querying which regions of a sparse file are allocated or not. This is currently only implemented for Linux (and no other Unix derivatives) and Windows.

Note: A return of VSI_RANGE_STATUS_DATA doesn't exclude that the extent is filled with zeroes! It must be interpreted as "may contain non-zero data".

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
<i>nOffset</i>	offset of the start of the extent.
<i>nLength</i>	extent length.

Returns

extent status: VSI_RANGE_STATUS_UNKNOWN, VSI_RANGE_STATUS_DATA or VSI_RANGE_STATUS_HOLE

Since

GDAL 2.2

11.12.5.10 VSILFILE CPL_DLL* VSIFileFromMemBuffer (const char * pszFilename, GByte * pabyData, vsi_l_offset nDataLength, int bTakeOwnership)

Create memory "file" from a buffer.

A virtual memory file is created from the passed buffer with the indicated filename. Under normal conditions the filename would need to be absolute and within the /vsimem/ portion of the filesystem.

If bTakeOwnership is TRUE, then the memory file system handler will take ownership of the buffer, freeing it when the file is deleted. Otherwise it remains the responsibility of the caller, but should not be freed as long as it might be accessed as a file. In no circumstances does this function take a copy of the pabyData contents.

Parameters

<i>pszFilename</i>	the filename to be created.
<i>pabyData</i>	the data buffer for the file.
<i>nDataLength</i>	the length of buffer in bytes.
<i>bTakeOwnership</i>	TRUE to transfer "ownership" of buffer or FALSE.

Returns

open file handle on created file (see [VSIFOpenL\(\)](#)).

11.12.5.11 VSILFILE CPL_DLL* VSIFOpenExL (const char * *pszFilename*, const char * *pszAccess*, int *bSetError*)

Open file.

This function opens a file with the desired access. Large files (larger than 2GB) should be supported. Binary access is always implied and the "b" does not need to be included in the *pszAccess* string.

Note that the "VSILFILE *" returned by this function is *NOT* a standard C library FILE *, and cannot be used with any functions other than the "VSI*L" family of functions. They aren't "real" FILE objects.

On windows it is possible to define the configuration option GDAL_FILE_IS_UTF8 to have *pszFilename* treated as being in the local encoding instead of UTF-8, restoring the pre-1.8.0 behavior of [VSIFOpenL\(\)](#).

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fopen()` function.

Parameters

<i>pszFilename</i>	the file to open. UTF-8 encoded.
<i>pszAccess</i>	access requested (i.e. "r", "r+", "w")
<i>bSetError</i>	flag determining whether or not this open call should set VSIFerrors on failure.

Returns

NULL on failure, or the file handle.

Since

GDAL 2.1

11.12.5.12 VSILFILE CPL_DLL* VSIFOpenL (const char * *pszFilename*, const char * *pszAccess*)

Open file.

This function opens a file with the desired access. Large files (larger than 2GB) should be supported. Binary access is always implied and the "b" does not need to be included in the *pszAccess* string.

Note that the "VSILFILE *" returned since GDAL 1.8.0 by this function is *NOT* a standard C library FILE *, and cannot be used with any functions other than the "VSI*L" family of functions. They aren't "real" FILE objects.

On windows it is possible to define the configuration option GDAL_FILE_IS_UTF8 to have *pszFilename* treated as being in the local encoding instead of UTF-8, restoring the pre-1.8.0 behavior of [VSIFOpenL\(\)](#).

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fopen()` function.

Parameters

<i>pszFilename</i>	the file to open. UTF-8 encoded.
<i>pszAccess</i>	access requested (i.e. "r", "r+", "w")

Returns

NULL on failure, or the file handle.

11.12.5.13 `int CPL_DLL int CPL_DLL VSIFPutcL (int nChar, VSILFILE * fp)`

Write a single byte to the file.

Writes the character *nChar*, cast to an unsigned char, to file.

