



SEDRIIS 201

Using SEDRIIS Software and Tools

www.sedris.org

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SEDRI 201 - Using SEDRI Software and Tools

The tutorial will show how the SEDRI SDK is used to create applications and libraries that can read and write SEDRI transmittals. The presentation will demonstrate the process of obtaining and setting up the appropriate SEDRI component SDKs, depending on the needs of the application.

The tutorial will also show how the SEDRI tools are used to convert and integrate databases to/from such data formats as Shapefile, GeoTIFF, CTDB, and others. The presentation will cover aspects of verifying the SEDRI transmittals for conformance to the syntax and rules of the SEDRI data representation model (DRM), and steps for creating and integrating databases using the Focus tool.

Prerequisites: General knowledge of SEDRI concepts and components, familiarity with software development and its use in environmental data generation and consumption.



Tutorial Organization

- Overview of the SEDRI SDKs
- Using the SEDRI SDK
 - Contents of the release package
 - Compiling the SDK with Visual Studio 2010
 - Creating and compiling user applications
 - Sample Data, Documentation, Getting Help
- Working with SEDRI Tools
 - Tools Overview
 - Using Converters
 - Using Focus to View/Edit STF files
 - SEE-IT, EDCS Query Tool
- Demos



Overview of the SEDRIS SDKs

- Five technology components:
 - Data Representation Model (DRM)
 - Environmental Data Coding Specification (EDCS)
 - Spatial Reference Model (SRM)

Used to express the semantics and representational schema of environmental data

 - Application Program Interfaces (API)
 - SEDRIS Transmittal Format (STF)

Used to exchange environmental data
- SDKs: EDCS, SRM, SEDRIS (integration of the 5 components for interchanging environmental data sets)
- All technology components are defined in 8 ISO/IEC standards
 - 3 of the standards are extensible through online registries



Overview of SEDRIS SDKs (cont.)

- Latest SDKs available from www.sedris.org/sdk
 - EDCS SDK: 4.4.0
 - SRM SDK: 4.1.4, 4.4 (with advanced features)
 - SEDRIS SDK: 4.1.4
- Zip and tgz files, in source and binary releases
- Support for Windows, Linux, Solaris, SGI IRIX
- Visual Studio support
- Makefiles for Unix systems
- Static and dynamic libraries



Overview of SEDRIS SDKs (cont.)

- EDCS SDK:
 - Implementation of the International Standard ISO/IEC 18025, Environmental Data Coding Specification (EDCS)
 - Provides a mechanism to specify the environmental "things" that a particular data model construct is intended to represent
 - C API release
 - EDCS Registry at edcsreg.sedris.org
 - More info on the EDCS at www.sedris.org/edcs
- SRM SDK:
 - Implementation of the International Standard ISO/IEC 18026, Spatial Reference Model (SRM)
 - Spatial reference frames, coordinate conversions
 - C, C++, and Java API releases
 - SRM Registry at srmreg.sedris.org
 - More info on the SRM at www.sedris.org/srm

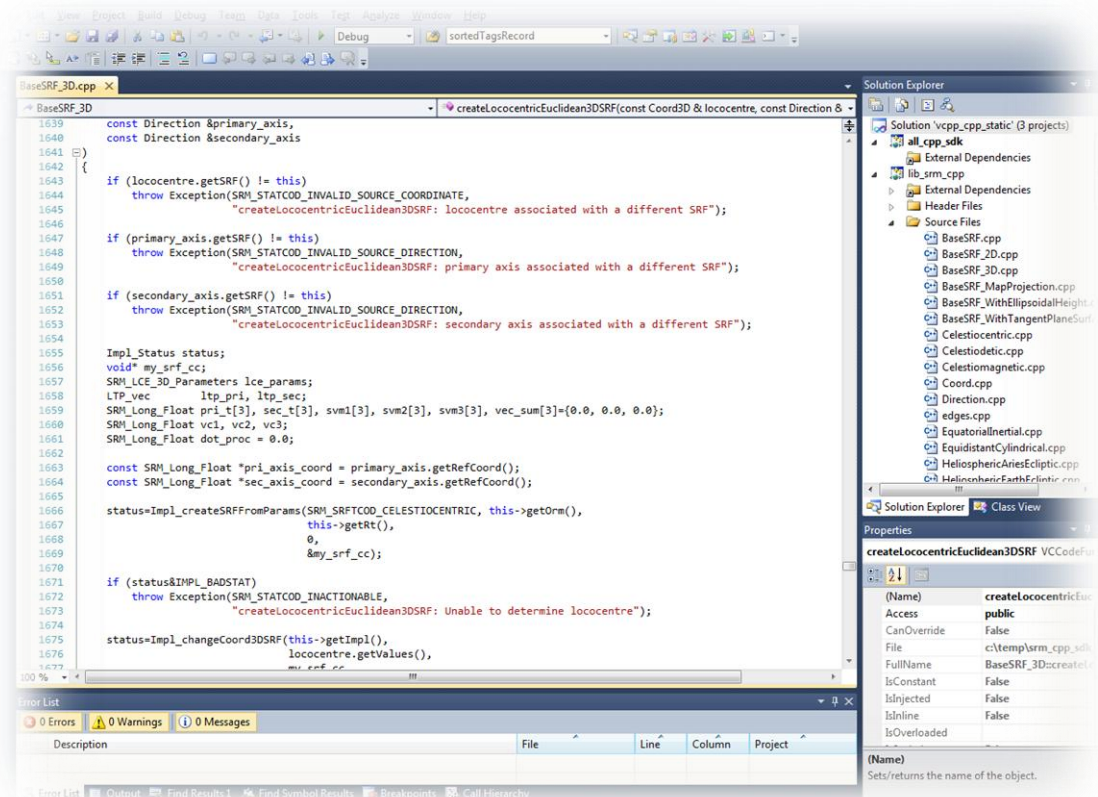


Overview of SEDRIS SDKs (cont.)

- SEDRIS SDK:
 - Implementation of the International Standard ISO/IEC 18023, SEDRIS – Part 1: Functional specification
 - Read/Write/Edit SEDRIS STF transmittals
 - Includes the EDCS and SRM SDKs
 - Documentation, example applications, and sample data
 - C and C++ API releases
 - SEDRIS Registry at sedrisreg.sedris.org
 - More info on the DRM at www.sedris.org/drm
 - More info on the SEDRIS API at www.sedris.org/api_desc.htm



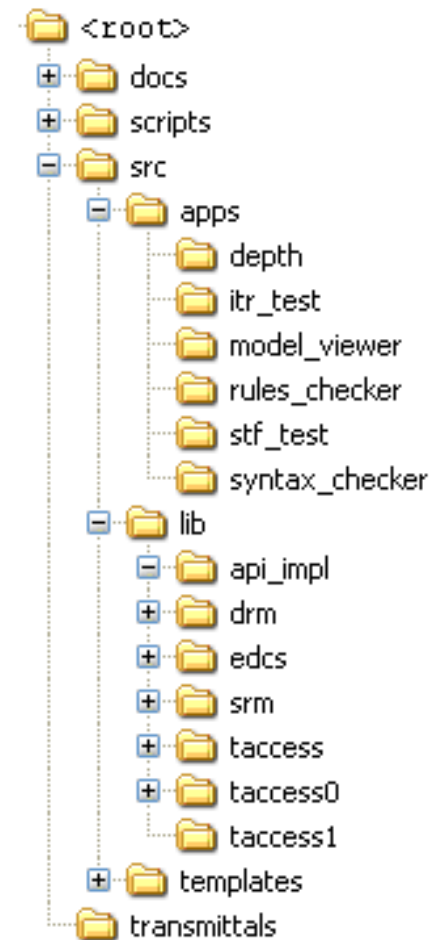
Using the SEDRIS SDKs





Contents of the SDK release package

- Makefiles and Visual Studio Solution files
- Documentation
- Migration scripts
- Source for libraries
- Source for core and example applications
- Sample transmittals





Compiling the SDKs with Visual Studio 2010

- Extract the source package release (e.g. SEDRI C++ SDK)
- Run the “win32_headers.bat” file (creates “include” directory with combined header files)
- If compiling the Model Viewer app, see next slide
- Open the solution file (e.g. “vcpp_static.sln”) with Visual Studio
 - Solutions files are 2003 versions, let VS 2010 perform the conversion
- Select Debug or Release mode
- Right-click the “all_sdk” project and choose “Build” (compilation takes a few minutes)
- Application binaries are in the “bin” directory, libraries in “lib”



