SDTS_AL

# Contents

# 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 fiarst 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 useable 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).

## Licensing

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## Building the Source

1. First, fetch the source. The most recent source should be accessable 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://mcmcweb.er.usgs.gov/sdts is the definative 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 accessable 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 accessable 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.

I would like to thank:

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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 is 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 DDBSubfieldDefn containing information about that subfield.

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

for( iSF=0; iSF < poFDefn->GetSubfieldCount(); iSF++ )
{
    DDFSubfieldDefn *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.

Coincidently (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::oModId 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 szOBRP 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 analygous 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();
```

```
    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;

            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 */
```

## Cleanup

In the case of sdts2shp, 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>

```
/* ******************************************************************************
 * $Id: sdts2shp.cpp 10645 2007-01-18 02:22:39Z warmerdam $
 *
 * 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 10645 2007-01-18 02:22:39Z warmerdam $");

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

/* -------------------------------------------------------------------- */
/*      Massage shapefile name to have no extension.                    */
/* -------------------------------------------------------------------- */
    pszShapefile = strdup( 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" );
        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" );
    }

/* -------------------------------------------------------------------- */
/*      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, "Unrecognised 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 )

{
    SDTSLineReader      *poLineReader;

/* -------------------------------------------------------------------- */
/*      Fetch a reference to the indexed Pointgon reader.                */
/* -------------------------------------------------------------------- */
    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;

    while( (poRawLine = poLineReader->GetNextLine()) != NULL )
    {
        int             iShape;

/* -------------------------------------------------------------------- */
/*      Write out a shape with the vertices.                            */
/* -------------------------------------------------------------------- */
        SHPObject       *psShape;

        psShape = SHPCreateSimpleObject( SHPT_ARC, poRawLine->nVertices,
                                         poRawLine->padfX, poRawLine->padfY,
                                         poRawLine->padfZ );

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

        SHPDestroyObject( psShape );

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

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

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

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

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

        sprintf( szID, "%s:%ld",
                 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 )

{
    SDTSPointReader     *poPointReader;

/* -------------------------------------------------------------------- */
/*      Fetch a reference to the indexed Pointgon reader.                */
/* -------------------------------------------------------------------- */
    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;

    while( (poRawPoint = poPointReader->GetNextPoint()) != NULL )
    {
        int             iShape;

/* -------------------------------------------------------------------- */
/*      Write out a shape with the vertices.                            */
/* -------------------------------------------------------------------- */
        SHPObject       *psShape;

        psShape = SHPCreateSimpleObject( SHPT_POINT, 1,
                                         &(poRawPoint->dfX),
                                         &(poRawPoint->dfY),
                                         &(poRawPoint->dfZ) );

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

        SHPDestroyObject( psShape );

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

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

        sprintf( szID, "%s:%ld",
                 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 )

{
    SDTSAttrReader      *poAttrReader;

/* -------------------------------------------------------------------- */
/*      Fetch a reference to the indexed Pointgon reader.                */
/* -------------------------------------------------------------------- */
    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;
    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 )
```

```
{
    SDTSPolygonReader *poPolyReader;

/* -------------------------------------------------------------------- */
/*      Fetch a reference to the indexed polygon reader.                */
/* -------------------------------------------------------------------- */
    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 );

/* -------------------------------------------------------------------- */
/*      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.                 */
/* ==================================================================== */
    SDTSRawPolygon      *poRawPoly;

    poPolyReader->Rewind();
    while( (poRawPoly = (SDTSRawPolygon *) poPolyReader->GetNextFeature())
           != NULL )
    {
```

```
        int             iShape;

/* -------------------------------------------------------------------- */
/*      Write out a shape with the vertices.                            */
/* -------------------------------------------------------------------- */
        SHPObject       *psShape;

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

        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++ )
    {
        SDTSAttrReader  *poAttrReader;

/* -------------------------------------------------------------------- */
/*      Get a reader on the desired module.                             */
/* -------------------------------------------------------------------- */
        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();

/* ------------------------------------------------------------------- */
/*      Read the first record so we can clone schema information off    */
/*      of it.                                                          */
/* ------------------------------------------------------------------- */
        SDTSAttrRecord  *poAttrFeature;

        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.     */
/* ==================================================================== */
    int         iAttrRecord;

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

        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;

            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

```
/* ******************************************************************************
 * $Id: 8211view.cpp 10645 2007-01-18 02:22:39Z warmerdam $
 *
 * Project:  SDTS Translator
 * Purpose:  Example program dumping data in 8211 data to stdout.
 * Author:   Frank Warmerdam, warmerdam@pobox.com
 *
 ******************************************************************************
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 * DEALINGS IN THE SOFTWARE.
 ******************************************************************************/

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

CPL_CVSID("$Id: 8211view.cpp 10645 2007-01-18 02:22:39Z warmerdam $");

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;
    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 )

{
    int         nBytesRemaining;
    const char  *pachFieldData;
    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.

    pachFieldData = poField->GetData();
    nBytesRemaining = poField->GetDataSize();

    /* ------------------------------------------------------- */
    /*      Loop over the repeat count for this fields         */
    /*      subfields.  The repeat count will almost           */
    /*      always be one.                                     */
```

```
    /* -------------------------------------------------------- */
    int         iRepeat;

    for( iRepeat = 0; iRepeat < poField->GetRepeatCount(); iRepeat++ )
    {

        /* -------------------------------------------------------- */
        /*   Loop over all the subfields of this field, advancing   */
        /*   the data pointer as we consume data.                   */
        /* -------------------------------------------------------- */
        int     iSF;

        for( iSF = 0; iSF < poFieldDefn->GetSubfieldCount(); iSF++ )
        {
            DDFSubfieldDefn *poSFDefn = poFieldDefn->GetSubfield( iSF );
            int         nBytesConsumed;

            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(),
                    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 < 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 = %u",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 = %u,FIDN = %u,FIDS = %u",
                     foid_agen,foid_find,foid_fids);
          }

          printf( "\n" );
      }
      break;

    }

    return nBytesConsumed;
}
```

# Chapter 6

# Class Index

## 6.1 Class Hierarchy

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


_CPLList . . . ??
CPLODBCDriverInstaller . . . ??
CPLODBCSession . . . ??
CPLODBCStatement . . . ??
CPLXMLNode . . . ??
DDFField . . . ??
DDFFieldDefn . . . ??
DDFModule . . . ??
DDFRecord . . . ??
DDFSubfieldDefn . . . ??
SDTS_CATD . . . ??
SDTS_IREF . . . ??
SDTS_XREF . . . ??
SDTSFeature . . . ??
  SDTSAttrRecord . . . ??
  SDTSRawLine . . . ??
  SDTSRawPoint . . . ??
  SDTSRawPolygon . . . ??
SDTSIndexedReader . . . ??
  SDTSAttrReader . . . ??
  SDTSLineReader . . . ??
  SDTSPointReader . . . ??
  SDTSPolygonReader . . . ??
SDTSModId . . . ??
SDTSRasterReader . . . ??
SDTSTransfer . . . ??

# Chapter 7

# Class Index

## 7.1 Class List

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


_CPLList . . . ??
CPLODBCDriverInstaller . . . ??
CPLODBCSession . . . ??
CPLODBCStatement . . . ??
CPLXMLNode . . . ??
DDFField . . . ??
DDFFieldDefn . . . ??
DDFModule . . . ??
DDFRecord . . . ??
DDFSubfieldDefn . . . ??
SDTS_CATD . . . ??
SDTS_IREF . . . ??
SDTS_XREF . . . ??
SDTSAttrReader . . . ??
SDTSAttrRecord . . . ??
SDTSFeature . . . ??
SDTSIndexedReader . . . ??
SDTSLineReader . . . ??
SDTSModId . . . ??
SDTSPointReader . . . ??
SDTSPolygonReader . . . ??
SDTSRasterReader . . . ??
SDTSRawLine . . . ??
SDTSRawPoint . . . ??
SDTSRawPolygon . . . ??
SDTSTransfer . . . ??

# Chapter 8

# File Index

## 8.1 File List

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


**cpl_config.h** . . . . . **??**
cpl_conv.h . . . . . **??**
**cpl_csv.h** . . . . . **??**
cpl_error.h . . . . . **??**
cpl_hash_set.h . . . . . **??**
**cpl_http.h** . . . . . **??**
cpl_list.h . . . . . **??**
cpl_minixml.h . . . . . **??**
**cpl_minizip_ioapi.h** . . . . . **??**
**cpl_minizip_unzip.h** . . . . . **??**
**cpl_multiproc.h** . . . . . **??**
cpl_odbc.h . . . . . **??**
cpl_port.h . . . . . **??**
cpl_quad_tree.h . . . . . **??**
cpl_string.h . . . . . **??**
cpl_vsi.h . . . . . **??**
**cpl_vsi_virtual.h** . . . . . **??**
**cpl_win32ce_api.h** . . . . . **??**
**cpl_wince.h** . . . . . **??**
**cplkeywordparser.h** . . . . . **??**
**iso8211.h** . . . . . **??**
**sdts_al.h** . . . . . **??**
sdtsdataset.cpp . . . . . **??**

# Chapter 9

# Class Documentation

## 9.1 _CPLList Struct Reference

`#include <cpl_list.h>`

### Public Attributes

- void * pData
- struct _CPLList * psNext

### 9.1.1 Detailed Description

List element structure.

### 9.1.2 Member Data Documentation

#### 9.1.2.1 void* _CPLList::pData

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

#### 9.1.2.2 struct _CPLList* _CPLList::psNext [read]

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

## 9.2 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)

### 9.2.1 Detailed Description

A class providing functions to install or remove ODBC driver.

### 9.2.2 Member Function Documentation

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

Installs ODBC driver or updates definition of already installed driver. Interanally, it calls ODBC's SQLInstallDriverEx function.

**Parameters:**

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

***pszPathIn*** - Full path of the target directory of the installation, or a null pointer (for unixODBC, NULL is passed).

***fRequest*** - The fRequest 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.

#### 9.2.2.2 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:**

***pszDriverName*** - The name of the driver as registered in the Odbcinst.ini key of the system information.

***fRemoveDSN*** - TRUE: Remove DSNs associated with the driver specified in lpszDriver. FALSE: Do not remove DSNs associated with the driver specified in lpszDriver.

**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

## 9.3 CPLODBCSession Class Reference

`#include <cpl_odbc.h>`

### Public Member Functions

- int EstablishSession (const char *pszDSN, const char *pszUserid, const char *pszPassword)
- const char * GetLastError ()

### 9.3.1 Detailed Description

A class representing an ODBC database session.

Includes error collection services.

### 9.3.2 Member Function Documentation

#### 9.3.2.1 int CPLODBCSession::EstablishSession (const char * *pszDSN*, const char * *pszUserid*, const char * *pszPassword*)

Connect to database and logon.

**Parameters:**

***pszDSN*** The name of the DSN being used to connect. This is not optional.

***pszUserid*** the userid to logon as, may be NULL if not not required, or provided by the DSN.

***pszPassword*** 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.

#### 9.3.2.2 const char * CPLODBCSession::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.

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

- cpl_odbc.h
- cpl_odbc.cpp

# 9.4 CPLODBCStatement Class Reference

`#include <cpl_odbc.h>`

## Public Member Functions

- void Clear ()
- void AppendEscaped (const char *)
- void Append (const char *)
- void Append (int)
- void Append (double)
- int Appendf (const char *,...)
- int ExecuteSQL (const char *=NULL)
- int Fetch (int nOrientation=SQL_FETCH_NEXT, int nOffset=0)
- int GetColCount ()
- const char * GetColName (int)
- short GetColType (int)
- const char * GetColTypeName (int)
- short GetColSize (int)
- short GetColPrecision (int)
- short GetColNullable (int)
- int GetColId (const char *)
- const char * GetColData (int, const char *=NULL)
- const char * GetColData (const char *, const char *=NULL)
- 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)

## Static Public Member Functions

- static CPLString GetTypeName (int)
- static SQLSMALLINT GetTypeMapping (SQLSMALLINT)

### 9.4.1 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.

### 9.4.2 Member Function Documentation

#### 9.4.2.1 void CPLODBCStatement::Clear ()

Clear internal command text and result set definitions.