Almost an analog of the POSIX `fputc()` call, except that it returns the number of character written (1 or 0), and not the (cast) character itself or EOF.

Parameters

<i>nChar</i>	character to write.
<i>fp</i>	file handle opened with VSIFOpenL() .

Returns

1 in case of success, 0 on error.

11.12.5.14 `size_t CPL_DLL VSIFReadL (void * pBuffer, size_t nSize, size_t nCount, VSILFILE * fp)`

Read bytes from file.

Reads *nCount* objects of *nSize* bytes from the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `fread()` call.

Parameters

<i>pBuffer</i>	the buffer into which the data should be read (at least $nCount * nSize$ bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.
<i>fp</i>	file handle opened with VSIFOpenL() .

Returns

number of objects successfully read.

11.12.5.15 `int CPL_DLL VSIFReadMultiRangeL (int nRanges, void ** ppData, const vsi_l_offset * panOffsets, const size_t * panSizes, VSILFILE * fp)`

Read several ranges of bytes from file.

Reads *nRanges* objects of *panSizes*[*i*] bytes from the indicated file at the offset *panOffsets*[*i*] into the buffer *ppData*[*i*].

Ranges must be sorted in ascending start offset, and must not overlap each other.

This method goes through the VSIFFileHandler virtualization and may work on unusual filesystems such as in memory or `/vsicurl/`.

Parameters

<i>nRanges</i>	number of ranges to read.
<i>ppData</i>	array of nRanges buffer into which the data should be read (<i>ppData</i> [<i>i</i>] must be at list <i>panSizes</i> [<i>i</i>] bytes).
<i>panOffsets</i>	array of nRanges offsets at which the data should be read.
<i>panSizes</i>	array of nRanges sizes of objects to read (in bytes).
<i>fp</i>	file handle opened with VSIFOpenL() .

Returns

0 in case of success, -1 otherwise.

Since

GDAL 1.9.0

11.12.5.16 void CPL_DLL VSIFree (void * *pData*)

Analog of free() for data allocated with [VSIMalloc\(\)](#), [VSIAlloc\(\)](#), [VSIFreeAlloc\(\)](#)

11.12.5.17 void CPL_DLL VSIFreeAligned (void * *ptr*)

Free a buffer allocated with [VSIMallocAligned\(\)](#).

Parameters

<i>ptr</i>	Buffer to free.
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Since

GDAL 2.2

11.12.5.18 int CPL_DLL VSIFseekL (VSILFILE * *fp*, vsi_i_offset *nOffset*, int *nWhence*)

Seek to requested offset.

Seek to the desired offset (*nOffset*) in the indicated file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fseek() call.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
<i>nOffset</i>	offset in bytes.
<i>nWhence</i>	one of SEEK_SET, SEEK_CUR or SEEK_END.

Returns

0 on success or -1 one failure.

11.12.5.19 vsi_l_offset CPL_DLL VSIFTellL (VSILFILE * fp)

Tell current file offset.

Returns the current file read/write offset in bytes from the beginning of the file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX ftell() call.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
-----------	---

Returns

file offset in bytes.

11.12.5.20 int CPL_DLL VSIFTruncateL (VSILFILE * fp, vsi_l_offset nNewSize)

Truncate/expand the file to the specified size.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX ftruncate() call.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
<i>nNewSize</i>	new size in bytes.

Returns

0 on success

Since

GDAL 1.9.0

11.12.5.21 size_t CPL_DLL VSIFWriteL (const void * pBuffer, size_t nSize, size_t nCount, VSILFILE * fp)

Write bytes to file.

Writes nCount objects of nSize bytes to the indicated file at the current offset into the indicated buffer.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fwrite() call.

Parameters

<i>pBuffer</i>	the buffer from which the data should be written (at least nCount * nSize bytes in size).
<i>nSize</i>	size of objects to read in bytes.
<i>nCount</i>	number of objects to read.

<i>fp</i>	file handle opened with VSIFOpenL() .
-----------	---

Returns

number of objects successfully written.