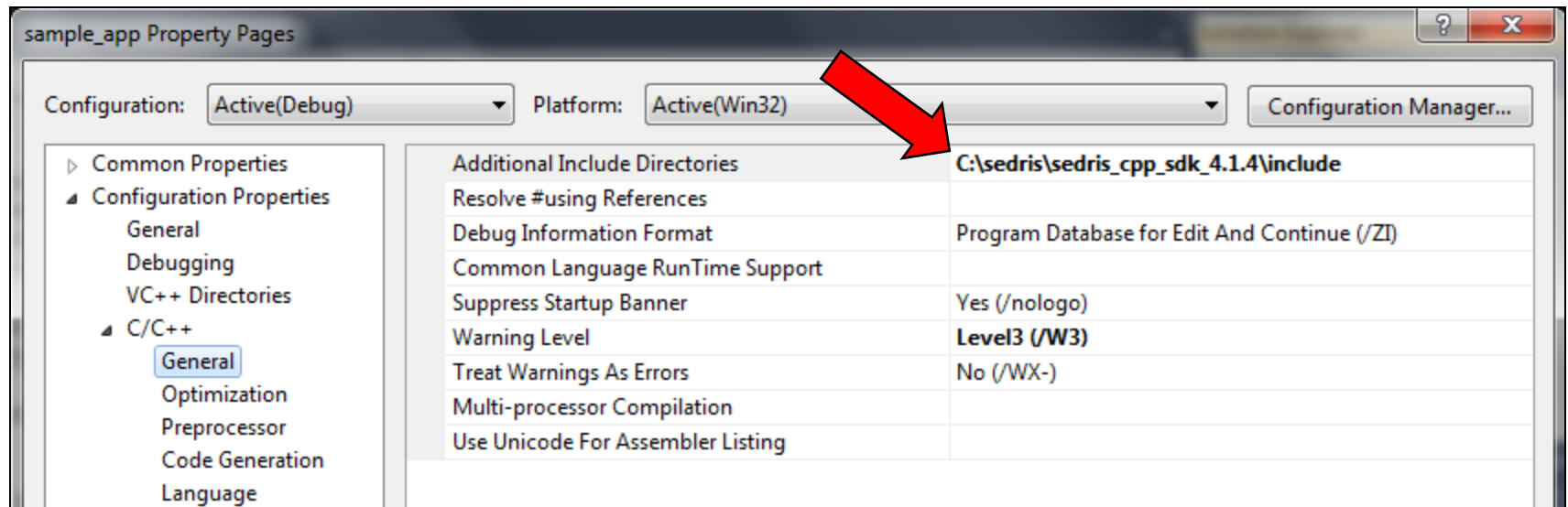
Compiling the SDKs with Visual Studio 2010 - GLUT

- The Model Viewer sample application uses OpenGL and GLUT for 3D viewing
- Currently uses GLUT 3.7.6, available from www.idfun.de/glut64/ (for 32 and 64 bit Windows)
- To install GLUT, extract the GLUT package and place:
 - “glut.h” in “C:\Program Files (x86)\Microsoft Visual Studio 10.0\VC\include\GL” (create folder)
 - “glut32.lib” and “glut64.lib” in “C:\Program Files (x86)\Microsoft Visual Studio 10.0\VC\lib”
 - “glut32.dll” and “glut64.dll” in “C:\Windows\SysWOW64” (for Windows 7 64-bit)



Creating and compiling user applications

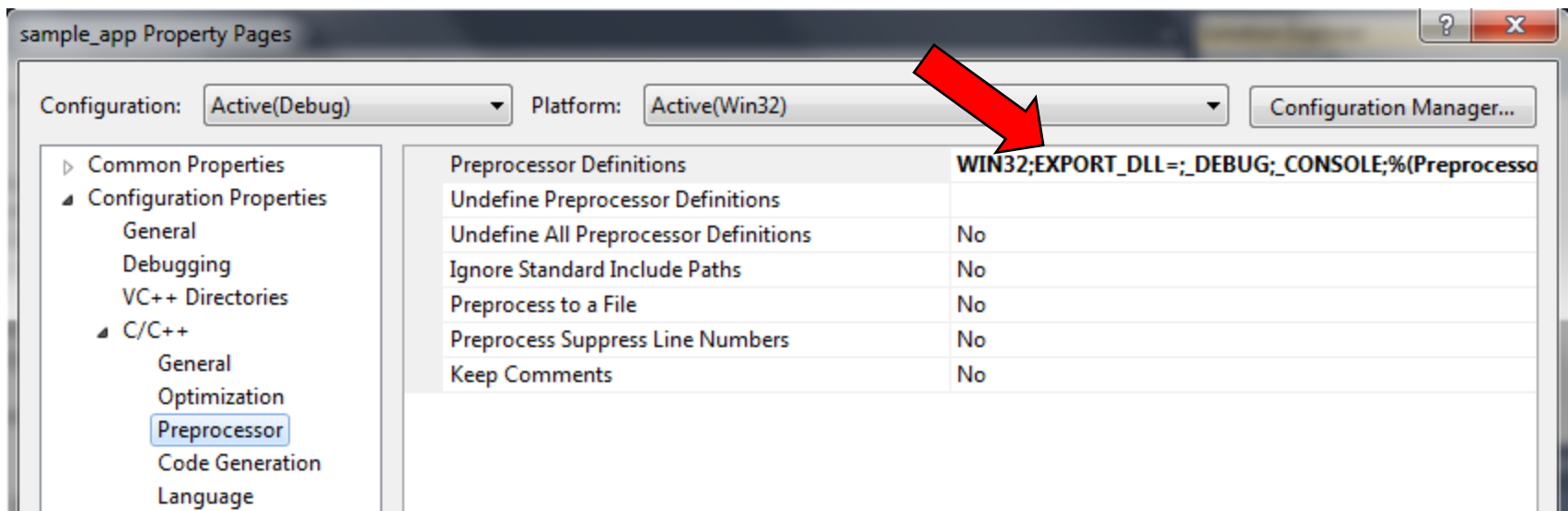
- Add a new project to the solution, or create a new separate project (e.g. “Win32 Console Application”)
- In the “C/C++” properties setting, add a reference to the SEDRIS “include” directory





Creating and compiling user applications (cont.)

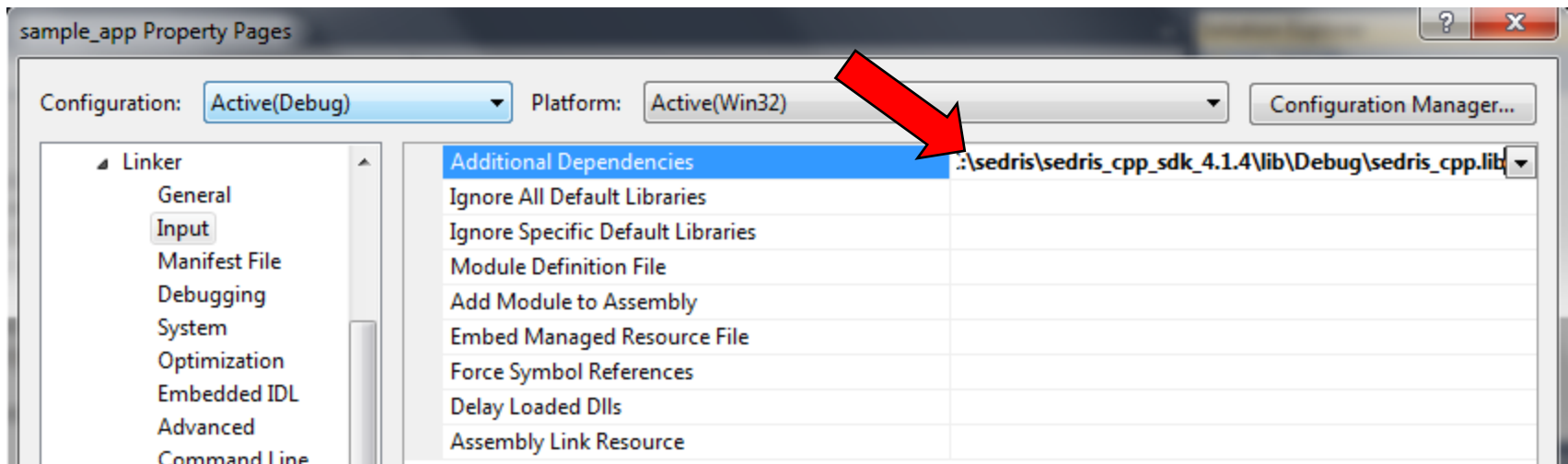
- If using a Static build, add the macro “EXPORT_DLL=” to the “Preprocessor” definitions in the “C/C++” settings





Creating and compiling user applications (cont.)