#### 9.4.2.2 void CPLODBCStatement::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:**

***pszText*** text to append.

#### 9.4.2.3 void CPLODBCStatement::Append (const char * *pszText*)

Append text to internal command.

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

**Parameters:**

***pszText*** text to append.

#### 9.4.2.4 void CPLODBCStatement::Append (int *nValue*)

Append to internal command.

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

**Parameters:**

***nValue*** value to append to the command.

#### 9.4.2.5 void CPLODBCStatement::Append (double *dfValue*)

Append to internal command.

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

**Parameters:**

***dfValue*** value to append to the command.

#### 9.4.2.6 int CPLODBCStatement::Appendf (const char * *pszFormat*, ...)

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:**

***pszFormat*** printf() style format string.

**Returns:**

FALSE if formatting fails dueto result being too large.

#### 9.4.2.7 int CPLODBCStatement::ExecuteSQL (const char * *pszStatement* = NULL)

Execute an SQL statement.

This method will execute the passed (or stored) SQL statement, and initialize information about the result-set 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:**

***pszStatement*** 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().

#### 9.4.2.8 int CPLODBCStatement::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 occured if Fetch() fails.

**Parameters:**

***nOrientation*** One of SQL_FETCH_NEXT, SQL_FETCH_LAST, SQL_FETCH_PRIOR, SQL_FETCH_ABSOLUTE, or SQL_FETCH_RELATIVE (default is SQL_FETCH_NEXT).

***nOffset*** the offset (number of records), ignored for some orientations.

**Returns:**

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

#### 9.4.2.9 int CPLODBCStatement::GetColCount ()

Fetch the resultset column count.

**Returns:**

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

#### 9.4.2.10 const char * CPLODBCStatement::GetColName (int *iCol*)

Fetch a column name.

**Parameters:**

***iCol*** the zero based column index.

**Returns:**

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

#### 9.4.2.11 short CPLODBCStatement::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_-TIMESTAMPT.

**Parameters:**

***iCol*** the zero based column index.

**Returns:**

type code or -1 if the column is illegal.

#### 9.4.2.12 const char * CPLODBCStatement::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:**

***iCol*** 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.

#### 9.4.2.13 short CPLODBCStatement::GetColSize (int *iCol*)

Fetch the column width.

**Parameters:**

***iCol*** the zero based column index.

**Returns:**

column width, zero for unknown width columns.

#### 9.4.2.14 short CPLODBCStatement::GetColPrecision (int *iCol*)

Fetch the column precision.

**Parameters:**

***iCol*** 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.

#### 9.4.2.15 short CPLODBCStatement::GetColNullable (int *iCol*)

Fetch the column nullability.

**Parameters:**

***iCol*** the zero based column index.

**Returns:**

TRUE if the column may contains or FALSE otherwise.

#### 9.4.2.16 int CPLODBCStatement::GetColId (const char * *pszColName*)

Fetch column index.

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

**Parameters:**

***pszColName*** the name to search for.

**Returns:**

the column index, or -1 if not found.

#### 9.4.2.17 const char * CPLODBCStatement::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:**

***iCol*** the zero based column to fetch.

***pszDefault*** 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.

#### 9.4.2.18 const char * CPLODBCStatement::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:**

***pszColName*** the name of the column requested.

***pszDefault*** 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.

#### 9.4.2.19 int CPLODBCStatement::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 queriable object such as a view). The column definitions are digested and used to populate the CPLODBCStatement column definitions essentially as if a "SELECT * FROM tablename" had been done; however, no resultset will be available.

**Parameters:**

***pszTable*** the name of the table to query information on. This should not be empty.

***pszCatalog*** the catalog to find the table in, use NULL (the default) if no catalog is available.

***pszSchema*** the schema to find the table in, use NULL (the default) if no schema is available.

**Returns:**

TRUE on success or FALSE on failure.

#### 9.4.2.20 int CPLODBCStatement::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:**

***pszTable*** the name of the table to query information on. This should not be empty.

***pszCatalog*** the catalog to find the table in, use NULL (the default) if no catalog is available.

***pszSchema*** the schema to find the table in, use NULL (the default) if no schema is available.

**Returns:**

TRUE on success or FALSE on failure.

#### 9.4.2.21 int CPLODBCStatement::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:**

***pszCatalog*** the catalog to find the table in, use NULL (the default) if no catalog is available.

***pszSchema*** the schema to find the table in, use NULL (the default) if no schema is available.

**Returns:**

TRUE on success or FALSE on failure.

#### 9.4.2.22 void CPLODBCStatement::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:**

***fp*** the file to write to. stdout or stderr are acceptable.

***bShowSchema*** TRUE to force writing schema information for the rowset before the rowset data itself. Default is FALSE.

#### 9.4.2.23 CPLString CPLODBCStatement::GetTypeName (int *nTypeCode*) [static]

Get name for SQL column type.

Returns a string name for the indicated type code (as returned from CPLODBCStatement::GetColType()).

**Parameters:**

***nTypeCode*** the SQL_ code, such as SQL_CHAR.

**Returns:**

internal string, "UNKNOWN" if code not recognised.

#### 9.4.2.24 SQLSMALLINT CPLODBCStatement::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 CPLODBCStatement::GetColType()).

**Parameters:**

***nTypeCode*** 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.

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

- cpl_odbc.h
- cpl_odbc.cpp

## 9.5 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.*

### 9.5.1 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 heirarchical tree structure for a document can be represented as a tree of CPLXMLNode structures.

### 9.5.2 Member Data Documentation

#### 9.5.2.1 CPLXMLNodeType CPLXMLNode::eType

Node type.

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

#### 9.5.2.2 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 "- → ").

#### 9.5.2.3 struct CPLXMLNode* CPLXMLNode::psNext [read]

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.

#### 9.5.2.4 struct CPLXMLNode* CPLXMLNode::psChild [read]

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.

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

- cpl_minixml.h

# 9.6 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 ()

### 9.6.1 Detailed Description

This object represents one field in a DDFRecord. This models an instance of the fields data, rather than it's 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().

### 9.6.2 Member Function Documentation

#### 9.6.2.1 void DDFField::Dump (FILE * *fp*)

Write out field contents to debugging file.

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

**Parameters:**

***fp*** The standard io file handle to write to. ie. stderr

#### 9.6.2.2 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:**

***poSFDefn*** The definition of the subfield for which the raw data pointer is desired.

***pnMaxBytes*** The maximum number of bytes that can be accessed from the returned data pointer is placed in this int, unless it is NULL.

***iSubfieldIndex*** 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.

#### 9.6.2.3 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:**

***nInstance*** a value from 0 to GetRepeatCount()-1.

***pnInstanceSize*** 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.

#### 9.6.2.4 const char* DDFField::GetData () [inline]

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

#### 9.6.2.5 int DDFField::GetDataSize () [inline]

Return the number of bytes in the data block returned by GetData().

#### 9.6.2.6 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 demonstation of handling repeated fields properly.

#### 9.6.2.7 DDFFieldDefn* DDFField::GetFieldDefn () [inline]

Fetch the corresponding DDFFieldDefn.

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

- iso8211.h
- ddffield.cpp

# 9.7 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)

### 9.7.1 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.

### 9.7.2 Member Function Documentation

#### 9.7.2.1 void DDFFieldDefn::Dump (FILE * *fp*)

Write out field definition info to debugging file.

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

**Parameters:**

***fp*** The standard io file handle to write to. ie. stderr

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

Fetch a pointer to the field name (tag).

**Returns:**

this is an internal copy and shouldn't be freed.

#### 9.7.2.3 const char* DDFFieldDefn::GetDescription () `[inline]`

Fetch a longer descriptio of this field.

**Returns:**

this is an internal copy and shouldn't be freed.

#### 9.7.2.4 int DDFFieldDefn::GetSubfieldCount () [inline]

Get the number of subfields.

#### 9.7.2.5 DDFSubfieldDefn * DDFFieldDefn::GetSubfield (int *i*)

Fetch a subfield by index.

**Parameters:**

***i*** The index subfield index. (Between 0 and GetSubfieldCount()-1)

**Returns:**

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

#### 9.7.2.6 DDFSubfieldDefn * DDFFieldDefn::FindSubfieldDefn (const char * *pszMnemonic*)

Find a subfield definition by it's mnemonic tag.

**Parameters:**

***pszMnemonic*** The name of the field.

**Returns:**

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

#### 9.7.2.7 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.

#### 9.7.2.8 int DDFFieldDefn::IsRepeating () [inline]

Fetch repeating flag.

**See also:**

DDFField::GetRepeatCount()

**Returns:**

TRUE if the field is marked as repeating.

#### 9.7.2.9 void DDFFieldDefn::SetRepeatingFlag (int *n*) [inline]

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

#### 9.7.2.10 char * DDFFieldDefn::GetDefaultValue (int * *pnSize*)

Return default data for field instance.

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

- iso8211.h
- ddffielddefn.cpp

## 9.8 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)
- void Rewind (long nOffset=-1)
- DDFFieldDefn * FindFieldDefn (const char *)
- int GetFieldCount ()
- DDFFieldDefn * GetField (int)
- void AddField (DDFFieldDefn *poNewFDefn)

### 9.8.1 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.

### 9.8.2 Constructor & Destructor Documentation

#### 9.8.2.1 DDFModule::DDFModule ()

The constructor.

#### 9.8.2.2 DDFModule::~DDFModule ()

The destructor.

### 9.8.3 Member Function Documentation

#### 9.8.3.1 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:**

***pszFilename*** The name of the file to open.

***bFailQuietly*** 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 CPLError().

#### 9.8.3.2 void DDFModule::Close ()

Close an ISO 8211 file.

#### 9.8.3.3 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:**

***fp*** The standard io file handle to write to. ie. stderr.

#### 9.8.3.4 DDFRecord * DDFModule::ReadRecord (void)

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 untill the next ReadRecord() at which point it is overwritten.

#### 9.8.3.5 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:**

***nOffset*** 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.

#### 9.8.3.6 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:**

***pszFieldName*** 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.

#### 9.8.3.7 int DDFModule::GetFieldCount () [inline]

Fetch the number of defined fields.

#### 9.8.3.8 DDFFieldDefn * DDFModule::GetField (int *i*)

Fetch a field definition by index.

**Parameters:**

***i*** (from 0 to GetFieldCount() - 1.

**Returns:**

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

#### 9.8.3.9 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:**

***poNewFDefn*** definition to be added to the module.

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

- iso8211.h
- ddfmodule.cpp

## 9.9 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 ()

### 9.9.1 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.

### 9.9.2 Member Function Documentation

#### 9.9.2.1 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 properly of application. However, it is automatically destroyed if the DDFModule it was created relative to is destroyed, as it's 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.

#### 9.9.2.2 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:**

***poTargetModule*** the module on which the record copy should be created.

**Returns:**

NULL on failure or a pointer to the cloned record.

#### 9.9.2.3 void DDFRecord::Dump (FILE * *fp*)

Write out record contents to debugging file.

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

**Parameters:**

***fp*** The standard io file handle to write to. ie. stderr

#### 9.9.2.4 int DDFRecord::GetFieldCount () `[inline]`

Get the number of DDFFields on this record.