11.12.5.22 GIntBig CPL_DLL VSIGetDiskFreeSpace (const char * *pszDirname*)

Return free disk space available on the filesystem.

This function returns the free disk space available on the filesystem.

Parameters

<i>pszDirname</i>	a directory of the filesystem to query.
-------------------	---

Returns

The free space in bytes. Or -1 in case of error.

Since

GDAL 2.1

11.12.5.23 GByte CPL_DLL* VSIGetMemFileBuffer (const char * *pszFilename*, vsi_l_offset * *pnDataLength*, int *bUnlinkAndSeize*)

Fetch buffer underlying memory file.

This function returns a pointer to the memory buffer underlying a virtual "in memory" file. If *bUnlinkAndSeize* is TRUE the filesystem object will be deleted, and ownership of the buffer will pass to the caller otherwise the underlying file will remain in existence.

Parameters

<i>pszFilename</i>	the name of the file to grab the buffer of.
<i>pnDataLength</i>	(file) length returned in this variable.
<i>bUnlinkAndSeize</i>	TRUE to remove the file, or FALSE to leave unaltered.

Returns

pointer to memory buffer or NULL on failure.

11.12.5.24 int CPL_DLL VSIngestFile (VSILFILE * *fp*, const char * *pszFilename*, GByte ** *ppabyRet*, vsi_l_offset * *pnSize*, GIntBig *nMaxSize*)

Ingest a file into memory.

Read the whole content of a file into a memory buffer.

Either *fp* or *pszFilename* can be NULL, but not both at the same time.

If *fp* is passed non-NULL, it is the responsibility of the caller to close it.

If non-NULL, the returned buffer is guaranteed to be NUL-terminated.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL() .
<i>pszFilename</i>	filename.
<i>ppabyRet</i>	pointer to the target buffer. *ppabyRet must be freed with VSIFree()
<i>pnSize</i>	pointer to variable to store the file size. May be NULL.
<i>nMaxSize</i>	maximum size of file allowed. If no limit, set to a negative value.

Returns

TRUE in case of success.

Since

GDAL 1.11

11.12.5.25 void VSInstallGZipFileHandler (void)

Install GZip file system handler.

A special file handler is installed that allows reading on-the-fly and writing in GZip (.gz) files.

All portions of the file system underneath the base path "/vsigzip/" will be handled by this driver.

Additional documentation is to be found at: <http://trac.osgeo.org/gdal/wiki/UserDocs/Read-InZip>

Since

GDAL 1.6.0

11.12.5.26 void CPL_DLL VSInstallMemFileHandler (void)

Install "memory" file system handler.

A special file handler is installed that allows block of memory to be treated as files. All portions of the file system underneath the base path "/vsimem/" will be handled by this driver.

Normal VSIL functions can be used freely to create and destroy memory arrays treating them as if they were real file system objects. Some additional methods exist to efficient create memory file system objects without duplicating original copies of the data or to "steal" the block of memory associated with a memory file.

At this time the memory handler does not properly handle directory semantics for the memory portion of the filesystem. The [VSIRReadDir\(\)](#) function is not supported though this will be corrected in the future.

Calling this function repeatedly should do no harm, though it is not necessary. It is already called the first time a virtualizable file access function (i.e. [VSIFOpenL\(\)](#), [VSIMkDir\(\)](#), etc) is called.