- In the “Linker” properties setting, add a reference to the SEDRI “lib\[Configuration]\sedris_cpp.lib” file



- Build and test



Sample Code – Open Transmittal

- Include header files:

```
#include "seWorkspace.h"  
#include "seTransmittal.h"
```

- Declare the SEDRIS namespace:

```
using namespace sedris;
```

- Use an seWorkspace to open the transmittal:

```
seWorkspace wksp;  
seTransmittal xmtal;  
  
wksp.openTransmittalByFile(argv[1], xmtal);
```



Sample Code – List Model Names

```
seDRMTransmittalRoot root_obj;  
seDRMModelLibrary model_lib_obj;  
  
xmtal.getRootObject(root_obj);  
  
if (root_obj.GetComponent(model_lib_obj))  
{  
    seIterator iter;  
    seDRMModel model_obj;  
  
    model_lib_obj.GetComponentIterator(iter, SE_CLS_DRM_MODEL);  
  
    while ( iter.getNext(model_obj) )  
    {  
        if ( model_obj.get_name().characters )  
            cout << "Model = " <<  
                model_obj.get_name().characters << endl;  
        else  
            cout << "Model = NO NAME" << endl;  
    }  
}
```




Sample Data, Documentation, Getting Help

- Sample Data in STF is available from data.sedris.org
 - Sample models
 - DEMs
 - Large city areas (Town Square, Anywhere)
 - Weather data samples
- Documentation and help files:
 - Guide to the Build Kit (sample app)
 - Windows Help File (chm) with SEDRIS C++ SDK docs
 - “docs” directory in SDKs
- SEDRIS Help Line at help@sedris.org



Working with SEDRIS Tools

The top-left screenshot displays a 3D map view with a grid and various colored regions. The top-right screenshot shows a search window with a list of results and a detailed view of an 'AIRFIELD' classification. The bottom screenshot shows a hierarchical tree view of the data structure and a detailed view of the 'Property Grid' data table.

Search Results:

- AIRCRAFT HANGAR
- AIRCRAFT MAINTENANCE SHOP
- AIRFIELD
- AMBASSADORIAL RESIDENCE
- AMPHITHEATRE
- ANTE ROOM
- APARTMENT HOUSE
- ARMOURY
- ASSEMBLY PLANT
- ATRIUM

EDCS Classification : AIRFIELD

Label: AIRFIELD
Code: 44
Symbolic Constant: ECC_AIRFIELD

Definition:
An <AIRPORT> with limited or absent <BUILDING>s, <FACILITY>s, and <EQUIPMENT>; an airfield.

Group Membership:

URN:
Object ID: 0,0,18
Class: SE_CLS_DRM_PROPERTY_GRID

spatial_axes_count: 1
location_index:
0. location_index: 0

srft_context_info.angular_unit: EUC_DEGREE_ARC
srft_context_info.linear_unit: EUC_METRE
srft_context_info.linear_scale: ESC_UNI
srft_context_info.use_dss_code: SE_TRUE
srft_context_info.dss_code: SRM_DSSCOD_MSL
srft_context_info.srft_parameters_info.srft_params_info_code: SRM_SRFTPARAMINFCOD_TEMPLATE
srft_context_info.srft_parameters_info.rt_code: SRM_RTCOD_WGS_1984_IDENT
srft_context_info.srft_parameters_info.value.srft_template.template_code: SRM_SRFTCOD_CELESTIODETC
srft_context_info.srft_parameters_info.value.srft_template.orm_code: SRM_ORMCOD
srft_context_info.srft_parameters_info.value.srft_template.parameters.cd_srf_pos: 0

data_present: SE_TRUE
relative_to_hook_point: SE_TRUE
View/Edit Data Table data



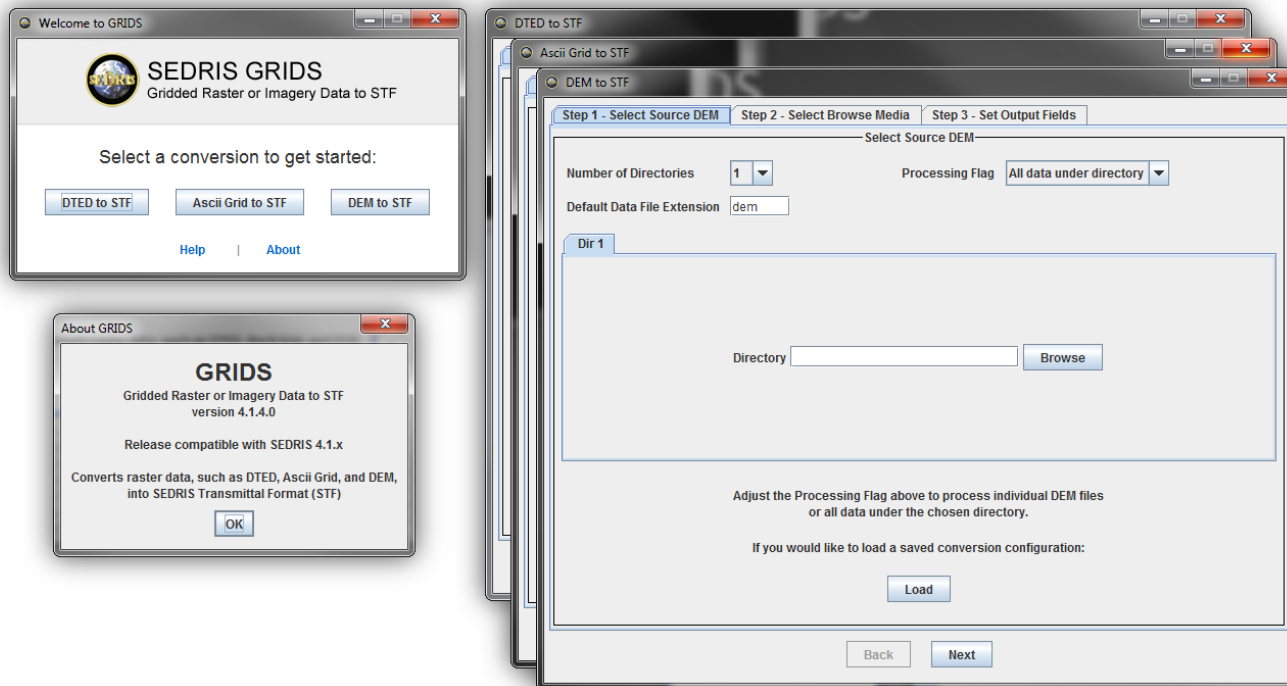
Tools Overview

- Download from tools.sedris.org
- **Converters:**
 - Move data to/from STF files, such as Shapefile, DTED, ASCII Grid, CTDB, GeoTIFF
 - Convert from older STF versions
- **Editors:**
 - View, create, edit STF transmittals (Focus)
- **Visualization:**
 - 2D and 3D visualization (SEE-IT, Model Viewer, Side-by-Side Viewer)
- **Verification:**
 - View an ASCII listing of transmittal content (Depth)
 - Verify DRM compliance (Syntax Checker and Rules Checker)
 - Verify data consistency and issues (SEE-IT)
 - Verify transmittal content meets specific criteria (XTCRS Checker)
- **Other:**
 - SRM coordinate converter integrated with Google Maps (iPhone/iPad)
 - EDCS Query Tool (search for EDCS terms)



GRIDS

- Converts gridded raster data to STF:
 - NGA DTED
 - USGS DEM
 - ArcInfo ASCII Grid





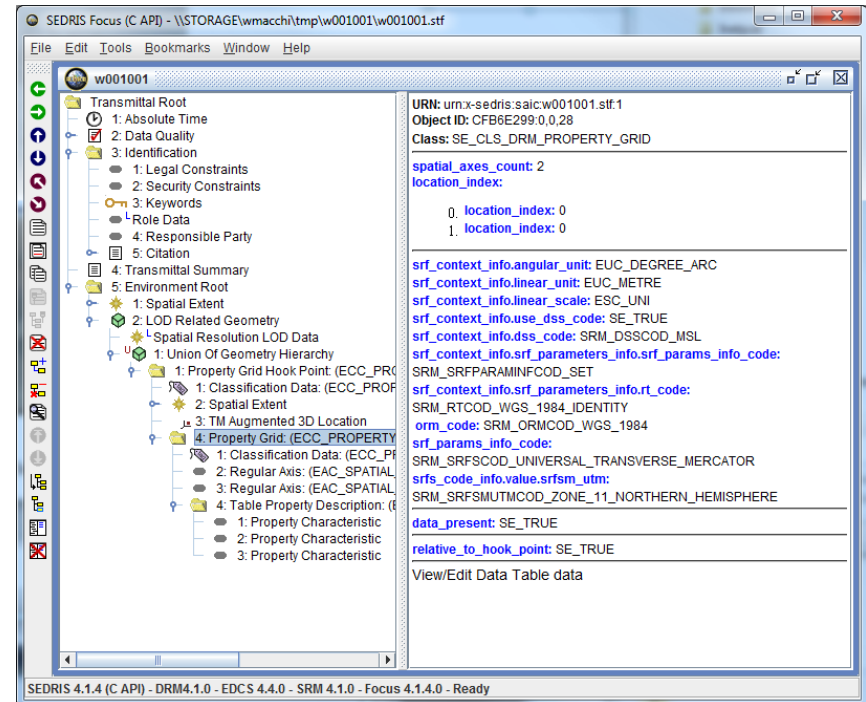
GRIDS (cont.)

w001001.asc



w001001.stf

w001001_00000.stf





GRIDS (cont.)