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

Find the named field within this record.

**Parameters:**

***pszName*** The name of the field to fetch. The comparison is case insensitive.

***iFieldIndex*** 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.

#### 9.9.2.6 DDFField * DDFRecord::GetField (int *i*)

Fetch field object based on index.

**Parameters:**

***i*** The index of the field to fetch. Between 0 and GetFieldCount()-1.

**Returns:**

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

#### 9.9.2.7 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:**

***pszField*** The name of the field containing the subfield.

***iFieldIndex*** The instance of this field within the record. Use zero for the first instance of this field.

***pszSubfield*** The name of the subfield within the selected field.

***iSubfieldIndex*** The instance of this subfield within the record. Use zero for the first instance.

***pnSuccess*** 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.

#### 9.9.2.8 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:**

***pszField*** The name of the field containing the subfield.

***iFieldIndex*** The instance of this field within the record. Use zero for the first instance of this field.

***pszSubfield*** The name of the subfield within the selected field.

***iSubfieldIndex*** The instance of this subfield within the record. Use zero for the first instance.

***pnSuccess*** 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.

#### 9.9.2.9 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:**

***pszField*** The name of the field containing the subfield.

***iFieldIndex*** The instance of this field within the record. Use zero for the first instance of this field.

***pszSubfield*** The name of the subfield within the selected field.

***iSubfieldIndex*** The instance of this subfield within the record. Use zero for the first instance.

***pnSuccess*** 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.

#### 9.9.2.10 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:**

***pszField*** the field name to operate on.

***iFieldIndex*** the field index to operate on (zero based).

***pszSubfield*** the subfield name to operate on.

***iSubfieldIndex*** the subfield index to operate on (zero based).

***nNewValue*** the new value to place in the subfield.

**Returns:**

TRUE if successful, and FALSE if not.

#### 9.9.2.11 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:**

***pszField*** the field name to operate on.

***iFieldIndex*** the field index to operate on (zero based).

***pszSubfield*** the subfield name to operate on.

***iSubfieldIndex*** the subfield index to operate on (zero based).

***pszValue*** the new string to place in the subfield. This may be arbitrary binary bytes if nValueLength is specified.

***nValueLength*** the number of valid bytes in pszValue, may be -1 to internally fetch with strlen().

**Returns:**

TRUE if successful, and FALSE if not.

#### 9.9.2.12 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:**

***pszField*** the field name to operate on.

***iFieldIndex*** the field index to operate on (zero based).

***pszSubfield*** the subfield name to operate on.

***iSubfieldIndex*** the subfield index to operate on (zero based).

***dfNewValue*** the new value to place in the subfield.

**Returns:**

TRUE if successful, and FALSE if not.

#### 9.9.2.13 int DDFRecord::GetDataSize () [inline]

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

#### 9.9.2.14 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().

#### 9.9.2.15 DDFModule* DDFRecord::GetModule () [inline]

Fetch the DDFModule with which this record is associated.

#### 9.9.2.16 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:**

***poField*** the field to alter.

***nNewDataSize*** the number of data bytes to be reserved for the field.

**Returns:**

TRUE on success or FALSE on failure.

#### 9.9.2.17 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:**

***poTarget*** 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.

#### 9.9.2.18 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:**

***poDefn*** the definition of the field to be added.

**Returns:**

the field object on success, or NULL on failure.

#### 9.9.2.19 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:**

***poField*** the field within the record to be assign a default instance.

***iIndexWithinField*** the instance to set (may not have been tested with values other than 0).

**Returns:**

TRUE on success or FALSE on failure.

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

Set the raw contents of a field instance.

**Parameters:**

***poField*** the field to set data within.

***iIndexWithinField*** 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 appeneded.

***pachRawData*** the raw data to replace this field instance with.

***nRawDataSize*** the number of bytes pointed to by pachRawData.

**Returns:**

TRUE on success or FALSE on failure.

#### 9.9.2.21 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

## 9.10 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)

### 9.10.1 Detailed Description

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

### 9.10.2 Member Enumeration Documentation

#### 9.10.2.1 enum DDFSubfieldDefn::DDFBinaryFormat

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

### 9.10.3 Member Function Documentation

#### 9.10.3.1 const char* DDFSubfieldDefn::GetName () [inline]

Get pointer to subfield name.

#### 9.10.3.2 const char* DDFSubfieldDefn::GetFormat () [inline]

Get pointer to subfield format string

#### 9.10.3.3 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.

#### 9.10.3.4 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:**

***pachSourceData*** 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.

***nMaxBytes*** The maximum number of bytes that are accessable after pachSourceData.

***pnConsumedBytes*** 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()

#### 9.10.3.5 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:**

***pachSourceData*** 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.

***nMaxBytes*** The maximum number of bytes that are accessable after pachSourceData.

***pnConsumedBytes*** 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:**

ExtractFloatData(), ExtractStringData()

#### 9.10.3.6 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:**

***pachSourceData*** 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.

***nMaxBytes*** The maximum number of bytes that are accessable after pachSourceData.

***pnConsumedBytes*** 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:**

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()

#### 9.10.3.7 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:**

***pachSourceData*** 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.

***nMaxBytes*** The maximum number of bytes that are accessable after pachSourceData.

***pnConsumedBytes*** 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).

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

Dump subfield value to debugging file.

**Parameters:**

***pachData*** Pointer to data for this subfield.

***nMaxBytes*** Maximum number of bytes available in pachData.

***fp*** File to write report to.

#### 9.10.3.9 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.

#### 9.10.3.10 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.

#### 9.10.3.11 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.

#### 9.10.3.12 int DDFSubfieldDefn::GetWidth () [inline]

Get the subfield width (zero for variable).

#### 9.10.3.13 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:**

***pachData*** the buffer into which the returned default will be placed. May be NULL if just querying default size.

***nBytesAvailable*** the size of pachData in bytes.

***pnBytesUsed*** 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.

#### 9.10.3.14 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:**

***fp*** The standard io file handle to write to. ie. stderr

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

- iso8211.h
- ddfsubfielddefn.cpp

# 9.11 SDTS_CATD Class Reference

`#include <sdts_al.h>`

## Public Member Functions

- const char * GetEntryTypeDesc (int)
- const char * GetEntryFilePath (int)
- SDTSLayerType GetEntryType (int)

### 9.11.1 Detailed Description

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

### 9.11.2 Member Function Documentation

#### 9.11.2.1 const char * SDTS_CATD::GetEntryTypeDesc (int *iEntry*)

Fetch the type description of a module in the catalog.

**Parameters:**

***iEntry*** 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 ".

#### 9.11.2.2 const char * SDTS_CATD::GetEntryFilePath (int *iEntry*)

Fetch the full filename of the requested module.

**Parameters:**

***iEntry*** 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.

#### 9.11.2.3 SDTSLayerType SDTS_CATD::GetEntryType (int *iEntry*)

Fetch the enumerated type of a module in the catalog.

**Parameters:**

***iEntry*** 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`.

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

- sdts_al.h
- sdtscatd.cpp

## 9.12 SDTS_IREF Class Reference

`#include <sdts_al.h>`

### 9.12.1 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:

- sdts_al.h
- sdtsiref.cpp

## 9.13 SDTS_XREF Class Reference

`#include <sdts_al.h>`

### Public Attributes

- char * pszSystemName
- char * pszDatum
- int nZone

### 9.13.1 Detailed Description

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

### 9.13.2 Member Data Documentation

#### 9.13.2.1 char* SDTS_XREF::pszSystemName

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

#### 9.13.2.2 char* SDTS_XREF::pszDatum

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

#### 9.13.2.3 int SDTS_XREF::nZone

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

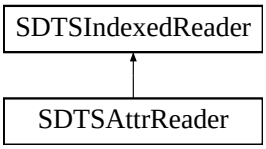
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtsxref.cpp

# 9.14 SDTSAttrReader Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSAttrReader::




## Public Member Functions

- int IsSecondary ()

## 9.14.1 Detailed Description

Class for reading SDTSAttrRecord features from a primary or secondary attribute module.

## 9.14.2 Member Function Documentation

### 9.14.2.1 int SDTSAttrReader::IsSecondary () `[inline]`

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

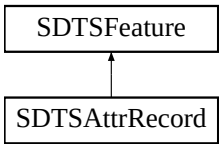
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtsattrreader.cpp

## 9.15 SDTSAttrRecord Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSAttrRecord::




### Public Member Functions

- virtual void Dump (FILE *)

### Public Attributes

- DDFRecord * poWholeRecord
- DDFField * poATTR

### 9.15.1 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.

### 9.15.2 Member Function Documentation

#### 9.15.2.1 void SDTSAttrRecord::Dump (FILE *) [virtual]

Dump reable description of feature to indicated stream.

Implements SDTSFeature.

### 9.15.3 Member Data Documentation

#### 9.15.3.1 DDFRecord* SDTSAttrRecord::poWholeRecord

The entire DDFRecord read from the file.

#### 9.15.3.2 DDFField* SDTSAttrRecord::poATTR

The ATTR DDFField with the user attribute. Each subfield is a attribute value.

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

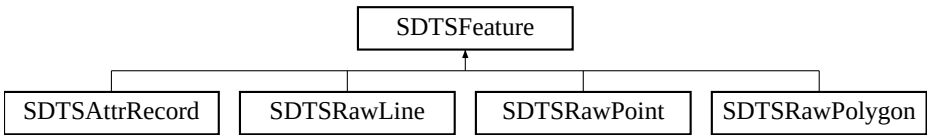
- sdts_al.h

- sdtsattrreader.cpp

## 9.16 SDTSFeature Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSFeature::




### Public Member Functions

- virtual void Dump (FILE *)=0

### Public Attributes

- SDTSModId oModId
- int nAttributes
- SDTSModId * paoATID

### 9.16.1 Detailed Description

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

### 9.16.2 Member Function Documentation

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

Dump reable description of feature to indicated stream.

Implemented in SDTSRawLine, SDTSAttrRecord, SDTSRawPoint, and SDTSRawPolygon.

### 9.16.3 Member Data Documentation

#### 9.16.3.1 SDTSModId SDTSFeature::oModId

Unique identifier for this record/feature within transfer.

#### 9.16.3.2 int SDTSFeature::nAttributes

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

#### 9.16.3.3 SDTSModId* SDTSFeature::paoATID

List of nAttributes attribute record identifiers related to this feature.

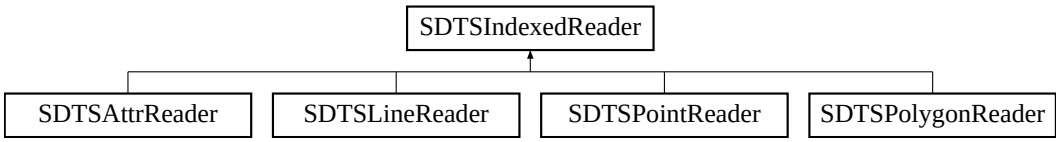
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtslib.cpp

## 9.17 SDTSIndexedReader Class Reference

`#include <sdts_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")

### 9.17.1 Detailed Description

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

### 9.17.2 Member Function Documentation

#### 9.17.2.1 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.

#### 9.17.2.2 void SDTSIndexedReader::Rewind () [virtual]

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

#### 9.17.2.3 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.

#### 9.17.2.4 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 untill the index is forcably filled again.

#### 9.17.2.5 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.

#### 9.17.2.6 SDTSFeature * SDTSIndexedReader::GetIndexedFeatureRef (int *iRecordId*)

Fetch a feature based on it's record number.

This method will forceably 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:**

***iRecordId*** 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.

#### 9.17.2.7 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:**

***pszFName*** the field name to search for. By default "ATID" is used.

**Returns:**

a NULL terminated list of module names. Free with CSLDestroy().