This code example demonstrates using GDAL to translate from one memory buffer to another.

```
* GByte *ConvertBufferFormat( GByte *pabyInData, vsi_l_offset nInDataLength,
*                               vsi_l_offset *pnOutDataLength )
* {
*     // create memory file system object from buffer.
*     VSIFCloseL( VSIFFileFromMemBuffer( "/vsimem/work.dat", pabyInData,
*                                       nInDataLength, FALSE ) );
*
*     // Open memory buffer for read.
*     GDALDatasetH hDS = GDALOpen( "/vsimem/work.dat", GA_ReadOnly );
*
*     // Get output format driver.
*     GDALDriverH hDriver = GDALGetDriverByName( "GTiff" );
*     GDALDatasetH hOutDS;
*
*     hOutDS = GDALCreateCopy( hDriver, "/vsimem/out.tif", hDS, TRUE, NULL,
```

```

*             NULL, NULL );
*
* // close source file, and "unlink" it.
* GDALClose( hDS );
* VSIUnlink( "/vsimem/work.dat" );
*
* // seize the buffer associated with the output file.
*
* return VSIGetMemFileBuffer( "/vsimem/out.tif", pnOutDataLength, TRUE );
* }
*

```

11.12.5.27 void CPL_DLL VSIInstallSparseFileHandler (void)

Install /vsiparse/ virtual file handler.

The sparse virtual file handler allows a virtual file to be composed from chunks of data in other files, potentially with large spaces in the virtual file set to a constant value. This can make it possible to test some sorts of operations on what seems to be a large file with image data set to a constant value. It is also helpful when wanting to add test files to the test suite that are too large, but for which most of the data can be ignored. It could, in theory, also be used to treat several files on different file systems as one large virtual file.

The file referenced by /vsiparse/ should be an XML control file formatted something like:

```

<VSISparseFile>
  <Length>87629264</Length>
  <SubfileRegion> Stuff at start of file.
    <Filename relative="1">251_head.dat</Filename>
    <DestinationOffset>0</DestinationOffset>
    <SourceOffset>0</SourceOffset>
    <RegionLength>2768</RegionLength>
  </SubfileRegion>

  <SubfileRegion> RasterDMS node.
    <Filename relative="1">251_rasterdms.dat</Filename>
    <DestinationOffset>87313104</DestinationOffset>
    <SourceOffset>0</SourceOffset>
    <RegionLength>160</RegionLength>
  </SubfileRegion>

  <SubfileRegion> Stuff at end of file.
    <Filename relative="1">251_tail.dat</Filename>
    <DestinationOffset>87611924</DestinationOffset>
    <SourceOffset>0</SourceOffset>
    <RegionLength>17340</RegionLength>
  </SubfileRegion>

  <ConstantRegion> Default for the rest of the file.
    <DestinationOffset>0</DestinationOffset>
    <RegionLength>87629264</RegionLength>
    <Value>0</Value>
  </ConstantRegion>
</VSISparseFile>

```

Hopefully the values and semantics are fairly obvious.

This driver is installed by default.

11.12.5.28 void VSIInstallStdinHandler (void)

Install /vsistdin/ file system handler.

A special file handler is installed that allows reading from the standard input stream.

The file operations available are of course limited to Read() and forward Seek() (full seek in the first MB of a file).

Since

GDAL 1.8.0

11.12.5.29 void VSInstallStdoutHandler (void)

Install /vsistdout/ file system handler.

A special file handler is installed that allows writing to the standard output stream.

The file operations available are of course limited to Write().

Since

GDAL 1.8.0

11.12.5.30 void CPL_DLL VSInstallSubFileHandler (void)

Install /vsisubfile/ virtual file handler.

This virtual file system handler allows access to subregions of files, treating them as a file on their own to the virtual file system functions ([VSIFOpenL\(\)](#), etc).

A special form of the filename is used to indicate a subportion of another file:

```
/vsisubfile/<offset>[_<size>],<filename>
```

The size parameter is optional. Without it the remainder of the file from the start offset as treated as part of the subfile. Otherwise only <size> bytes from <offset> are treated as part of the subfile. The <filename> portion may be a relative or absolute path using normal rules. The <offset> and <size> values are in bytes.

eg. /vsisubfile/1000_3000,/data/abc.ntf /vsisubfile/5000,..xyz/raw.dat

Unlike the /vsimem/ or conventional file system handlers, there is no meaningful support for filesystem operations for creating new files, traversing directories, and deleting files within the /vsisubfile/ area. Only the [VSIStatL\(\)](#), [VSIFOpenL\(\)](#) and operations based on the file handle returned by [VSIFOpenL\(\)](#) operate properly.