- Example conversion
 - Step 1: Select Source DTED data
 - Choose a directory containing source DTED data
 - Choose the appropriate DTED Level
 - Step 2: Select Browse Media (Optional)
 - If appropriate, select desired browse media
 - Step 3: Set Output Options
 - Choose a name and desired location for the new Transmittal
 - Enter any desired “metadata” to be included (source, edition, series, etc.)
 - Click the “Start Conversion” button to perform the conversion

DTED to STF

Step 1 - Select Source DTED Step 2 - Select Browse Media Step 3 - Set Output Fields

Select Source DTED

Number of Directories: 1 Processing Flag: All data under directory

Dir 1

Directory: C:\SEDRIS\data\test_dtd Browse

DTED Level: 0

Adjust the Processing Flag above to process individual DTED files, a specific latitude and longitude range, or process all data under the chosen directory.

If you would like to load a saved conversion configuration:

Load

Back Next

DTED to STF

Step 1 - Select Source DTED Step 2 - Select Browse Media Step 3 - Set Output Fields

Select Browse Media

Number of Browse Media: 0

Adjust the Number of Browse Media above to include them in the DTED to STF conversion.

Load

Back Next

DTED to STF

Step 1 - Select Source DTED Step 2 - Select Browse Media Step 3 - Set Output Fields

Set Output Fields

New Transmittal Name: C:\SEDRIS\data\output\newSTF.stf Browse

Date MM/DD/YYYY: 09/19/2011

Series Name: Test Series

Edition: Test Edition

NSN/PCN Number: 0123456789

STF File Description: This is a STF created using the GRIDS DTED to STF converter.

Complete the fields above with the required information and when ready, click the Start Conversion button to initiate the DTED conversion.

Start Conversion

If you would like to save this conversion configuration for reuse:

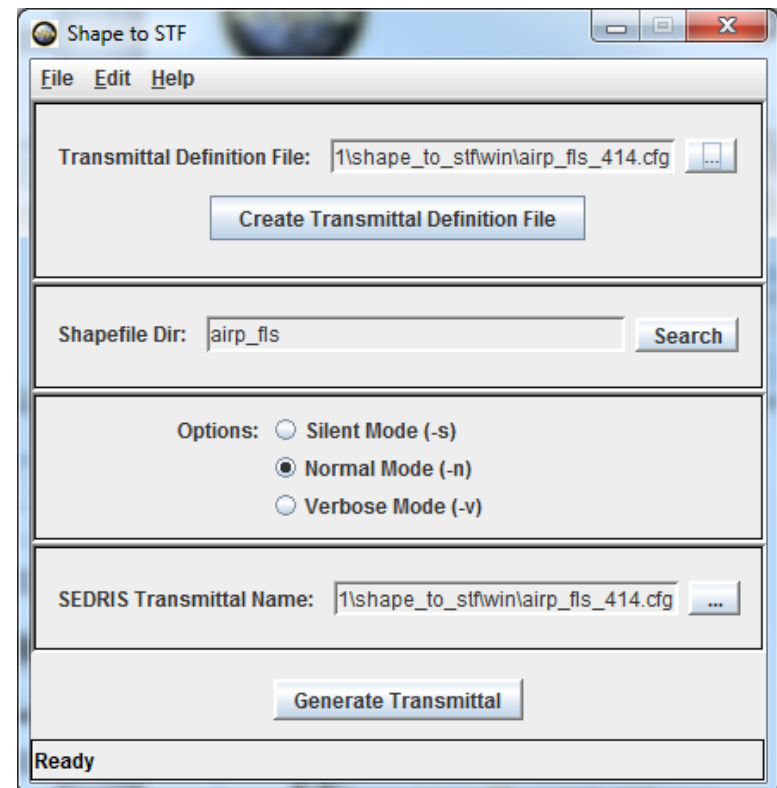
Save Save As

Back Next



Shape to STF

- Converts ESRI Shapefiles to SEDRI transmittals
- Uses DIGEST FACC 2.1 to EDCS 4.x Mapping library to create Classification Related Features
- First column of Shapefile's DBF file should be named FCODE, F_CODE, FEATURE_AT, FEATURE, or FEATURE_NA
- Can read the associated projection (".prj") file to determine coordinate reference system
- Other feature attributes are converted to Property Values (as text values).
- An Area of Interest can be specified (features at least partially within the bounds are processed)



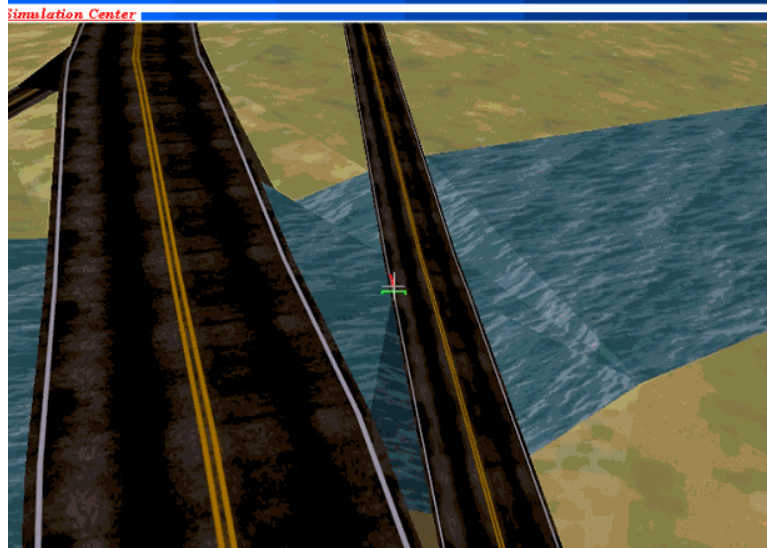


SEE-IT

- Checks for conditions that may be inaccurate descriptions of the physical environment, and it finds conditions that can lead to anomalous behaviors by entities operating in the simulated world



Road - River Intersection Without Bridge

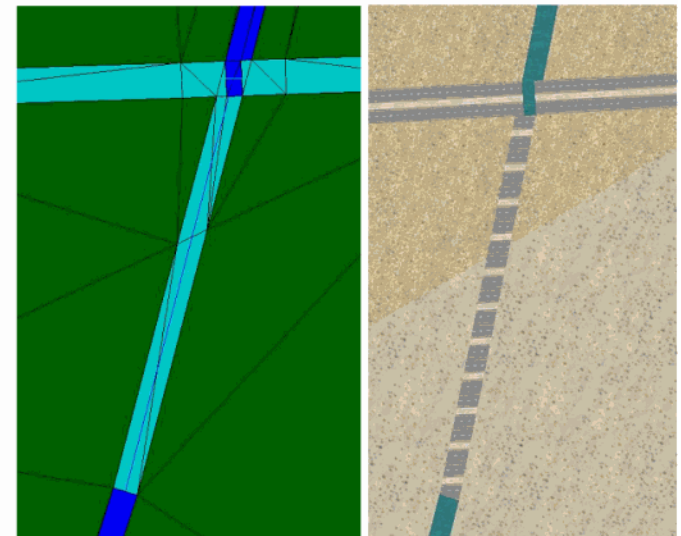


Simulation Center

Unusual River (Or is it a Road?)

Left: SEE-IT locates an anomalous river/road crossing.