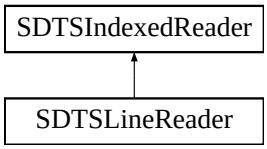
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtsindexedreader.cpp

# 9.18 SDTSLineReader Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSLineReader::




## Public Member Functions

- void AttachToPolygons (SDTSTransfer *)

## 9.18.1 Detailed Description

Reader for SDTS line modules.

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

## 9.18.2 Member Function Documentation

### 9.18.2.1 void SDTSLineReader::AttachToPolygons (SDTSTransfer * *poTransfer*)

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

See also the SDTSRawPolygon::AssembleRings() method.

**Parameters:**

***poTransfer*** the SDTSTransfer of this SDTSLineReader, and from which the related SDTSPolygonReader will be instantiated.

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

- sdts_al.h
- sdtslinereader.cpp

## 9.19 SDTSModId Class Reference

`#include <sdts_al.h>`

### Public Attributes

- char szModule [8]
- long nRecord
- char szOBRP [8]

### 9.19.1 Detailed Description

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

### 9.19.2 Member Data Documentation

#### 9.19.2.1 char SDTSModId::szModule[8]

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

#### 9.19.2.2 long SDTSModId::nRecord

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

#### 9.19.2.3 char SDTSModId::szOBRP[8]

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

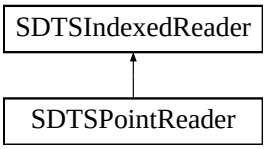
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtslib.cpp

## 9.20 SDTSPointReader Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSPointReader::




### 9.20.1 Detailed Description

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

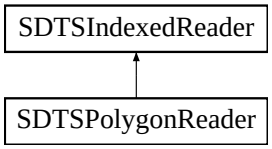
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtspointreader.cpp

## 9.21 SDTSPolygonReader Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSPolygonReader::




### Public Member Functions

- void AssembleRings (SDTSTransfer *)

### 9.21.1 Detailed Description

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

### 9.21.2 Member Function Documentation

#### 9.21.2.1 void SDTSPolygonReader::AssembleRings (SDTSTransfer * *poTransfer*)

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:**

***poTransfer*** the SDTSTransfer that this reader is a part of. Used to get a list of line layers that might be needed.

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

- sdts_al.h
- sdtspolygonreader.cpp

# 9.22 SDTSRasterReader Class Reference

`#include <sdts_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)

### 9.22.1 Detailed Description

Class for reading raster data from a raster layer.

This class is somewhat unique amoung 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.

### 9.22.2 Member Function Documentation

#### 9.22.2.1 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().

#### 9.22.2.2 int SDTSRasterReader::GetTransform (double * *padfTransformOut*)

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

**Parameters:**

***padfTransformOut*** 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.

#### 9.22.2.3 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:**

***pdfMin*** variable in which the minimum value encountered is returned.

***pdfMax*** variable in which the maximum value encountered is returned.

***dfNoData*** a value to ignore when computing min/max, defaults to -32766.

**Returns:**

TRUE on success, or FALSE if an error occurs.

#### 9.22.2.4 int SDTSRasterReader::GetXSize () [inline]

Fetch the raster width.

**Returns:**

the width in pixels.

#### 9.22.2.5 int SDTSRasterReader::GetYSize () [inline]

Fetch the raster height.

**Returns:**

the height in pixels.

#### 9.22.2.6 int SDTSRasterReader::GetBlockXSize () [inline]

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

#### 9.22.2.7 int SDTSRasterReader::GetBlockYSize () [inline]

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

#### 9.22.2.8 int SDTSRasterReader::GetBlock (int *nXOffset*, int *nYOffset*, void * *pData*)

Read a block of raster data from the file.

**Parameters:**

***nXOffset*** X block offset into the file. Normally zero for scanline organized raster files.

***nYOffset*** Y block offset into the file. Normally the scanline offset from top of raster for scanline organized raster files.

***pData*** pointer to GInt16 (signed short) buffer of data into which to read the raster.

**Returns:**

TRUE on success and FALSE on error.

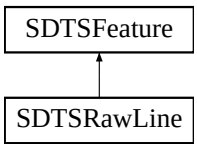
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtsrasterreader.cpp

## 9.23 SDTSRawLine Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSRawLine::




### Public Member Functions

- void Dump (FILE *)

### Public Attributes

- int nVertices
- double * padfX
- double * padfY
- double * padfZ
- SDTSModId oLeftPoly
- SDTSModId oRightPoly
- SDTSModId oStartNode
- SDTSModId oEndNode

### 9.23.1 Detailed Description

SDTS line feature, as read from LE* modules by SDTSLineReader.

### 9.23.2 Member Function Documentation

#### 9.23.2.1 void SDTSRawLine::Dump (FILE *) [virtual]

Dump reable description of feature to indicated stream.

Implements SDTSFeature.

### 9.23.3 Member Data Documentation

#### 9.23.3.1 int SDTSRawLine::nVertices

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

#### 9.23.3.2 double* SDTSRawLine::padfX

List of nVertices X coordinates.

#### 9.23.3.3 double* SDTSRawLine::padfY

List of nVertices Y coordinates.

#### 9.23.3.4 double* SDTSRawLine::padfZ

List of nVertices Z coordinates - currently always zero.

#### 9.23.3.5 SDTSModId SDTSRawLine::oLeftPoly

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

#### 9.23.3.6 SDTSModId SDTSRawLine::oRightPoly

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

#### 9.23.3.7 SDTSModId SDTSRawLine::oStartNode

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

#### 9.23.3.8 SDTSModId SDTSRawLine::oEndNode

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

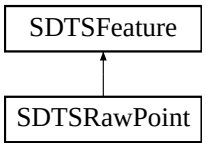
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtslinereader.cpp

## 9.24 SDTSRawPoint Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSRawPoint::




### Public Member Functions

- virtual void Dump (FILE *)

### Public Attributes

- double dfX
- double dfY
- double dfZ
- SDTSModId oAreaId

### 9.24.1 Detailed Description

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

### 9.24.2 Member Function Documentation

#### 9.24.2.1 void SDTSRawPoint::Dump (FILE *) [virtual]

Dump reable description of feature to indicated stream.

Implements SDTSFeature.

### 9.24.3 Member Data Documentation

#### 9.24.3.1 double SDTSRawPoint::dfX

X coordinate of point.

#### 9.24.3.2 double SDTSRawPoint::dfY

Y coordinate of point.

#### 9.24.3.3 double SDTSRawPoint::dfZ

Z coordinate of point.

#### 9.24.3.4 SDTSModId SDTSRawPoint::oAreaId

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

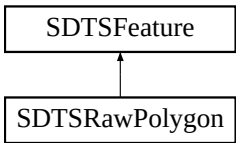
The documentation for this class was generated from the following files:

- sdts_al.h
- sdtspointreader.cpp

## 9.25 SDTSRawPolygon Class Reference

`#include <sdts_al.h>`

Inheritance diagram for SDTSRawPolygon::




### Public Member Functions

- int AssembleRings ()
- virtual void Dump (FILE *)

### Public Attributes

- int nRings
- int nVertices
- int * panRingStart
- double * padfX
- double * padfY
- double * padfZ

### 9.25.1 Detailed Description

Class for holding information about a polygon feature.

When directly read from a polygon module, the polygon has no concept of it's 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 counterclockwise).

### 9.25.2 Member Function Documentation

#### 9.25.2.1 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 it's 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 occured. 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.

#### 9.25.2.2 void SDTSRawPolygon::Dump (FILE *) [virtual]

Dump reable description of feature to indicated stream.

Implements SDTSFeature.

### 9.25.3 Member Data Documentation

#### 9.25.3.1 int SDTSRawPolygon::nRings

Number of rings in assembled polygon.

#### 9.25.3.2 int SDTSRawPolygon::nVertices

Total number of vertices in all rings of assembled polygon.

#### 9.25.3.3 int* SDTSRawPolygon::panRingStart

Offsets into padfX/padfY/padfZ for the beginning of each ring in the polygon. This array is nRings long.

#### 9.25.3.4 double* SDTSRawPolygon::padfX

List of nVertices X coordinates for the polygon (split over multiple rings via panRingStart.

#### 9.25.3.5 double* SDTSRawPolygon::padfY

List of nVertices Y coordinates for the polygon (split over multiple rings via panRingStart.

#### 9.25.3.6 double* SDTSRawPolygon::padfZ

List of nVertices Z coordinates for the polygon (split over multiple rings via panRingStart. The values are almost always zero.

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

- sdts_al.h
- sdtspolygonreader.cpp

# 9.26 SDTSTransfer Class Reference

`#include <sdts_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)

### 9.26.1 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.

### 9.26.2 Member Function Documentation

#### 9.26.2.1 int SDTSTransfer::Open (const char * *pszFilename*)

Open an SDTS transfer, and establish a list of data layers in the transfer.

**Parameters:**

***pszFilename*** The name of the CATD file within the transfer.

**Returns:**

TRUE if the open success, or FALSE if it fails.

#### 9.26.2.2 int SDTSTransfer::FindLayer (const char * *pszModule*)

Fetch the SDTSTransfer layer number corresponding to a module name.

**Parameters:**

***pszModule*** 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.

#### 9.26.2.3 SDTSLayerType SDTSTransfer::GetLayerType (int *iEntry*)

Fetch type of requested feature layer.

**Parameters:**

***iEntry*** 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 SDTSAttrReader 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.

#### 9.26.2.4 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 it's filename, and description.

**Parameters:**

***iEntry*** the layer index from 0 to GetLayerCount()-1.

**Returns:**

the module index suitable for use with the various SDTS_CATD methods.

#### 9.26.2.5 SDTSRasterReader * SDTSTransfer::GetLayerRasterReader (int *iEntry*)

Instantiate an SDTSRasterReader for the indicated layer.

**Parameters:**

***iEntry*** 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.

#### 9.26.2.6 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. Amoung other things this means that the returned reader may not be positioned to read from the beginning of the module, and may already have it's 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:**

***iEntry*** 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.

#### 9.26.2.7 SDTS_CATD* SDTSTransfer::GetCATD () [inline]

Fetch the catalog object for this transfer.

**Returns:**

pointer to the internally managed SDTS_CATD for the transfer.

#### 9.26.2.8 SDTS_XREF* SDTSTransfer::GetXREF () [inline]

Fetch the external reference object for this transfer.

**Returns:**

pointer to the internally managed SDTS_XREF for the transfer.

#### 9.26.2.9 DDFField * SDTSTransfer::GetAttr (SDTSModId * *poModId*)

Fetch the attribute fields given a particular module/record id.

**Parameters:**

***poModId*** an attribute record identifer, normally taken from the aoATID[] array of an SDTSIndexedFeature.

**Returns:**

a pointer to the DDFField containing the user attribute values as subfields.

#### 9.26.2.10 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:**

***pdfMinX*** western edge of dataset

***pdfMinY*** southern edge of dataset

***pdfMaxX*** eastern edge of dataset

***pdfMaxY*** northern edge of dataset

**Returns:**

TRUE if success, or FALSE on a failure.