11.12.5.31 void VSInstallTarFileHandler (void)

Install /vsitar/ file system handler.

A special file handler is installed that allows reading on-the-fly in TAR (regular .tar, or compressed .tar.gz/.tgz) archives.

All portions of the file system underneath the base path "/vsitar/" will be handled by this driver.

The syntax to open a file inside a tar file is /vsitar/path/to/the/file.tar/path/inside/the/tar/file where path/to/the/file.tar is relative or absolute and path/inside/the/tar/file is the relative path to the file inside the archive.

Starting with GDAL 2.2, an alternate syntax is available so as to enable chaining and not being dependent on .tar extension : /vsitar/{/path/to/the/archive}/path/inside/the/tar/file. Note that /path/to/the/archive may also itself this alternate syntax.

If the path is absolute, it should begin with a / on a Unix-like OS (or C:\ on Windows), so the line looks like /vsitar//home/gdal/... For example gdalinfo /vsitar/myarchive.tar/subdir1/file1.tif

Syntactic sugar : if the tar archive contains only one file located at its root, just mentioning "/vsitar/path/to/the/file.-tar" will work

[VSIStatL\(\)](#) will return the uncompressed size in st_size member and file nature- file or directory - in st_mode member.

Directory listing is available through [VSIReadDir\(\)](#).

Since

GDAL 1.8.0

11.12.5.32 void VSInstallZipFileHandler (void)

Install ZIP file system handler.

A special file handler is installed that allows reading on-the-fly in ZIP (.zip) archives.

All portions of the file system underneath the base path "/vsizip/" will be handled by this driver.

The syntax to open a file inside a zip file is /vsizip/path/to/the/file.zip/path/inside/the/zip/file where path/to/the/file.zip is relative or absolute and path/inside/the/zip/file is the relative path to the file inside the archive.

Starting with GDAL 2.2, an alternate syntax is available so as to enable chaining and not being dependent on .zip extension : /vsitar{/path/to/the/archive}/path/inside/the/zip/file. Note that /path/to/the/archive may also itself this alternate syntax.

If the path is absolute, it should begin with a / on a Unix-like OS (or C:\ on Windows), so the line looks like /vsizip//home/gdal/... For example gdalinfo /vsizip/myarchive.zip/subdir1/file1.tif

Syntactic sugar : if the .zip file contains only one file located at its root, just mentioning "/vsizip/path/to/the/file.zip" will work

[VSISStatL\(\)](#) will return the uncompressed size in st_size member and file nature- file or directory - in st_mode member.

Directory listing is available through [VSIReadDir\(\)](#).

Since GDAL 1.8.0, write capabilities are available. They allow creating a new zip file and adding new files to an already existing (or just created) zip file. Read and write operations cannot be interleaved : the new zip must be closed before being re-opened for read.

Additional documentation is to be found at <http://trac.osgeo.org/gdal/wiki/UserDocs/ReadIn-Zip>

Since

GDAL 1.6.0

11.12.5.33 int CPL_DLL VSIsCaseSensitiveFS (const char * pszFilename)

Returns if the filenames of the filesystem are case sensitive.

This method retrieves to which filesystem belongs the passed filename and return TRUE if the filenames of that filesystem are case sensitive.

Currently, this will return FALSE only for Windows real filenames. Other VSI virtual filesystems are case sensitive.

This methods avoid ugly `#ifndef WIN32 / #endif` code, that is wrong when dealing with virtual filenames.

Parameters

<i>pszFilename</i>	the path of the filesystem object to be tested. UTF-8 encoded.
--------------------	--

Returns

TRUE if the filenames of the filesystem are case sensitive.