Right: The same anomaly viewed using an out-the-window-viewer

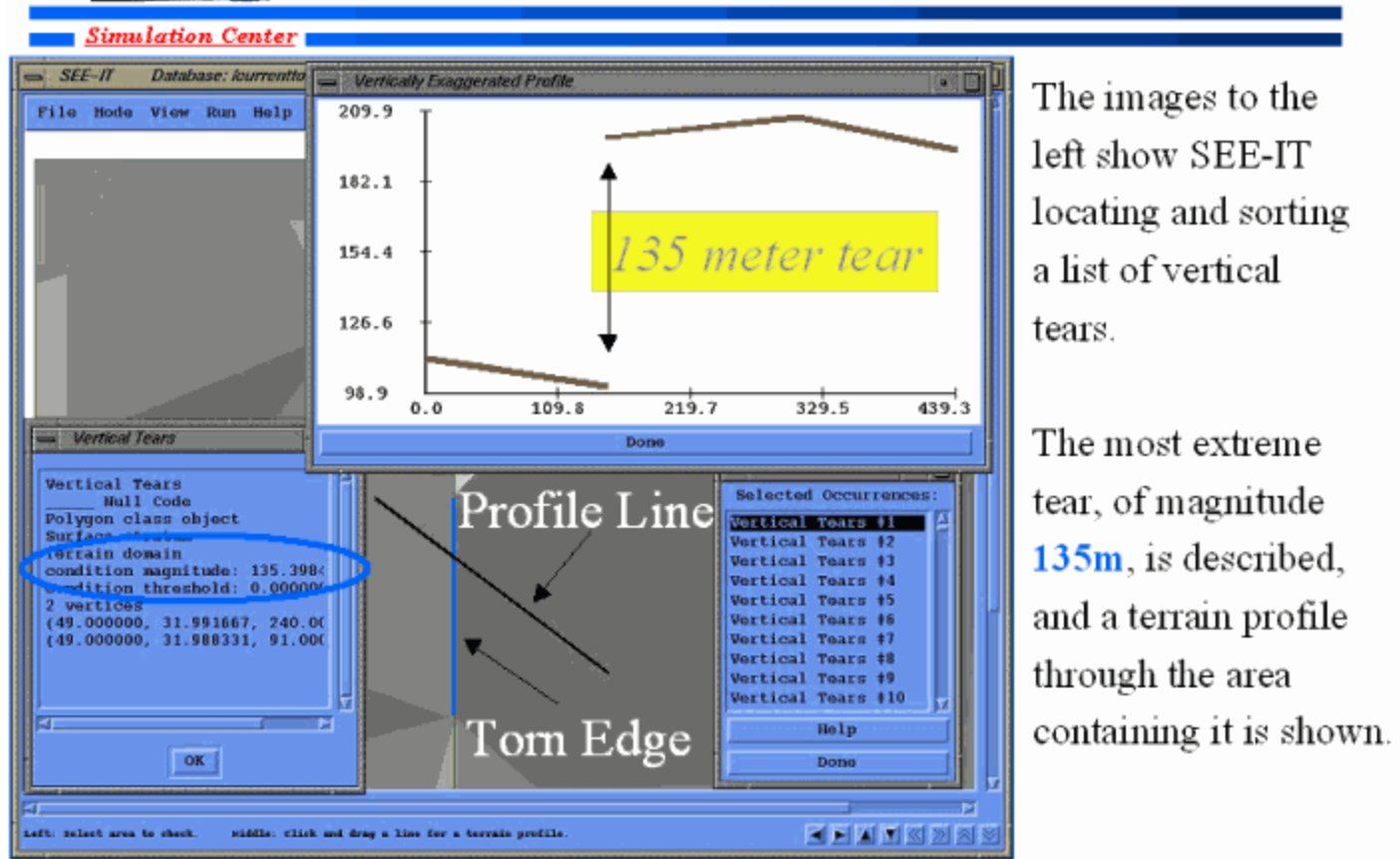




SEE-IT (cont.)



Vertical Tears



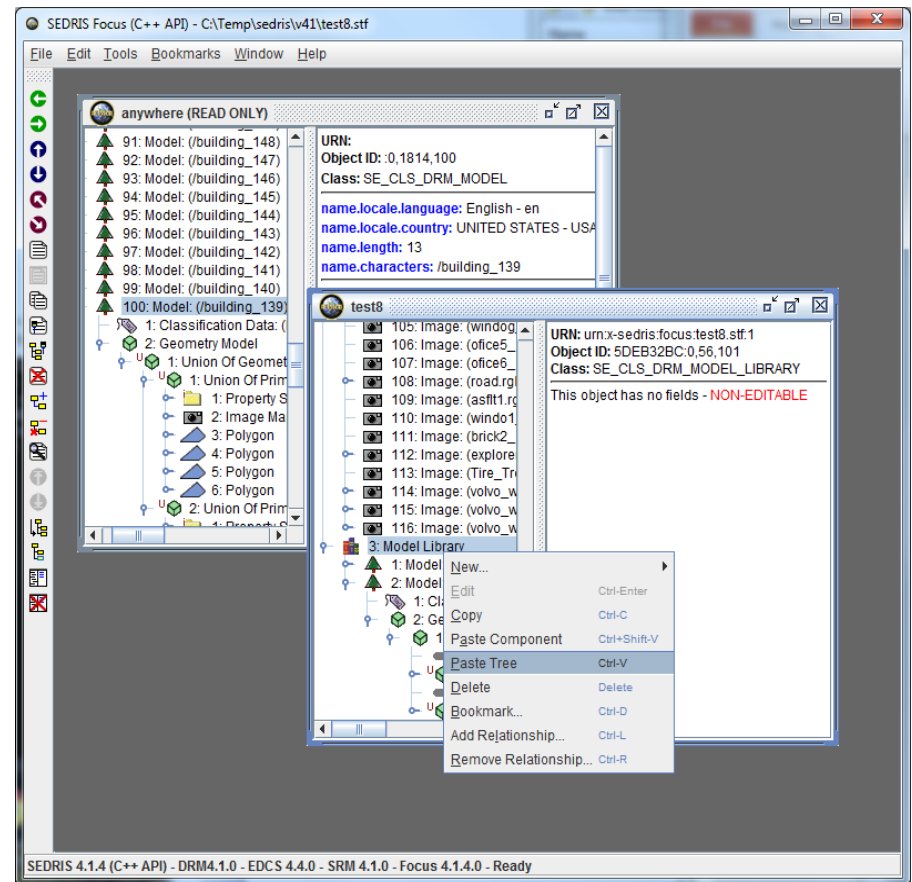


-
- The screenshot shows the SEDRIS Focus (C API) interface. The title bar reads "SEDRIS Focus (C API) - C:\Temp\sample.stf". The menu bar includes File, Edit, Tools, Bookmarks, Window, and Help. The left sidebar contains various icons for file operations. The main window is divided into two panes. The top pane, titled "sample", shows a tree structure with "Transmittal Root" and "1: IC". A context menu is open over the "1: IC" item, listing actions like New..., Edit, Copy, Paste Component, Paste Tree, Delete, Bookmark..., Add Relationship..., and Remove Relationship..., each with a keyboard shortcut. The bottom pane displays metadata for the selected item, including "URN: urn:x-sedris:focus:sample.stf:1" and various fields like "credit_count", "credit", "supplemental_information.locale.language", "supplemental_information.locale.country", "supplemental_information.length", and "supplemental_information.characters". The status bar at the bottom indicates the software version and readiness: "SEDRIS 4.1.4 (C API) - DRM4.1.0 - EDCS 4.4.0 - SRM 4.1.0 - Focus 4.1.4.0 - Ready".
- SEDRIS Focus (C API) - C:\Temp\sample.stf
- File Edit Tools Bookmarks Window Help
- sample
- Transmittal Root
- URN: urn:x-sedris:focus:sample.stf:1
- 1: IC
- New... Edit Ctrl-Enter Copy Ctrl-C Paste Component Ctrl+Shift-V Paste Tree Ctrl-V Delete Delete Bookmark... Ctrl-D Add Relationship... Ctrl-L Remove Relationship... Ctrl-R
- Browse Media Citation Keywords Legal Constraints Responsible Party Security Constraints
- credit_count: 0
- credit:
0. NULL Field
- supplemental_information.locale.language: English - en
- supplemental_information.locale.country: UNITED STATES - USA
- supplemental_information.length: 0
- supplemental_information.characters:
- SEDRIS 4.1.4 (C API) - DRM4.1.0 - EDCS 4.4.0 - SRM 4.1.0 - Focus 4.1.4.0 - Ready



Focus (cont.)