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

- sdts_al.h
- sdtstransfer.cpp

# Chapter 10

# File Documentation

## 10.1 cpl_conv.h File Reference

```
#include "cpl_port.h"
#include "cpl_vsi.h"
#include "cpl_error.h"
```

### Classes

- struct **CPLSharedFileInfo**

### Functions

- void CPL_DLL * CPLMalloc (size_t)
- void CPL_DLL * CPLCalloc (size_t, size_t)
- void CPL_DLL * CPLRealloc (void *, size_t)
- char CPL_DLL * CPLStrdup (const char *)
- char CPL_DLL * CPLStrlwr (char *)
- char CPL_DLL * CPLFGets (char *, int, FILE *)
- const char CPL_DLL * CPLReadLine (FILE *)
- const char CPL_DLL * CPLReadLineL (FILE *)
- 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)
- 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 CPLPrintDouble (char *, const char *, double, const char *)
- 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 *)
- int CPL_DLL CPLGetExecPath (char *pszPathBuf, int nMaxLength)
- const char CPL_DLL * CPLGetPath (const char *)
- const char CPL_DLL * CPLGetDirname (const char *)
- const char CPL_DLL * CPLGetFilename (const char *)
- const char CPL_DLL * CPLGetBasename (const char *)
- const char CPL_DLL * CPLGetExtension (const char *)
- char CPL_DLL * CPLGetCurrentDir (void)
- const char CPL_DLL * CPLFormFilename (const char *pszPath, const char *pszBasename, const char *pszExtension)
- const char CPL_DLL * CPLFormCIFilename (const char *pszPath, const char *pszBasename, const char *pszExtension)
- const char CPL_DLL * CPLResetExtension (const char *, const char *)
- const char CPL_DLL * CPLProjectRelativeFilename (const char *pszProjectDir, const char *pszSecondaryFilename)
- int CPL_DLL CPLIsFilenameRelative (const char *pszFilename)
- const char CPL_DLL * CPLExtractRelativePath (const char *, const char *, int *)
- const char CPL_DLL * CPLCleanTrailingSlash (const char *)
- char CPL_DLL ** CPLCorrespondingPaths (const char *pszOldFilename, const char *pszNewFilename, char **papszFileList)
- int CPL_DLL CPLCheckForFile (char *pszFilename, char **papszSiblingList)
- const char CPL_DLL * CPLGenerateTempFilename (const char *pszStem)
- 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 CPLPackedDMSToDec (double)
- double CPL_DLL CPLDecToPackedDMS (double dfDec)
- int CPL_DLL CPLUnlinkTree (const char *)

### 10.1.1 Detailed Description

Various convenience functions for CPL.

### 10.1.2 Function Documentation

#### 10.1.2.1 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. Existance 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 user works in localized environment and her input will be done accordingly 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 shoudl 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:**

***nptr*** Pointer to string to convert.

**Returns:**

Converted value, if any.

#### 10.1.2.2 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:**

***nptr*** Pointer to string to convert.

***point*** Decimal delimiter.

**Returns:**

Converted value, if any.

#### 10.1.2.3 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:**

***nptr*** The string to convert.

**Returns:**

Converted value, if any. Zero on failure.

#### 10.1.2.4 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:**

***nCount*** number of objects to allocate.

***nSize*** size (in bytes) of object to allocate.

**Returns:**

pointer to newly allocated memory, only NULL if nSize * nCount is NULL.

#### 10.1.2.5 int CPL_DLL CPLCheckForFile (char * *pszFilename*, char ** *papszSiblingFiles*)

Check for file existance.

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 VSIStatL() is used to test for the files existance, and no case insensitive testing is done.

**Parameters:**

***pszFilename*** name of file to check for - filename case updated in some cases.

***papszSiblingFiles*** 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.

#### 10.1.2.6 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:**

***pszPath*** 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. The returned will generally not contain a trailing path separator.

#### 10.1.2.7 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:**

***fp*** file handle from CPLOpenShared() to deaccess.

#### 10.1.2.8 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 correspondance 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:**

***pszOldFilename*** path to old prototype file.

***pszNewFilename*** path to new prototype file.

***papszFileList*** list of other files associated with pszOldFilename to rename similarly.

**Returns:**

a list of files corresponding to papszFileList but renamed to correspond to pszNewFilename.

#### 10.1.2.9 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:**

***dfDec*** Angle in decimal degrees.

**Returns:**

Angle in packed DMS format.

#### 10.1.2.10 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:**

***fp*** File handle to write to.

#### 10.1.2.11 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:**

***pszBaseDir*** the name of the directory relative to which the path should be computed. pszBaseDir may be NULL in which case the original target is returned without relitivizing.

***pszTarget*** the filename to be changed to be relative to pszBaseDir.

***pbGotRelative*** 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.

#### 10.1.2.12 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:**

***pszBuffer*** pointer to the targeting character buffer.

***nBufferSize*** maximum size of the string to read (not including termonating '\0').

***fp*** 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.

#### 10.1.2.13 const char CPL_DLL* CPLFormCIFilename (const char * *pszPath*, const char * *pszBasename*, const char * *pszExtension*)

Case insensitive file searching, returing 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 equivelent to CPLFormFilename() on case insensitive file systems (like Windows).

**Parameters:**

***pszPath*** 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.

***pszBasename*** file basename. May optionally have path and/or extension. May not be NULL.

***pszExtension*** 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.

#### 10.1.2.14 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:**

***pszPath*** 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.

***pszBasename*** file basename. May optionally have path and/or extension. May not be NULL.

***pszExtension*** 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.

#### 10.1.2.15 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:**

***pszStem*** if non-NULL this will be part of the filename.

**Returns:**

a filename which is valid till the next CPL call in this thread.

#### 10.1.2.16 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:**

***pszFullFilename*** 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.

#### 10.1.2.17 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.

#### 10.1.2.18 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:**

***pszFilename*** 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.

#### 10.1.2.19 int CPL_DLL CPLGetExecPath (char * *pszPathBuf*, int *nMaxLength*)

Fetch path of executable.

The path to the executable currently running is returned. This path includes the name of the executable. Currently this only works on win32 platform.

**Parameters:**

***pszPathBuf*** the buffer into which the path is placed.

***nMaxLength*** the buffer size, MAX_PATH+1 is suggested.

**Returns:**

FALSE on failure or TRUE on success.

#### 10.1.2.20 const char CPL_DLL* CPLGetExtension (const char * *pszFullFilename*)

Extract filename extension from full filename.

Returns a string containing the extention 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:**

***pszFullFilename*** 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.

#### 10.1.2.21 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:**

***pszFullFilename*** the full filename potentially including a path.

**Returns:**

just the non-directory portion of the path (points back into original string).

#### 10.1.2.22 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:**

***pszFilename*** 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.

#### 10.1.2.23 CPLSharedFileInfo CPL_DLL* CPLGetSharedList (int * *pnCount*)

Fetch list of open shared files.

**Parameters:**

***pnCount*** place to put the count of entries.

**Returns:**

the pointer to the first in the array of shared file info structures.

#### 10.1.2.24 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 CPLError() 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-prending or post-pending an underscore.

Some of these issues may be worked on in the future.

**Parameters:**

***pszLibrary*** 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.

***pszSymbolName*** 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.

#### 10.1.2.25 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:**

***pszFilename*** the filename with path to test.

**Returns:**

TRUE if the filename is relative or FALSE if it is absolute.

#### 10.1.2.26 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:**

***nSize*** size (in bytes) of memory block to allocate.

**Returns:**

pointer to newly allocated memory, only NULL if nSize is zero.

#### 10.1.2.27 FILE CPL_DLL* CPLOpenShared (const char * *pszFilename*, const char * *pszAccess*, int *bLarge*)

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:**

***pszFilename*** the name of the file to open.

***pszAccess*** the normal fopen()/VSIFOpen() style access string.

***bLarge*** If TRUE VSIFOpenL() (for large files) will be used instead of VSIFOpen().

**Returns:**

a file handle or NULL if opening fails.

#### 10.1.2.28 double CPL_DLL CPLPackedDMSToDec (double *dfPacked*)

Convert a packed DMS value (DDDMMMSSS.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: ang = 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 = ang/1000000 (fractional portion truncated)

3. The minutes are separated out: min = (ang - deg ∗ 1000000) / 1000 (fractional portion truncated)

4. The seconds are then computed: sec = ang - 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:**

***dfPacked*** Angle in packed DMS format.

**Returns:**

Angle in decimal degrees.

#### 10.1.2.29 int CPL_DLL CPLPrintDouble (char ∗ *pszBuffer*, const char ∗ *pszFormat*, double *dfValue*, const char ∗ *pszLocale*)

Print double value into specified string buffer. Exponential character flag 'E' (or 'e') will be replaced with 'D', as in Fortran. Resulting string will not to be NULL-terminated.

**Parameters:**

***pszBuffer*** 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.

***pszFormat*** Format specifier (for example, "%16.9E").

***dfValue*** Numerical value to print.

***pszLocale*** 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. With the pszLocale option we can control what exact locale will be used for printing a numeric value to the string (in most cases it should be C/POSIX).

**Returns:**

Number of characters printed.

#### 10.1.2.30 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:**

***pszBuffer*** 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.

***iValue*** Numerical value to print.

***nMaxLen*** Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.

**Returns:**

Number of characters printed.

#### 10.1.2.31 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:**

***pszBuffer*** 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.

***pValue*** Pointer to ASCII encode.

***nMaxLen*** Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.

**Returns:**

Number of characters printed.

#### 10.1.2.32 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:**

***pszDest*** Pointer to the destination string buffer. Should be large enough to hold the resulting string.

***pszSrc*** Pointer to the source buffer.

***nMaxLen*** Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.

**Returns:**

Number of characters printed.

#### 10.1.2.33 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:**

***pszDest*** Pointer to the destination string buffer. Should be large enough to hold the resulting string.

***pszSrc*** Pointer to the source buffer.

***nMaxLen*** Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.

**Returns:**

Number of characters printed.

#### 10.1.2.34 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:**

***pszBuffer*** 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.

***nMaxLen*** Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.

***pszFormat*** Controls the output format. Options are the same as for strftime(3) function.

***poBrokenTime*** Pointer to the broken-down time structure. May be requested with the VSIGMTime() and VSILocalTime() functions.

***pszLocale*** 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 ajusted differently from the C/POSIX defaults. To solve these problems this option was introdiced.

**Returns:**

Number of characters printed.

#### 10.1.2.35 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:**

***pszBuffer*** 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.

***iValue*** Numerical value to print.

***nMaxLen*** Maximum length of the resulting string. If string length is greater than nMaxLen, it will be truncated.

**Returns:**

Number of characters printed.

#### 10.1.2.36 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:**

***pszProjectDir*** the directory relative to which the secondary files path should be interpreted.

***pszSecondaryFilename*** 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.

#### 10.1.2.37 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 ... equivelent of DKReadLine(). Pointer to an internal buffer is returned. The application shouldn't free it, or depend on it's 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:**

***fp*** 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.

#### 10.1.2.38 const char CPL_DLL* CPLReadLineL (FILE * *fp*)

Simplified line reading from text file.

Similar to CPLReadLine(), but reading from a large file API handle.

**Parameters:**

***fp*** 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.

#### 10.1.2.39 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 VSIRealloc() to get the memory, so any hooking of VSIRealloc() 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:**

***pData*** existing memory block which should be copied to the new block.

***nNewSize*** new size (in bytes) of memory block to allocate.

**Returns:**

pointer to allocated memory, only NULL if nNewSize is zero.

#### 10.1.2.40 const char CPL_DLL* CPLResetExtension (const char * *pszPath*, const char * *pszExt*)

Replace the extension with the provided one.

**Parameters:**

***pszPath*** the input path, this string is not altered.

***pszExt*** 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.

#### 10.1.2.41 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:**

***pszString*** String containing characters to be scanned. It may be terminated with a null character.

***nMaxLength*** 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.

#### 10.1.2.42 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:**

***pszString*** String containing characters to be scanned. It may be terminated with a null character.

***nMaxLength*** 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.

#### 10.1.2.43 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:**

***pszString*** String containing characters to be scanned. It may be terminated with a null character.

***nMaxLength*** 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.

#### 10.1.2.44 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:**

***pszString*** String containing characters to be scanned. It may be terminated with a null character.

***nMaxLength*** The maximum number of character to read. Less characters will be read if a null character is encountered.

