



# SEDRIIS 201

## Using SEDRIIS Software and Tools

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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.

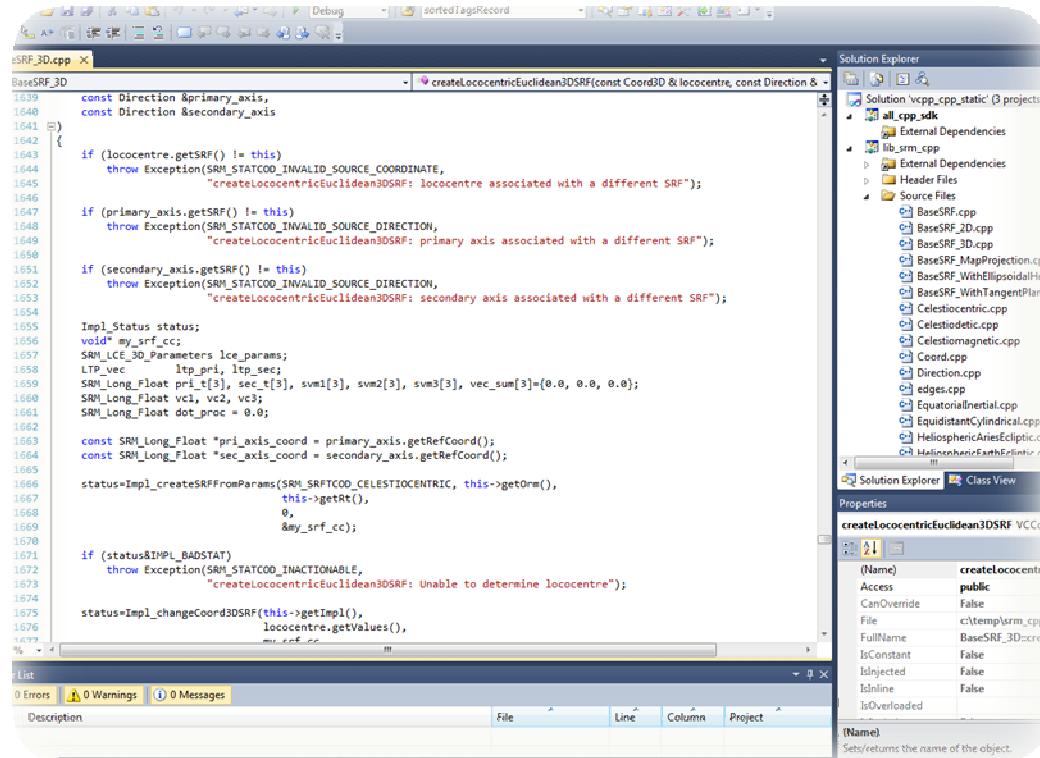


# Tutorial Organization

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



# Using the SEDRIS SDKs





# Overview of SEDRI 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)
  - SEDRI Transmittal Format (STF)

Used to exchange environmental data
- SDKs: EDCS, SRM, SEDRI (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](http://www.sedris.org/sdk)
  - EDCS SDK: 4.3.1
  - SRM SDK: 4.1.3, 4.4 (with advanced features)
  - SEDRIS SDK: 4.1.3
- 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 SEDRIIS SDKs (cont.)

- EDCS SDK:
  - Implementation of the International Standard ISO/IEC 18025 – Environmental Data Coding Specification (EDCS)
  - C API release
  - Provides a mechanism to specify the environmental "things" that a particular data model construct is intended to represent
  - EDCS Registry at [edcsreg.sedris.org](http://edcsreg.sedris.org)
  - More info at [www.sedris.org/edcs](http://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](http://srmreg.sedris.org)
  - More info at [www.sedris.org/srm](http://www.sedris.org/srm)