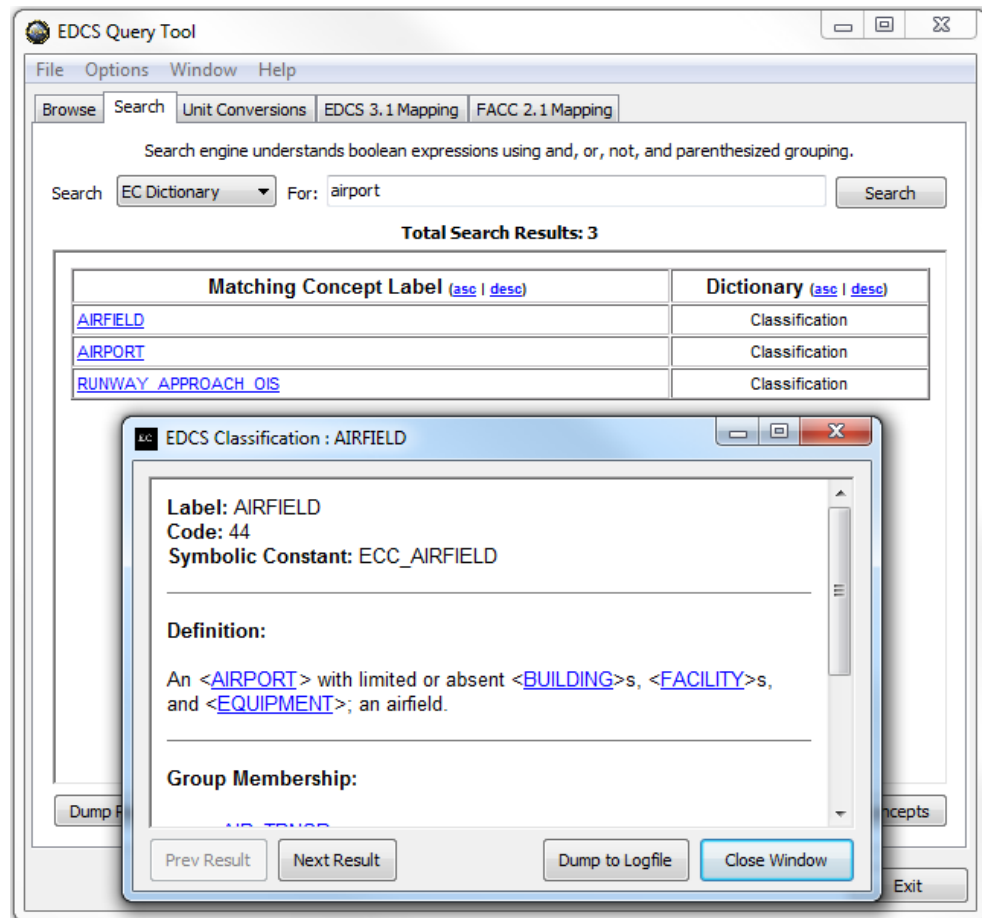
- Run SEDRIS utilities from within Focus:
 - **Depth:** Text output for a section of the transmittal
 - **Rules Checker:** Verifies the structural semantics of a given SEDRIS transmittal against the DRM constraints
 - **Syntax Checker:** Verifies the syntactic correctness of a given DRM hierarchy
 - **Model Viewer:** Displays 3D models and images





EDCS Query Tool

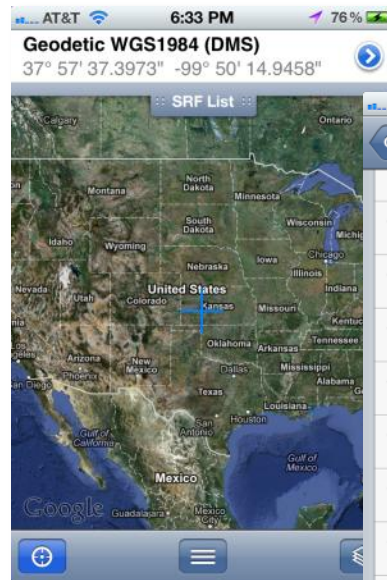
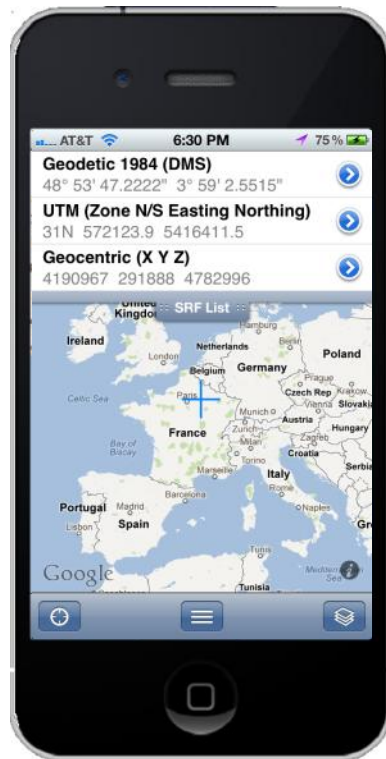
- Browse and query the EDCS
- Perform Unit Conversions within EDCS Units
- Map FACC 2.1 concepts to EDCS