***bTrimSpaces*** If TRUE, trim ending spaces from the input string. Character considered as empty using isspace(3) function.

***bNormalize*** 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().

#### 10.1.2.45 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:**

***pszString*** String containing characters to be scanned. It may be terminated with a null character.

***nMaxLength*** 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.

#### 10.1.2.46 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:**

***pszString*** String containing characters to be scanned. It may be terminated with a null character.

***nMaxLength*** 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.

#### 10.1.2.47 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:**

***pszString*** input string to be duplicated. May be NULL.

**Returns:**

pointer to a newly allocated copy of the string. Free with CPLFree() or VSIFree().

#### 10.1.2.48 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:**

***pszString*** input string to be converted.

**Returns:**

pointer to the same string, pszString.

#### 10.1.2.49 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:**

***nptr*** Pointer to string to convert.

***endptr*** 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.

#### 10.1.2.50 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:**

***nptr*** Pointer to string to convert.

***endptr*** 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.

***point*** Decimal delimiter.

**Returns:**

Converted value, if any.

#### 10.1.2.51 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:**

***nptr*** Pointer to string to convert.

***endptr*** 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.

#### 10.1.2.52 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:**

***nptr*** Pointer to string to convert.

***endptr*** 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.

***point*** Decimal delimiter.

**Returns:**

Converted value, if any.

#### 10.1.2.53 int CPL_DLL CPLUnlinkTree (const char * *pszPath*)

**Returns:**

0 on successful completion, -1 if function fails.

## 10.2 cpl_error.h File Reference

```
#include "cpl_port.h"
```

### Functions

- void CPL_DLL CPL_STDCALL CPLErrorReset (void)
- int CPL_DLL CPL_STDCALL CPLGetLastErrorNo (void)
- CPLErr CPL_DLL CPL_STDCALL CPLGetLastErrorType (void)
- const char CPL_DLL *CPL_STDCALL CPLGetLastErrorMsg (void)
- CPLErrorHandler CPL_DLL CPL_STDCALL CPLSetErrorHandler (CPLErrorHandler)
- void CPL_DLL CPL_STDCALL CPLPushErrorHandler (CPLErrorHandler)
- void CPL_DLL CPL_STDCALL CPLPopErrorHandler (void)
- void CPL_DLL CPL_STDCALL void CPL_DLL CPL_STDCALL _CPLAssert (const char *, const char *, int)

### 10.2.1 Detailed Description

CPL error handling services.

### 10.2.2 Function Documentation

#### 10.2.2.1 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.

#### 10.2.2.2 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.

#### 10.2.2.3 const char CPL_DLL* CPL_STDCALL CPLGetLastErrorMsg (void)

Get the last error message.

Fetches the last error message posted with CPLError(), that hasn't been cleared by CPLErrorReset(). 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.

#### 10.2.2.4 int CPL_DLL CPL_STDCALL CPLGetLastErrorNo (void)

Fetch the last error number.

This is the error number, not the error class.

**Returns:**

the error number of the last error to occur, or CPLE_None (0) if there are no posted errors.

#### 10.2.2.5 CPLErr CPL_DLL CPL_STDCALL CPLGetLastErrorType (void)

Fetch the last error type.

This is the error class, not the error number.

**Returns:**

the error number of the last error to occur, or CE_None (0) if there are no posted errors.

#### 10.2.2.6 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 CPLPushErrorHandler() call. This method has no effect if there are no error handlers on the current threads error handler stack.

#### 10.2.2.7 void CPL_DLL CPL_STDCALL CPLPushErrorHandler (CPLErrorHandler *pfnErrorHandlerNew*)

Push a new CPLError handler.

This pushes a new error handler on the thread-local error handler stack. This handler will be used untill removed with CPLPopErrorHandler().

The CPLSetErrorHandler() docs have further information on how CPLError handlers work.

**Parameters:**

***pfnErrorHandlerNew*** new error handler function.

#### 10.2.2.8 CPLErrorHandler CPL_DLL CPL_STDCALL CPLSetErrorHandler (CPLErrorHandler *pfnErrorHandlerNew*)

Install custom error handler.

Allow the library's user to specify his own 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 CPLError() 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 CPLQuietErrorHandler() which doesn't make any attempt to report the passed error or warning messages but will process debug messages via CPLDefaultErrorHandler.

Note that error handlers set with CPLSetErrorHandler() apply to all threads in an application, while error handlers set with CPLPushErrorHandler are thread-local. However, any error handlers pushed with CPLPushErrorHandler (and not removed with CPLPopErrorHandler) take precidence over the global error handlers set with CPLSetErrorHandler(). Generally speaking CPLSetErrorHandler() would be used to set a desired global error handler, while CPLPushErrorHandler() would be used to install a temporary local error handler, such as CPLQuietErrorHandler() to suppress error reporting in a limited segment of code.

**Parameters:**

***pfnErrorHandlerNew*** new error handler function.

**Returns:**

returns the previously installed error handler.

# 10.3 cpl_hash_set.h File Reference

```
#include "cpl_port.h"
```

## Functions

- CPLHashSet CPL_DLL * CPLHashSetNew (CPLHashSetHashFunc fnHashFunc, CPLHashSetEqualFunc fnEqualFunc, CPLHashSetFreeEltFunc fnFreeEltFunc)
- void CPL_DLL CPLHashSetDestroy (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)
- 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)

### 10.3.1 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.

### 10.3.2 Function Documentation

#### 10.3.2.1 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:**

***set*** the hash set

#### 10.3.2.2 int CPL_DLL CPLHashSetEqualPointer (const void * *elt1*, const void * *elt2*)

Equality function for arbitrary pointers

**Parameters:**

***elt1*** the first arbitrary pointer to compare

***elt2*** the second arbitrary pointer to compare

**Returns:**

TRUE if the pointers are equal

#### 10.3.2.3 int CPL_DLL CPLHashSetEqualStr (const void * *elt1*, const void * *elt2*)

Equality function for strings

**Parameters:**

***elt1*** the first string to compare. May be NULL.

***elt2*** the second string to compare. May be NULL.

**Returns:**

TRUE if the strings are equal

#### 10.3.2.4 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:**

***set*** the hash set.

***fnIterFunc*** the function called on each element.

***user_data*** the user data provided to the function.

#### 10.3.2.5 unsigned long CPL_DLL CPLHashSetHashPointer (const void * *elt*)

Hash function for an arbitrary pointer

**Parameters:**

***elt*** the arbitrary pointer to hash

**Returns:**

the hash value of the pointer

#### 10.3.2.6 unsigned long CPL_DLL CPLHashSetHashStr (const void * *elt*)

Hash function for a zero-terminated string

**Parameters:**

***elt*** the string to hash. May be NULL.

**Returns:**

the hash value of the string

#### 10.3.2.7 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:**

***set*** the hash set

***elt*** the new element to insert in the hash set

**Returns:**

TRUE if the element was not already in the hash set

#### 10.3.2.8 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:**

***set*** the hash set

***elt*** the element to look up in the hash set

**Returns:**

the element found in the hash set or NULL

#### 10.3.2.9 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:**

***fnHashFunc*** hash function. May be NULL.

***fnEqualFunc*** equal function. May be NULL.

***fnFreeEltFunc*** element free function. May be NULL.

**Returns:**

a new hash set

#### 10.3.2.10 int CPL_DLL CPLHashSetRemove (CPLHashSet * *set*, const void * *elt*)

Removes an element from a hash set

**Parameters:**

***set*** the hash set

***elt*** the new element to remove from the hash set

**Returns:**

TRUE if the element was in the hash set

#### 10.3.2.11 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

## 10.4 cpl_list.h File Reference

```
#include "cpl_port.h"
```

### Classes

- struct _CPLList

### Typedefs

- typedef CPL_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 *psList, int nPosition)
- int CPL_DLL CPLListCount (CPLList *psList)
- CPLList CPL_DLL * CPLListRemove (CPLList *psList, int nPosition)
- void CPL_DLL CPLListDestroy (CPLList *psList)
- CPLList CPL_DLL * CPLListGetNext (CPLList *psElement)
- void CPL_DLL * CPLListGetData (CPLList *psElement)

### 10.4.1 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.

### 10.4.2 Typedef Documentation

#### 10.4.2.1 typedef CPL_C_START struct _CPLList CPLList

List element structure.

### 10.4.3 Function Documentation

#### 10.4.3.1 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:**

***psList*** pointer to list head.

***pData*** pointer to inserted data object. May be NULL.

**Returns:**

pointer to the head of modified list.

#### 10.4.3.2 int CPL_DLL CPLListCount (CPLList * *psList*)

Return the number of elements in a list.

**Parameters:**

***psList*** pointer to list head.

**Returns:**

number of elements in a list.

#### 10.4.3.3 void CPL_DLL CPLListDestroy (CPLList * *psList*)

Destroy a list. Caller responsible for freeing data objects contained in list elements.

**Parameters:**

***psList*** pointer to list head.

#### 10.4.3.4 CPLList CPL_DLL* CPLListGet (CPLList * *psList*, int *nPosition*)

Return the pointer to the specified element in a list.

**Parameters:**

***psList*** pointer to list head.

***nPosition*** the index of the element in the list, 0 being the first element

**Returns:**

pointer to the specified element in a list.

#### 10.4.3.5 void CPL_DLL* CPLListGetData (CPLList * *psElement*)

Return pointer to the data object contained in given list element.

**Parameters:**

***psElement*** pointer to list element.

**Returns:**

pointer to the data object contained in given list element.

#### 10.4.3.6 CPLList CPL_DLL* CPLListGetLast (CPLList * *psList*)

Return the pointer to last element in a list.

**Parameters:**

***psList*** pointer to list head.

**Returns:**

pointer to last element in a list.

#### 10.4.3.7 CPLList CPL_DLL* CPLListGetNext (CPLList * *psElement*)

Return the pointer to next element in a list.

**Parameters:**

***psElement*** pointer to list element.

**Returns:**

pointer to the list element preceded by the given element.

#### 10.4.3.8 CPLList CPL_DLL* CPLListInsert (CPLList * *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:**

***psList*** pointer to list head.

***pData*** pointer to inserted data object. May be NULL.

***nPosition*** position number to insert an object.

**Returns:**

pointer to the head of modified list.

#### 10.4.3.9 CPLList CPL_DLL* CPLListRemove (CPLList * *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:**

***psList*** pointer to list head.

***nPosition*** position number to delet an element.

**Returns:**

pointer to the head of modified list.

## 10.5 cpl_minixml.h File Reference

```
#include "cpl_port.h"
```

### Classes

- struct 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 *pszDefault)
  *Fetch element/attribute value.*
- CPLXMLNode CPL_DLL * CPLCreateXMLNode (CPLXMLNode *poParent, CPLXMLNodeType eType, const char *pszText)
  *Create an document tree item.*
- char CPL_DLL * CPLSerializeXMLTree (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 *pszName, const char *pszValue)

  *Create an element 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 bRecurse)

  *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 (CPLXMLNode *psTree, const char *pszFilename)

  *Write document tree to a file.*

## 10.5.1 Detailed Description

Definitions for CPL mini XML Parser/Serializer.

## 10.5.2 Enumeration Type Documentation

### 10.5.2.1 enum CPLXMLNodeType

**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

## 10.5.3 Function Documentation

### 10.5.3.1 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 (it's psNext is not NULL) they will be trimmed, but if the child has children they are carried with it.