Since

GDAL 1.8.0

11.12.5.34 void CPL_DLL* VSIMalloc (size_t nSize)

Analog of malloc(). Use [VSIFree\(\)](#) to free

11.12.5.35 void CPL_DLL* VSIMalloc2 (size_t nSize1, size_t nSize2)

VSIMalloc2 allocates (nSize1 * nSize2) bytes. In case of overflow of the multiplication, or if memory allocation fails, a NULL pointer is returned and a CE_Failure error is raised with CPL_Error(). If nSize1 == 0 || nSize2 == 0, a NULL pointer will also be returned. [CPLFree\(\)](#) or [VSIFree\(\)](#) can be used to free memory allocated by this function.

11.12.5.36 void CPL_DLL* VSIMalloc2Verbose (size_t nSize1, size_t nSize2, const char * pszFile, int nLine)

VSIMalloc2Verbose

11.12.5.37 void CPL_DLL* VSIMalloc3 (size_t nSize1, size_t nSize2, size_t nSize3)

VSIMalloc3 allocates (nSize1 * nSize2 * nSize3) bytes. In case of overflow of the multiplication, or if memory allocation fails, a NULL pointer is returned and a CE_Failure error is raised with CPL_Error(). If nSize1 == 0 || nSize2 == 0 || nSize3 == 0, a NULL pointer will also be returned. [CPLFree\(\)](#) or [VSIFree\(\)](#) can be used to free memory allocated by this function.

11.12.5.38 void CPL_DLL* VSIMalloc3Verbose (size_t nSize1, size_t nSize2, size_t nSize3, const char * pszFile, int nLine)

VSIMalloc3Verbose

11.12.5.39 void CPL_DLL* VSIMallocAligned (size_t nAlignment, size_t nSize)

Allocates a buffer with an alignment constraint.

The return value must be freed with [VSIFreeAligned\(\)](#).

Parameters

<i>nAlignment</i>	Must be a power of 2, multiple of sizeof(void*), and lesser than 256.
<i>nSize</i>	Size of the buffer to allocate.

Returns

a buffer aligned on nAlignment and of size nSize, or NULL

Since

GDAL 2.2

11.12.5.40 void CPL_DLL* VSIMallocAlignedAuto (size_t nSize)

Allocates a buffer with an alignment constraint such that it can be used by the most demanding vector instruction set on that platform.

The return value must be freed with [VSIFreeAligned\(\)](#).

Parameters

<i>nSize</i>	Size of the buffer to allocate.
--------------	---------------------------------

Returns

an aligned buffer of size *nSize*, or NULL

Since

GDAL 2.2

11.12.5.41 void CPL_DLL* VSIMallocAlignedAutoVerbose (size_t *nSize*, const char * *pszFile*, int *nLine*)

See [VSIMallocAlignedAuto\(\)](#)

11.12.5.42 void CPL_DLL* VSIMallocVerbose (size_t *nSize*, const char * *pszFile*, int *nLine*)

VSIMallocVerbose

11.12.5.43 int CPL_DLL VSIMkdir (const char * *pszPathname*, long *mode*)

Create a directory.

Create a new directory with the indicated mode. The mode is ignored on some platforms. A reasonable default mode value would be 0666. This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX mkdir() function.

Parameters

<i>pszPathname</i>	the path to the directory to create. UTF-8 encoded.
<i>mode</i>	the permissions mode.

Returns

0 on success or -1 on an error.

11.12.5.44 char CPL_DLL** VSIReadDir (const char * *pszPath*)

Read names in a directory.

This function abstracts access to directory contents. It returns a list of strings containing the names of files, and directories in this directory. The resulting string list becomes the responsibility of the application and should be freed with [CSLDestroy\(\)](#) when no longer needed.

Note that no error is issued via CPLError() if the directory path is invalid, though NULL is returned.

This function used to be known as [CPLReadDir\(\)](#), but the old name is now deprecated.