SRM-based iPhone/iPad App

- Created using Xcode





SEDRI Tools

Demos



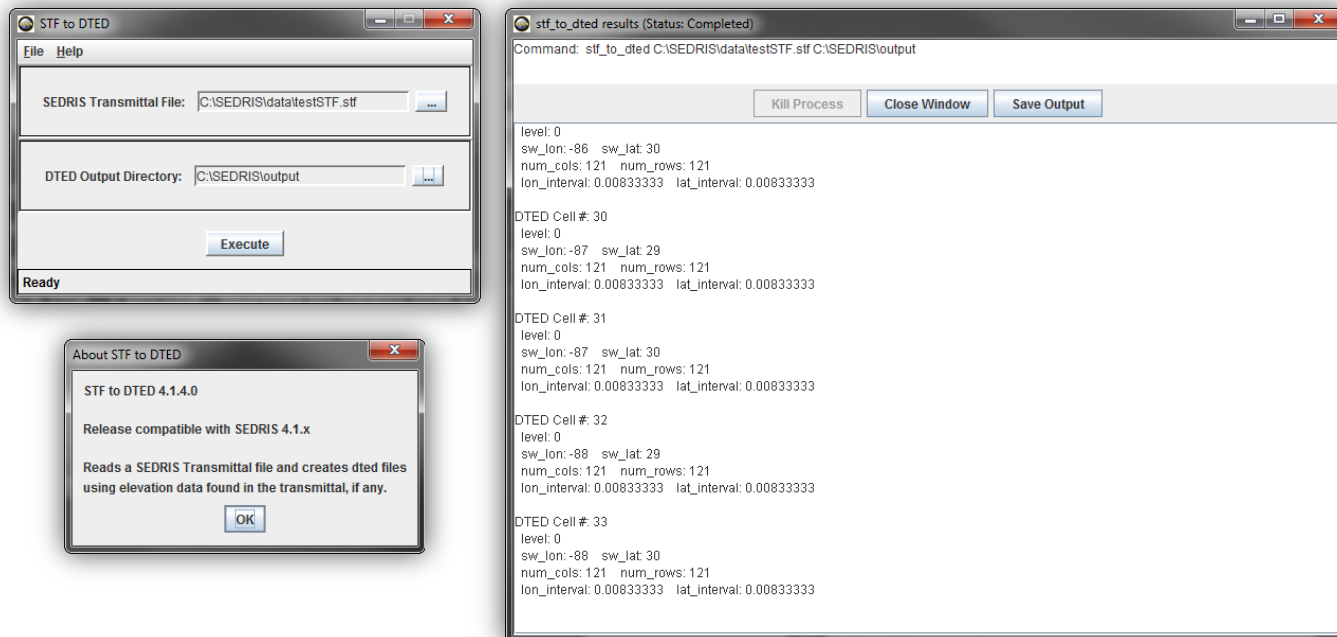
Backup Slides

Additional Converter Tools



STF to DTED

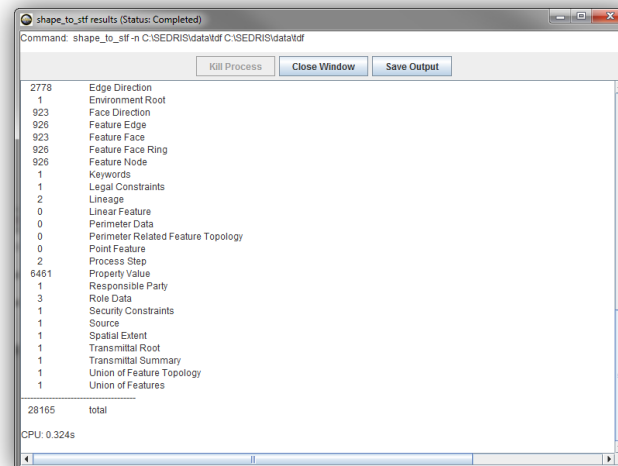
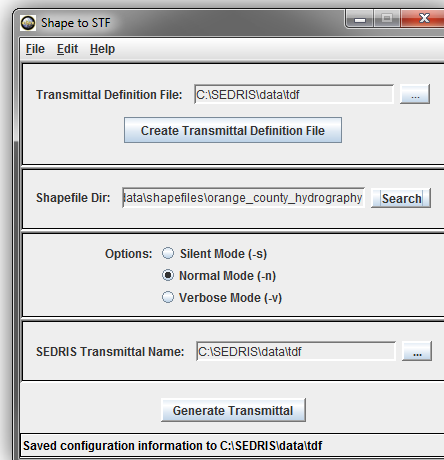
- Extracts gridded terrain elevation data from a SEDRIS Transmittal and produces NGA DTED data files
- Example conversion
 - Step 1: Choose the source Transmittal
 - Step 2: Choose the desired directory for the converted DTED data
 - Step 3: Click the “Execute” button to perform the conversion





Shape to STF

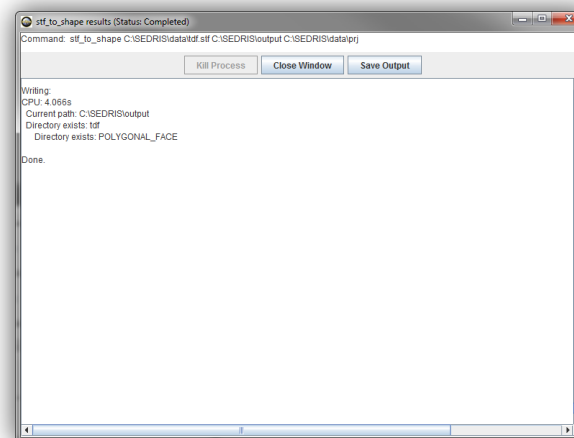
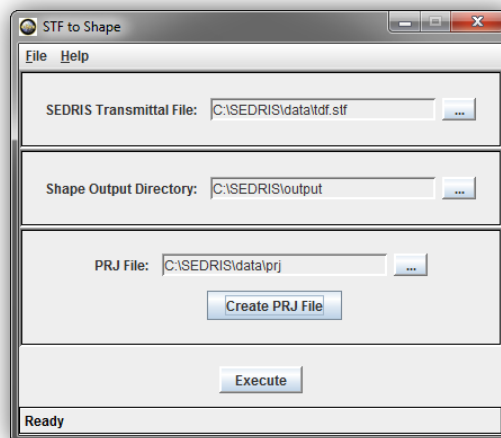
- Converts objects from ESRI Shape files into a SEDRIS Transmittal
- Example conversion:
 - Step 1: Create a Transmittal definition file to specify the appropriate spatial reference frame, mandatory STF meta data, and area of interest
 - Step 2: Choose the directory containing the source Shape file data
 - Step 3: Choose a name and desired location for the new Transmittal
 - Step 4: Click the “Generate Transmittal” button to perform the conversion





STF to Shape

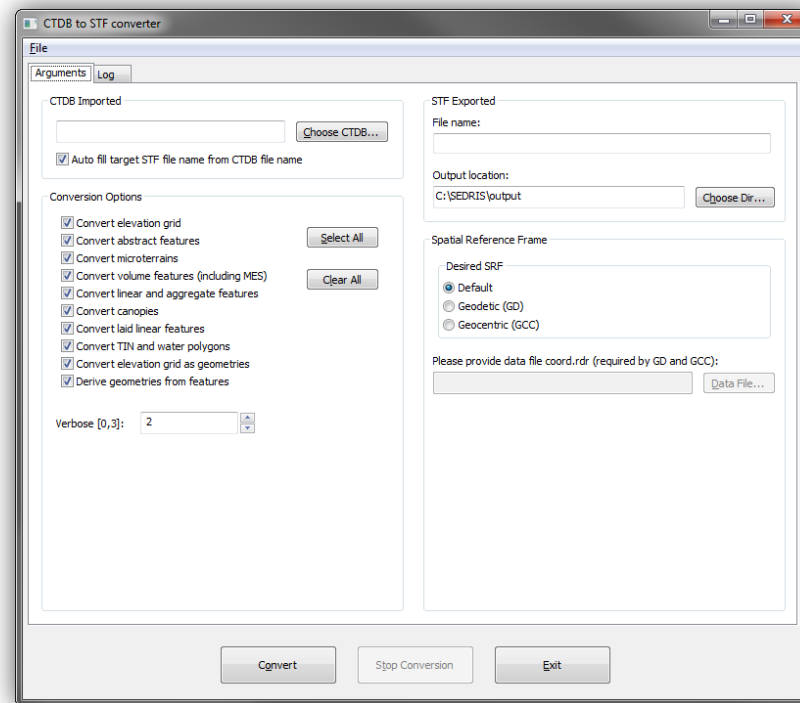
- Extracts features from a SEDRI Transmittal and creates ESRI Shape files
- Example conversion
 - Step 1: Choose the source Transmittal
 - Step 2: Choose the desired directory to place the converted Shape files
 - Step 3: Create a Projection File, providing projections for the new Shape files
 - Step 4: Click the “Execute” button to perform the conversion





CTDB to STF

- Converts from the Compact Terrain Database format to a SEDRIS Transmittal





CTDB to STF

- Example conversion
 - Step 1: Choose the source CTDB to convert
 - Step 2: Choose any desired conversion options
 - Step 3: Choose a name and desired location for the new Transmittal
 - Step 4: Choose relevant Spatial Reference Frame
 - Step 5: Click “Convert” to perform the conversion



-
- STF to CTDB converter
- File Help
- Input/Output Configuration Files Spatial Info Options and Controls Custom PAT Columns Log
- Please indicate SEDRIS transmital files to be converted
- C:\SEDRI5\data\stf.stf
 - C:\SEDRI5\data\testSTF.stf
- Add...
- Remove
- Please set CTDB output path and base name
- Output path: C:\SEDRI5\output Select...
- Base name: (no extension)
- Version: 1
- Please set the output directory for temporary files created during compilation
- Temp path: C:\SEDRI5\temp Select...
- ☐ Preserve temporary files (keep_temp_files)
- Please specify name of the file containing NOAA geoid data if any
- Geoid data file: Select...
- Convert Stop Conversion Exit

ST to CDB converter

File Help

Input/Output... Configuration Files Spatial Info Options and Controls Custom PAT Columns Log...

Please select an EDCS attribute and click "Add" button to add to PAT:

ABSOLUTE_ELEVATION_ACCURACY
ABSOLUTE_HORIZONTAL_ACCURACY
ABSOLUTE_HEIGHT
ABSOLUTE_HEIGHT_ACCURACY
ABSOLUTE_LONGITUDE_ACCURACY
ABSOLUTE_VERTICAL_ACCURACY
ACCESS_DIRECTION_TYPE
ACCESSIBILITY_STATUS
ACQUA_PRECIP
ACQUA_PRECIP_24_HOUR
ACQUA_PRECIP_24_HOUR_DENSITY
ACQUA_PRECIP_3_HOUR
ACQUA_PRECIP_3_HOUR_DENSITY
ACQUA_PRECIP_6_HOUR
ACQUA_PRECIP_6_HOUR_DENSITY
ACQUA_PRECIP_DENSITY
ACCUMULATION_PERIOD
ACCUMULATION_PERIOD_CATEGORY
ACOUSTIC_BOUNDMY_LOSS
ACOUSTIC_CENTRE_FREQUENCY_BAND
ACOUSTIC_HALFCHANNEL_OBSERVATION_FRACTION
ACOUSTIC_NOISE_MARGINAL_IJC_ZONE_MULTIPLES
ACOUSTIC_NOISE_SPECTRAL_CURVE_CORRECTION
ACOUSTIC_PIVAR_LVL_BAND
ACOUSTIC_PIVAR_LVL_SPECTRUM
ACOUSTIC_PIVAR_LVL_SPECTRUM_CORRECTION
ACOUSTIC_REFLECTION_TYPE
ACOUSTIC_REFLECTOR
ACOUSTIC_SCATTERING_STRENGTH
ACOUSTIC_TARGET_STRENGTH
ACOUSTIC_TRANSMISSION_LOSS
ACOUSTIC_VOLUME_LAYER_SCATTERING_STRENGTH_FREQUENCY
ACTIVE_ACOUSTIC
AERIAL_COUNT

Add>>

<-Remove

The following columns will be added to PAT:

Will map to FACC attribute code:

Note: the converter accepts one to one mapping only and the mapped FACC attribute must be of enum type)

Convert Stop Conversion Exit

Note: (Note: SOIL_TYPE, SOIL_WETNESS_CATEGORY and SURFACE_MATERIAL_TYPE are default PAT columns. The max number of PAT columns is 255.)