**Parameters:**

***psParent*** the node to attach the child to. May not be NULL.

***psChild*** the child to add to the parent. May not be NULL. Should not be a child of any other parent.

#### 10.5.3.2 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:**

***psOlderSibling*** the node to attach the sibling after.

***psNewSibling*** the node to add at the end of psOlderSiblings psNext chain.

#### 10.5.3.3 void CPL_DLL CPLCleanXMLElementName (char * *pszTarget*)

Make string into safe XML token.

Modifiies 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:**

***pszTarget*** the string to be adjusted. It is altered in place.

#### 10.5.3.4 CPLXMLNode CPL_DLL* CPLCloneXMLTree (CPLXMLNode * *psTree*)

Copy tree.

Creates a deep copy of a CPLXMLNode tree.

**Parameters:**

***psTree*** the tree to duplicate.

**Returns:**

a copy of the whole tree.

#### 10.5.3.5 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:**

***psParent*** the parent node to which the resulting node should be attached. May be NULL to keep as freestanding.

***pszName*** the element name to create.

***pszValue*** the text to attach to the element. Must not be NULL.

**Returns:**

the pointer to the new element node.

#### 10.5.3.6 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:**

***poParent*** the parent to which this node should be attached as a child. May be NULL to keep as free standing.

***eType*** the type of the newly created node

***pszText*** the value of the newly created node

**Returns:**

the newly created node, now owned by the caller (or parent node).

#### 10.5.3.7 void CPL_DLL CPLDestroyXMLNode (CPLXMLNode * *psNode*)

Destroy a tree.

This function frees resources associated with a CPLXMLNode and all its children nodes.

**Parameters:**

***psNode*** the tree to free.

#### 10.5.3.8 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. Seaching 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 it's 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:**

***psRoot*** the subtree in which to search. This should be a node of type CXT_Element. NULL is safe.

***pszPath*** the list of element names in the path (dot separated).

**Returns:**

the requested element node, or NULL if not found.

#### 10.5.3.9 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 not 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:**

***psRoot*** the subtree in which to search. This should be a node of type CXT_Element. NULL is safe.

***pszPath*** the list of element names in the path (dot separated). An empty path means get the value of the psRoot node.

***pszDefault*** the value to return if a corresponding value is not found, may be NULL.

**Returns:**

the requested value or pszDefault if not found.

#### 10.5.3.10 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 CPLError().

The "large file" API is used, so XML files can come from virtualized files.

**Parameters:**

***pszFilename*** the file to open.

**Returns:**

NULL on failure, or the document tree on success.

#### 10.5.3.11 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 CPLError(). No validation beyond well-formedness is done. The CPLParseXMLFile() convenience function can be used to parse from a file.

The returned document tree is is owned by the caller and should be freed with CPLDestroyXMLNode() 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:**

***pszString*** the document to parse.

**Returns:**

parsed tree or NULL on error.

#### 10.5.3.12 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 it's own children, but is cleanly removed from the child list of the parent.

**Parameters:**

***psParent*** the node to the child is attached to.

***psChild*** the child to remove.

**Returns:**

TRUE on success or FALSE if the child was not found.

#### 10.5.3.13 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 it's first child, that childs first child, and so on.

Use CPLGetXMLNode() to find a specific child, or along a specific node path.

**Parameters:**

***psRoot*** the subtree to search. This should be a node of type CXT_Element. NULL is safe.

***pszElement*** the name of the element or attribute to search for.

**Returns:**

The matching node or NULL on failure.

#### 10.5.3.14 char CPL_DLL* CPLSerializeXMLTree (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:**

***psNode***

**Returns:**

the document on success or NULL on failure.

#### 10.5.3.15 int CPL_DLL CPLSerializeXMLTreeToFile (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:**

***psTree*** the document tree to write.

***pszFilename*** the name of the file to write to.

**Returns:**

TRUE on success, FALSE otherwise.

#### 10.5.3.16 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:**

***psRoot*** the subdocument to be updated.

***pszPath*** the dot seperated path to the target element/attribute.

***pszValue*** the text value to assign.

**Returns:**

TRUE on success.

#### 10.5.3.17 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:**

***psRoot*** the document to operate on.

***pszNamespace*** the name space prefix (not including colon), or NULL.

***bRecurse*** TRUE to recurse over whole document, or FALSE to only operate on the passed node.

## 10.6 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

### 10.6.1 Detailed Description

ODBC Abstraction Layer (C++).

# 10.7 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>
```

## Defines

- #define CPL_LSBINT16PTR(x) ((∗(GByte∗)(x)) | ((∗(GByte∗)((x)+1)) << 8))
- #define CPL_LSBINT32PTR(x)

### 10.7.1 Detailed Description

Core portability definitions for CPL.

### 10.7.2 Define Documentation

#### 10.7.2.1 #define CPL_LSBINT16PTR(x) ((∗(GByte∗)(x)) | ((∗(GByte∗)((x)+1)) << 8))

Return a Int16 from the 2 bytes ordered in LSB order at address x

#### 10.7.2.2 #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

## 10.8 cpl_quad_tree.h File Reference

```
#include "cpl_port.h"
```

### Classes

- struct **CPLRectObj**

### 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 ** CPLQuadTreeSearch (const CPLQuadTree *hQuadtree, const CPLRectObj *pAoi, int *pnFeatureCount)
- void CPL_DLL CPLQuadTreeForeach (const CPLQuadTree *hQuadtree, CPLQuadTreeForeachFunc pfnForeach, void *pUserData)

### 10.8.1 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

### 10.8.2 Function Documentation

#### 10.8.2.1 CPLQuadTree CPL_DLL* CPLQuadTreeCreate (const CPLRectObj * *pGlobalBounds*, CPLQuadTreeGetBoundsFunc *pfnGetBounds*)

Create a new quadtree

**Parameters:**

***pGlobalBounds*** a pointer to the global extent of all the elements that will be inserted

***pfnGetBounds*** a user provided function to get the bounding box of the inserted elements

**Returns:**

a newly allocated quadtree

#### 10.8.2.2 void CPL_DLL CPLQuadTreeDestroy (CPLQuadTree * *hQuadTree*)

Destroy a quadtree

**Parameters:**

***hQuadTree*** the quad tree to destroy

#### 10.8.2.3 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:**

***hQuadTree*** the quad tree

***pfnForeach*** the function called on each element.

***pUserData*** the user data provided to the function.

#### 10.8.2.4 int CPL_DLL CPLQuadTreeGetAdvisedMaxDepth (int *nExpectedFeatures*)

Returns the optimal depth of a quadtree to hold nExpectedFeatures

**Parameters:**

***nExpectedFeatures*** the expected maximum number of elements to be inserted

**Returns:**

the optimal depth of a quadtree to hold nExpectedFeatures

#### 10.8.2.5 void CPL_DLL CPLQuadTreeInsert (CPLQuadTree * *hQuadTree*, void * *hFeature*)

Insert a feature into a quadtree

**Parameters:**

***hQuadTree*** the quad tree

***hFeature*** the feature to insert

#### 10.8.2.6 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:**

***hQuadTree*** the quad tree

***pAoi*** the pointer to the area of interest

***pnFeatureCount*** the user data provided to the function.

**Returns:**

an array of features that must be freed with CPLFree

#### 10.8.2.7 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:**

***hQuadTree*** the quad tree

***nBucketCapacity*** the maximum capactiy of a node of a quadtree

#### 10.8.2.8 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:**

***hQuadTree*** the quad tree

***nMaxDepth*** the maximum depth allowed

## 10.9 cpl_string.h File Reference

```
#include "cpl_vsi.h"
#include "cpl_error.h"
#include "cpl_conv.h"
```

### Functions

- int CPL_DLL CSLCount (char **papszStrList)
- void CPL_DLL CPL_STDCALL CSLDestroy (char **papszStrList)
- char CPL_DLL ** CSLDuplicate (char **papszStrList)
- char CPL_DLL ** CSLMerge (char **papszOrig, char **papszOverride)

  *Merge two lists.*

- char CPL_DLL ** CSLTokenizeString2 (const char *pszString, const char *pszDelimeter, int nCSLTFlags)
- char CPL_DLL ** CSLLoad (const char *pszFname)
- int CPL_DLL CSLFindString (char **, const char *)
- int CPL_DLL CSLPartialFindString (char **papszHaystack, const char *pszNeedle)
- int CPL_DLL CSLFindName (char **papszStrList, const char *pszName)
- int CPL_DLL CSLTestBoolean (const char *pszValue)
- const char CPL_DLL * CPLParseNameValue (const char *pszNameValue, char **ppszKey)
- char CPL_DLL ** CSLSetNameValue (char **papszStrList, const char *pszName, const char *pszValue)
- void CPL_DLL CSLSetNameValueSeparator (char **papszStrList, const char *pszSeparator)
- char CPL_DLL * CPLEscapeString (const char *pszString, int nLength, int nScheme)
- char CPL_DLL * CPLUnescapeString (const char *pszString, int *pnLength, int nScheme)
- char CPL_DLL * CPLBinaryToHex (int nBytes, const GByte *pabyData)
- GByte CPL_DLL * CPLHexToBinary (const char *pszHex, int *pnBytes)
- CPLValueType CPL_DLL CPLGetValueType (const char *pszValue)
- char CPL_DLL * CPLRecodeFromWChar (const wchar_t *pwszSource, const char *pszSrcEncoding, const char *pszDstEncoding)
- wchar_t CPL_DLL * CPLRecodeToWChar (const char *pszSource, const char *pszSrcEncoding, const char *pszDstEncoding)

### 10.9.1 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()).

## 10.9.2 Function Documentation

### 10.9.2.1 char CPL_DLL* CPLBinaryToHex (int *nBytes*, const GByte * *pabyData*)

Binary to hexadecimal translation.

**Parameters:**

***nBytes*** number of bytes of binary data in pabyData.

***pabyData*** array of data bytes to translate.

**Returns:**

hexadecimal translation, zero terminated. Free with CPLFree().

### 10.9.2.2 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 reconstitued to it's 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 equivelent (>, < 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 underscore 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, 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:**

***pszInput*** the string to escape.

***nLength*** The number of bytes of data to preserve. If this is -1 the strlen(pszString) function will be used to compute the length.

***nScheme*** the encoding scheme to use.

**Returns:**

an escaped, zero terminated string that should be freed with CPLFree() when no longer needed.

#### 10.9.2.3 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.

**Parameters:**

***pszValue*** the string to analyze

**Returns:**

returns the type of the value contained in the string.

#### 10.9.2.4 GByte CPL_DLL* CPLHexToBinary (const char * *pszHex*, int * *pnBytes*)

Hexadecimal to binary translation

**Parameters:**

***pszHex*** the input hex encoded string.

***pnBytes*** the returned count of decoded bytes placed here.

**Returns:**

returns binary buffer of data - free with CPLFree().

#### 10.9.2.5 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 delimeter when forming name and value strings.

Eventually CSLFetchNameValue() and friends may be modified to use CPLParseNameValue().

**Parameters:**

***pszNameValue*** string in "NAME=VALUE" format.

***ppszKey*** optional pointer though which to return the name portion.

**Returns:**

the value portion (pointing into original string).

#### 10.9.2.6 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 (ie. 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:**

***pwszSource*** the source wchar_t string, terminated with a 0 wchar_t.

***pszSrcEncoding*** the source encoding, typically CPL_ENC_UCS2.

***pszDstEncoding*** the destination encoding, typically CPL_ENC_UTF8.

**Returns:**

a zero terminated multi-byte string which should be freed with CPLFree(), or NULL if an error occurs.

#### 10.9.2.7 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:**

***pszSource*** input multi-byte character string.

***pszSrcEncoding*** source encoding, typically CPL_ENC_UTF8.

***pszDstEncoding*** destination encoding, typically CPL_ENC_UCS2.

**Returns:**

the zero terminated wchar_t string (to be freed with CPLFree()) or NULL on error.

#### 10.9.2.8 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 it's original form.

**Parameters:**

***pszInput*** the input string. This is a zero terminated string.

***pnLength*** location to return the length of the unescaped string, which may in some cases include embedded '\0' characters.

***nScheme*** the escaped scheme to undo (see CPLEscapeString() for a list).

**Returns:**

a copy of the unescaped string that should be freed by the application using CPLFree() when no longer needed.

#### 10.9.2.9 int CPL_DLL CSLCount (char ** *papszStrList*)

Return number of items in a string list.

Returns the number of items in a string list, not counting the terminating NULL. Passing in NULL is safe, and will result in a count of zero.

Lists are counted by iterating through them so long lists will take more time than short lists. Care should be taken to avoid using CSLCount() as an end condition for loops as it will result in O(n^2) behavior.

**Parameters:**

***papszStrList*** the string list to count.

**Returns:**

the number of entries.

#### 10.9.2.10 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:**

***papszStrList*** the list to free.

#### 10.9.2.11 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 CSLDestroy().

**Parameters:**

***papszStrList*** the input string list.

**Returns:**

newly allocated copy.

#### 10.9.2.12 int CPL_DLL CSLFindName (char ** *papszStrList*, const char * *pszName*)

Find StringList entry with given key name.

**Parameters:**

***papszStrList*** the string list to search.

***pszName*** the key value to look for (case insensitive).

**Returns:**

-1 on failure or the list index of the first occurance matching the given key.

#### 10.9.2.13 int CPL_DLL CSLFindString (char ** *papszList*, const char * *pszTarget*)

Find a string within a string list.

Returns the index of the entry in the string list that contains the target string. The string in the string list must be a full match for the target, but the search is case insensitive.

**Parameters:**

***papszList*** the string list to be searched.

***pszTarget*** the string to be searched for.

**Returns:**

the index of the string within the list or -1 on failure.

#### 10.9.2.14 char CPL_DLL** CSLLoad (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:**

***pszFname*** the name of the file to read.

**Returns:**

a string list with the files lines, now owned by caller.

#### 10.9.2.15 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 precidence.

**Parameters:**

***papszOrig*** the original list, being modified.

***papszOverride*** the list of items being merged in. This list is unaltered and remains owned by the caller.

**Returns:**

updated list.

#### 10.9.2.16 int CPL_DLL CSLPartialFindString (char ** *papszHaystack*, const char * *pszNeedle*)

Find a substring within a string list.

Returns the index of the entry in the string list that contains the target string as a substring. The search is case sensitive (unlike CSLFindString()).

**Parameters:**

***papszHaystack*** the string list to be searched.

***pszNeedle*** the substring to be searched for.

**Returns:**

the index of the string within the list or -1 on failure.

#### 10.9.2.17 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:**

***papszList*** the original list, the modified version is returned.

***pszName*** the name to be assigned a value. This should be a well formed token (no spaces or very special characters).

***pszValue*** 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.

#### 10.9.2.18 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 manipulatable 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 desireable to include some white space in the new separator. eg. ": " or " = ".

**Parameters:**

***papszList*** the list to update. Component strings may be freed but the list array will remain at the same location.

***pszSeparator*** the new separator string to insert.

#### 10.9.2.19 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.

**Parameters:**

***pszValue*** the string should be tested.

**Returns:**

TRUE or FALSE.

#### 10.9.2.20 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' delimeter(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;
int i;

papszTokens =
    CSLTokenizeString2( pszCommand, " \t\n",
                        CSLT_HONOURSTRINGS | CSLT_ALLOWEMPTYTOKENS );

for( i = 0; papszTokens != NULL && papszTokens[i] != NULL; i++ )
    printf( "arg %d: '%s'", papszTokens[i] );
CSLDestroy( papszTokens );
```