Parameters

<i>pszPath</i>	the relative, or absolute path of a directory to read. UTF-8 encoded.
----------------	---

Returns

The list of entries in the directory, or NULL if the directory doesn't exist. Filenames are returned in UTF-8 encoding.

11.12.5.45 char CPL_DLL VSIReadDirEx (const char * *pszPath*, int *nMaxFiles*)**

Read names in a directory.

This function abstracts access to directory contents. It returns a list of strings containing the names of files, and directories in this directory. The resulting string list becomes the responsibility of the application and should be freed with [CSLDestroy\(\)](#) when no longer needed.

Note that no error is issued via [CPLERROR\(\)](#) if the directory path is invalid, though NULL is returned.

If *nMaxFiles* is set to a positive number, directory listing will stop after that limit has been reached. Note that to indicate truncate, at least one element more than the *nMaxFiles* limit will be returned. If [CSLCount\(\)](#) on the result is lesser or equal to *nMaxFiles*, then no truncation occurred.

Parameters

<i>pszPath</i>	the relative, or absolute path of a directory to read. UTF-8 encoded.
<i>nMaxFiles</i>	maximum number of files after which to stop, or 0 for no limit.

Returns

The list of entries in the directory, or NULL if the directory doesn't exist. Filenames are returned in UTF-8 encoding.

Since

GDAL 2.1

11.12.5.46 char CPL_DLL VSIReadDirRecursive (const char * *pszPathIn*)**

Read names in a directory recursively.

This function abstracts access to directory contents and subdirectories. It returns a list of strings containing the names of files and directories in this directory and all subdirectories. The resulting string list becomes the responsibility of the application and should be freed with [CSLDestroy\(\)](#) when no longer needed.

Note that no error is issued via [CPLERROR\(\)](#) if the directory path is invalid, though NULL is returned.

Parameters

<i>pszPathIn</i>	the relative, or absolute path of a directory to read. UTF-8 encoded.
------------------	---

Returns

The list of entries in the directory and subdirectories or NULL if the directory doesn't exist. Filenames are returned in UTF-8 encoding.

Since

GDAL 1.10.0

11.12.5.47 void CPL_DLL* VSIRealloc (void * *pData*, size_t *nNewSize*)

Analog of realloc(). Use VSIFree() to free

11.12.5.48 void CPL_DLL* VSIReallocVerbose (void * *pOldPtr*, size_t *nNewSize*, const char * *pszFile*, int *nLine*)

VSIReallocVerbose

11.12.5.49 int CPL_DLL VSIRename (const char * *oldpath*, const char * *newpath*)

Rename a file.

Renames a file object in the file system. It should be possible to rename a file onto a new filesystem, but it is safest if this function is only used to rename files that remain in the same directory.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX rename() function.

Parameters

<i>oldpath</i>	the name of the file to be renamed. UTF-8 encoded.
<i>newpath</i>	the name the file should be given. UTF-8 encoded.

Returns

0 on success or -1 on an error.

11.12.5.50 void CPL_DLL VSIRewindL (VSILFILE * *fp*)

Rewind the file pointer to the beginning of the file.

This is equivalent to VSIFSeekL(fp, 0, SEEK_SET)

Analog of the POSIX rewind() call.

Parameters

<i>fp</i>	file handle opened with VSIFOpenL().
-----------	--------------------------------------

11.12.5.51 int CPL_DLL VSIRmdir (const char * *pszDirname*)

Delete a directory.

Deletes a directory object from the file system. On some systems the directory must be empty before it can be deleted.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX rmdir() function.

Parameters

<i>pszDirname</i>	the path of the directory to be deleted. UTF-8 encoded.
-------------------	---

Returns

0 on success or -1 on an error.

11.12.5.52 `int CPL_DLL VSISatExL (const char * pszFilename, VSISatBufL * psStatBuf, int nFlags)`

Get filesystem object info.