STF to CTDB

- Example conversion
 - Step 1: Choose the source Transmittal
 - Step 2: Choose a name and desired location for the CTDB file
 - Step 3: Choose the configuration files for the converter to use
 - Step 4: Choose relevant Spatial Reference Frame options
 - Step 5: Choose any general program options and controls
 - Step 6: Create the desired Custom PAT Columns using the EDCS Attribute list
 - Step 7: Click “Convert” to perform the conversion



GeoTIFF to STF

- Converts GeoTIFF digital elevation models to a SEDRI Transmittal
- Example conversion (using a sample included with the tool)
 - Step 1: Create or modify a template mapping file with desired settings
 - Step 2: From a command prompt or Unix shell, run the command:
`geotiff_to_stf test/dem_10m_w108470_n35430.tif newTransmittal.stf test/tdm2sedri`

```
C:\Windows\system32\cmd.exe
GeoTIFF to STF Converter v4.1.4.0
  <compatible with SEDRI SDK 4.1.x>

Usage: geotiff_to_stf <path/geotiff.tif> <path/transmittal.stf>
      <path/tdm2sedri> [tolerance]

[ERROR] Please specify GeoTIFF data, STF, and parameter file names
[ERROR]       as arguments.

An optional fourth argument <read as a floating point number> will
be used to pack the data tables. This number is the tolerance to
which the packing is done.
```



GRIB to STF

- Creates SEDRIS Transmittals from
 - World Meteorological Organization GRIB (Gridded Binary)
 - NATO METGM (meteorological grid format)

```
C:\Windows\system32\cmd.exe
GRIB to STF Converter v4.1.4.0
  <compatible with SEDRIS SDK 4.1.x>

Usage: grib_to_stf.exe <transmittal_name> <path> <metadata_file> <model_id>
      <format> [debug_flag]

Where:
    path = path to directory containing data
    metadata_file = path & name of metadata file
    model_id = model identifier
    format = {GRIB | METGM}
    debug_flag = 1  write to stderr
                0  no debugging output (default)
                -1  write to /tmp/<transmittal_name>_dump
```



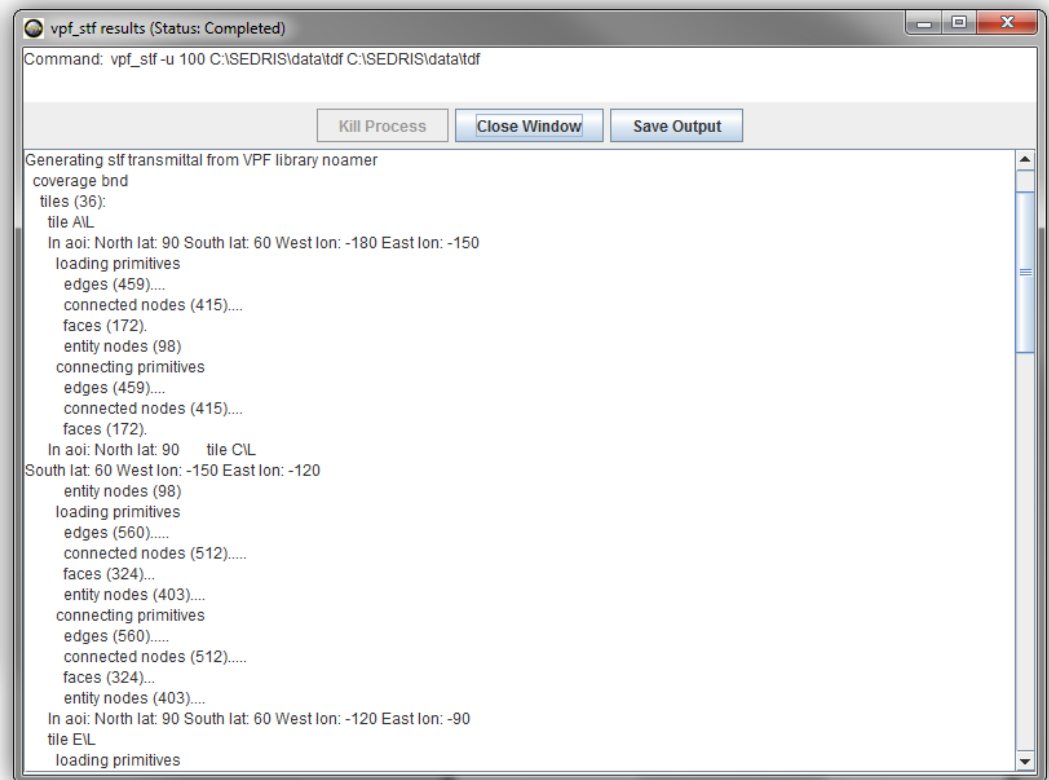
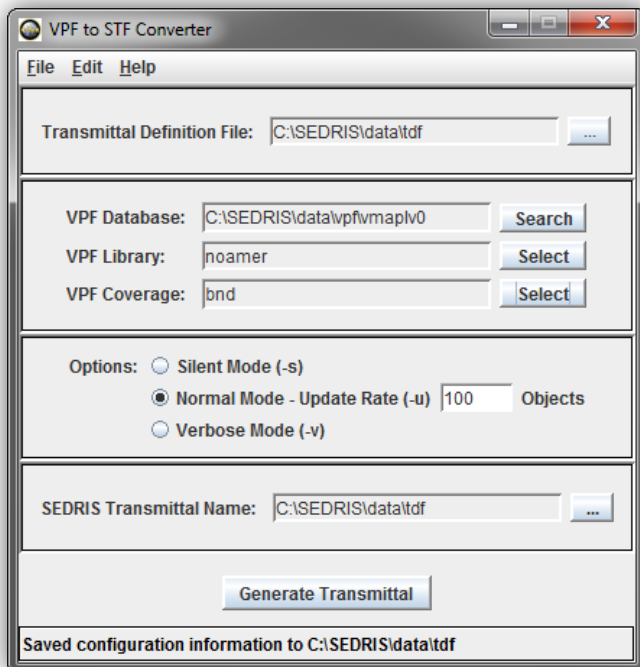

GRIB to STF

- Example GRIB to STF conversion (using sample data included with the tool)
 - From a command prompt or Unix shell, run the command:
`grib_to_stf example_1.stf Data/GRIB1 Data/GRIB1/coamps.meta COAMPS GRIB`
 - General Syntax:
`grib_to_stf <stf_name> <data_path> <metadata_path> <model> <format>`
 - *<stf_name>* = the name of the STF to be created
 - *<data_path>* = path to location of the data files
 - *<metadata_path>* = path, with file name, to location of the metadata file
 - *<model>* = name of the model used to create the data in the data files
 - *<format>* = format of data files (*GRIB* or *METGM*)



VPF to STF

- Converts NGA feature data in Vector Product Format (VPF) to a SEDRI Transmittal





VPF to STF

- Example VPF to STF conversion
 - Step 1: Create a Transmittal definition file to provide the area of interest and required “metadata” for the Transmittal
 - Step 2: Choose the source VPF data to convert, and the VPF Library and Coverage to use for the conversion
 - Step 3: Choose a name and desired location for the new Transmittal
 - Step 4: Click the “Generate Transmittal” button to perform the conversion



STF to STF Converter

- Creates a new SEDRI Transmittal (using the current SEDRI SDK) from an existing Transmittal created with a previous version of the SEDRI SDK
- Example STF conversion
 - From a Command Prompt or Unix shell, run the command:
`stf_convert [options] <source_transmittal> <target_transmittal>`

```
C:\Windows\system32\cmd.exe
STF Converter 4.0.x to 4.1.x v4.1.4.0
<compatible with SEDRI SDK 4.1.x>

Usage: stf_convert [options] <source_transmittal> <target_transmittal>

Options:
  -progress <nn>      : show conversion progress every <nn> objects,
                        <default is 1000, 0 to turn off>
  -verbose             : show detailed progress and warnings/errors
  -h                  : show help
  -v                  : show version

Error - missing arguments
```