**Parameters:**

***pszString*** the string to be split into tokens.

***pszDelimiters*** one or more characters to be used as token delimeters.

***nCSLTFlags*** an ORing of one or more of the CSLT_ flag values.

**Returns:**

a string list of tokens owned by the caller.

## 10.10 cpl_vsi.h File Reference

```
#include "cpl_port.h"
#include <unistd.h>
#include <sys/stat.h>
```

### Functions

- FILE CPL_DLL * VSIFOpenL (const char *, const char *)
  *Open file.*
- int CPL_DLL VSIFCloseL (FILE *)
  *Close file.*
- int CPL_DLL VSIFSeekL (FILE *, vsi_l_offset, int)
  *Seek to requested offset.*
- vsi_l_offset CPL_DLL VSIFTellL (FILE *)
  *Tell current file offset.*
- size_t CPL_DLL VSIFReadL (void *, size_t, size_t, FILE *)
  *Read bytes from file.*
- size_t CPL_DLL VSIFWriteL (const void *, size_t, size_t, FILE *)
  *Write bytes to file.*
- int CPL_DLL VSIFEofL (FILE *)
  *Test for end of file.*
- int CPL_DLL VSIFFlushL (FILE *)
  *Flush pending writes to disk.*
- int CPL_DLL VSIStatL (const char *, VSIStatBufL *)
  *Get filesystem object info.*
- void CPL_DLL * VSIMalloc2 (size_t nSize1, size_t nSize2)
- void CPL_DLL * VSIMalloc3 (size_t nSize1, size_t nSize2, size_t nSize3)
- char CPL_DLL ** VSIReadDir (const char *)
  *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.*
- void CPL_DLL VSIInstallMemFileHandler (void)
  *Install "memory" file system handler.*
- void VSIInstallGZipFileHandler (void)
  *Install GZip file system handler.*
- void VSIInstallZipFileHandler (void)
  *Install ZIP file system handler.*
- FILE CPL_DLL * VSIFileFromMemBuffer (const char *pszFilename, GByte *pabyData, vsi_l_offset nDataLength, int bTakeOwnership)
  *Create memory "file" from a buffer.*
- GByte CPL_DLL * VSIGetMemFileBuffer (const char *pszFilename, vsi_l_offset *pnDataLength, int bUnlinkAndSeize)
  *Fetch buffer underlying memory file.*

## 10.10.1 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.

Is 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.

## 10.10.2 Function Documentation

### 10.10.2.1 int CPL_DLL VSIFCloseL (FILE * *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:**

***fp*** file handle opened with VSIFOpenL().

**Returns:**

0 on success or -1 on failure.

#### 10.10.2.2 int CPL_DLL VSIFEofL (FILE * *fp*)

Test for end of file.

Returns TRUE (non-zero) if the file read/write offset is currently at the end of the file.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX feof() call.

**Parameters:**

***fp*** file handle opened with VSIFOpenL().

**Returns:**

TRUE if at EOF else FALSE.

#### 10.10.2.3 int CPL_DLL VSIFFlushL (FILE * *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:**

***fp*** file handle opened with VSIFOpenL().

**Returns:**

0 on success or -1 on error.

#### 10.10.2.4 FILE 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:**

***pszFilename*** the filename to be created.

***pabyData*** the data buffer for the file.

***nDataLength*** the length of buffer in bytes.

***bTakeOwnership*** TRUE to transfer "ownership" of buffer or FALSE.

**Returns:**

open file handle on created file (see VSIFOpenL()).

#### 10.10.2.5 FILE 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 "FILE *" returned by this function is not really 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.

This method goes through the VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fopen() function.

**Parameters:**

***pszFilename*** the file to open.

***pszAccess*** access requested (ie. "r", "r+", "w".

**Returns:**

NULL on failure, or the file handle.

#### 10.10.2.6 size_t CPL_DLL VSIFReadL (void * *pBuffer*, size_t *nSize*, size_t *nCount*, FILE * *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 VSIFileHandler virtualization and may work on unusual filesystems such as in memory.

Analog of the POSIX fread() call.

**Parameters:**

***pBuffer*** the buffer into which the data should be read (at least nCount * nSize bytes in size.

***nSize*** size of objects to read in bytes.

***nCount*** number of objects to read.

***fp*** file handle opened with VSIFOpenL().

**Returns:**

number of objects successfully read.

#### 10.10.2.7 int CPL_DLL VSIFSeekL (FILE * *fp*, vsi_l_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:**

***fp*** file handle opened with VSIFOpenL().

***nOffset*** offset in bytes.

***nWhence*** one of SEEK_SET, SEEK_CUR or SEEK_END.

**Returns:**

0 on success or -1 one failure.

#### 10.10.2.8 vsi_l_offset CPL_DLL VSIFTellL (FILE * *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:**

***fp*** file handle opened with VSIFOpenL().

**Returns:**

file offset in bytes.

#### 10.10.2.9 size_t CPL_DLL VSIFWriteL (const void * *pBuffer*, size_t *nSize*, size_t *nCount*, FILE * *fp*)

Write bytes to file.

Writess 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:**

***pBuffer*** the buffer from which the data should be written (at least nCount * nSize bytes in size.

***nSize*** size of objects to read in bytes.

***nCount*** number of objects to read.

***fp*** file handle opened with VSIFOpenL().

**Returns:**

number of objects successfully written.

#### 10.10.2.10 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 existance.

**Parameters:**

***pszFilename*** the name of the file to grab the buffer of.

***pnDataLength*** (file) length returned in this variable.

***bUnlinkAndSeize*** TRUE to remove the file, or FALSE to leave unaltered.

**Returns:**

pointer to memory buffer or NULL on failure.

#### 10.10.2.11 void VSIInstallGZipFileHandler (void)

Install GZip file system handler.

A special file handler is installed that allows reading on-the-fly 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/ReadInZip

#### 10.10.2.12 void CPL_DLL VSIInstallMemFileHandler (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 VSI*L 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 VSIReadDir() 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 (ie. 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( VSIFileFromMemBuffer( "/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 );
}
```

#### 10.10.2.13 void VSIInstallZipFileHandler (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.

Additional documentation is to be found at http://trac.osgeo.org/gdal/wiki/UserDocs/ReadInZip

#### 10.10.2.14 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 CPLError(). 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.

#### 10.10.2.15 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 CPLError(). 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.

#### 10.10.2.16 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:**

***pszPathname*** the path to the directory to create.

***mode*** the permissions mode.

**Returns:**

0 on success or -1 on an error.

#### 10.10.2.17 char CPL_DLL** VSIReadDir (const char * *pszPath*)

Read names in a directory.

This function abstracts access to directory contains. 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:**

***pszPath*** the relative, or absolute path of a directory to read.

**Returns:**

The list of entries in the directory, or NULL if the directory doesn't exist.

#### 10.10.2.18 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:**

***oldpath*** the name of the file to be renamed.

***newpath*** the name the file should be given.

**Returns:**

0 on success or -1 on an error.

#### 10.10.2.19 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:**

***pszDirname*** the path of the directory to be deleted.

**Returns:**

0 on success or -1 on an error.

#### 10.10.2.20 int CPL_DLL VSIStatL (const char * *pszFilename*, VSIStatBufL * *psStatBuf*)

Get filesystem object info.

Fetches status information about a filesystem object (file, directory, etc). The returned information is placed in the VSIStatBufL structure. For portability only the st_size (size in bytes), and st_mode (file type). This method is similar to VSIStat(), 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:**

***pszFilename*** the path of the filesystem object to be queried.

***psStatBuf*** the structure to load with information.

**Returns:**

0 on success or -1 on an error.

#### 10.10.2.21 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:**

***pszFilename*** the path of the file to be deleted.

**Returns:**

0 on success or -1 on an error.

## 10.11 sdtsdataset.cpp File Reference

```
#include "sdts_al.h"
#include "gdal_pam.h"
#include "ogr_spatialref.h"
```

### Classes

- class **SDTSDataset**
- class **SDTSRasterBand**

### 10.11.1 Detailed Description

exclude