Fetches status information about a filesystem object (file, directory, etc). The returned information is placed in the VSISatBufL structure. For portability, only use the `st_size` (size in bytes) and `st_mode` (file type). This method is similar to `VSISat()`, but will work on large files on systems where this requires special calls.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `stat()` function, with an extra parameter to specify which information is needed, which offers a potential for speed optimizations on specialized and potentially slow virtual filesystem objects (`/vsigzip/`, `/vsicurl/`)

Parameters

<i>pszFilename</i>	the path of the filesystem object to be queried. UTF-8 encoded.
<i>psStatBuf</i>	the structure to load with information.
<i>nFlags</i>	0 to get all information, or <code>VSI_STAT_EXISTS_FLAG</code> , <code>VSI_STAT_NATURE_FLAG</code> or <code>VSI_STAT_SIZE_FLAG</code> , or a combination of those to get partial info.

Returns

0 on success or -1 on an error.

Since

GDAL 1.8.0

11.12.5.53 `int CPL_DLL VSISatL (const char * pszFilename, VSISatBufL * psStatBuf)`

Get filesystem object info.

Fetches status information about a filesystem object (file, directory, etc). The returned information is placed in the VSISatBufL structure. For portability, only use the `st_size` (size in bytes) and `st_mode` (file type). This method is similar to `VSISat()`, but will work on large files on systems where this requires special calls.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX `stat()` function.

Parameters

<i>pszFilename</i>	the path of the filesystem object to be queried. UTF-8 encoded.
<i>psStatBuf</i>	the structure to load with information.

Returns

0 on success or -1 on an error.

11.12.5.54 `void CPL_DLL VSIStdoutSetRedirection (VSIWriteFunction pFct, FILE * stream)`

Set an alternative write function and output file handle instead of `fwrite()` / `stdout`.

Parameters

<i>pFct</i>	Function with same signature as fwrite()
<i>stream</i>	File handle on which to output. Passed to pFct.

Since

GDAL 2.0

11.12.5.55 char CPL_DLL* VSIStrdup (const char * *pszString*)

Analog of strdup(). Use VSIFree() to free

11.12.5.56 char CPL_DLL* VSIStrdupVerbose (const char * *pszStr*, const char * *pszFile*, int *nLine*)

VSIStrdupVerbose

11.12.5.57 char CPL_DLL* VSIStrerror (int *nErrno*)

Return the error string corresponding to the error number. Do not free it

11.12.5.58 int CPL_DLL VSISupportsSparseFiles (const char * *pszPath*)

Returns if the filesystem supports sparse files.

Only supported on Linux (and no other Unix derivatives) and Windows. On Linux, the answer depends on a few hardcoded signatures for common filesystems. Other filesystems will be considered as not supporting sparse files.

Parameters

<i>pszPath</i>	the path of the filesystem object to be tested. UTF-8 encoded.
----------------	--

Returns

TRUE if the file system is known to support sparse files. FALSE may be returned both in cases where it is known to not support them, or when it is unknown.

Since

GDAL 2.2

11.12.5.59 int CPL_DLL VSIUnlink (const char * *pszFilename*)

Delete a file.

Deletes a file object from the file system.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX unlink() function.

Parameters

<i>pszFilename</i>	the path of the file to be deleted. UTF-8 encoded.
--------------------	--

Returns

0 on success or -1 on an error.

11.13 cpl_worker_thread_pool.h File Reference

```
#include "cpl_multiproc.h"
#include "cpl_list.h"
#include <vector>
```

Classes

- struct [CPLWorkerThreadJob](#)
- struct [CPLWorkerThread](#)
- class [CPLWorkerThreadPool](#)

11.13.1 Detailed Description

Class to manage a pool of worker threads.

Since

GDAL 2.1

11.14 sdtstdataset.cpp File Reference

```
#include "gdal_frmts.h"
#include "gdal_pam.h"
#include "ogr_spatialref.h"
#include "sdtst_al.h"
```

Classes

- class [SDTSDataset](#)
- class [SDTSRasterBand](#)

11.14.1 Detailed Description

exclude