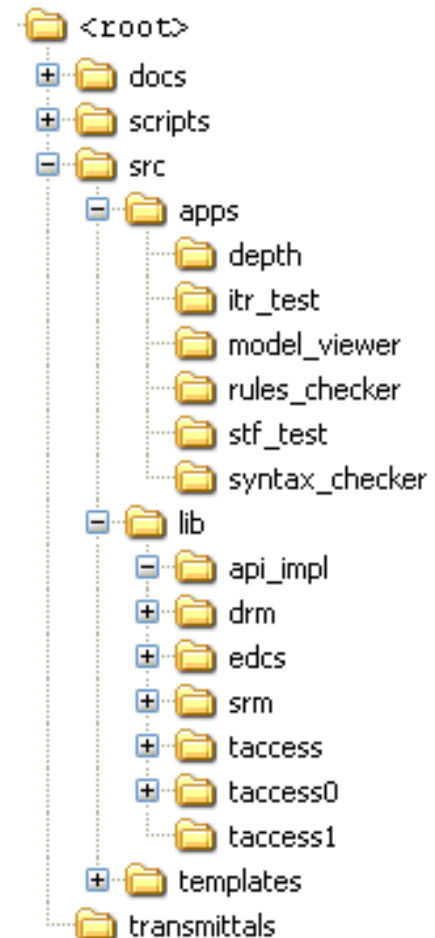
# Overview of SEDRIIS SDKs (cont.)

- SEDRIIS SDK:
  - Read/Write/Edit SEDRIIS STF transmittals
  - Provides access to DRM classes and fields
  - Includes the EDCS and SRM SDKs
  - C and C++ API releases
  - Fully interlinked documentation for included SDKs
  - Sample applications and data
  - Download at [www.sedris.org/sdk](http://www.sedris.org/sdk)



# Contents of the SEDRIS SDK

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





# Sample Code – Open Transmittal

- Include header files:

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

- Declare the SEDRIIS 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;  
    }  
}
```



## Compiling the SDKs with Visual Studio 2010

- Extract the source package release (e.g. SEDRIS 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”



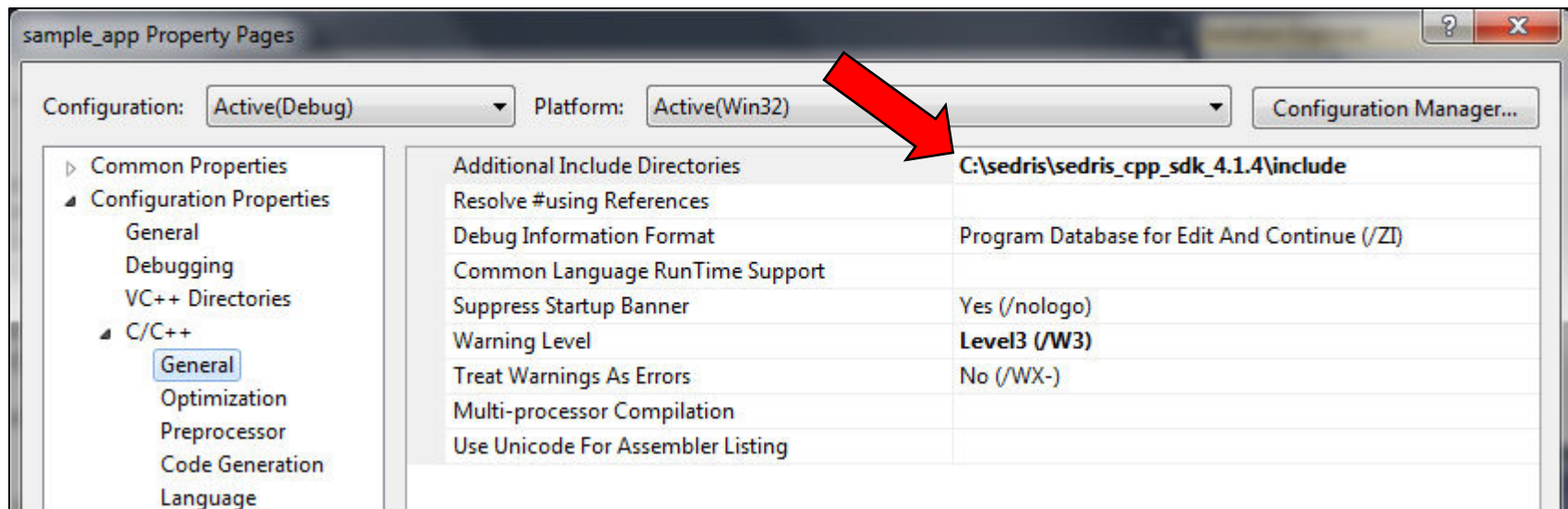
# Compiling the SDKs with Visual Studio 2010 - GLUT

- The Model Viewer sample application uses OpenGL and GLUT for 3D viewing
- Currently uses GLUT 3.7.6, available from [www.idfun.de/glut64/](http://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

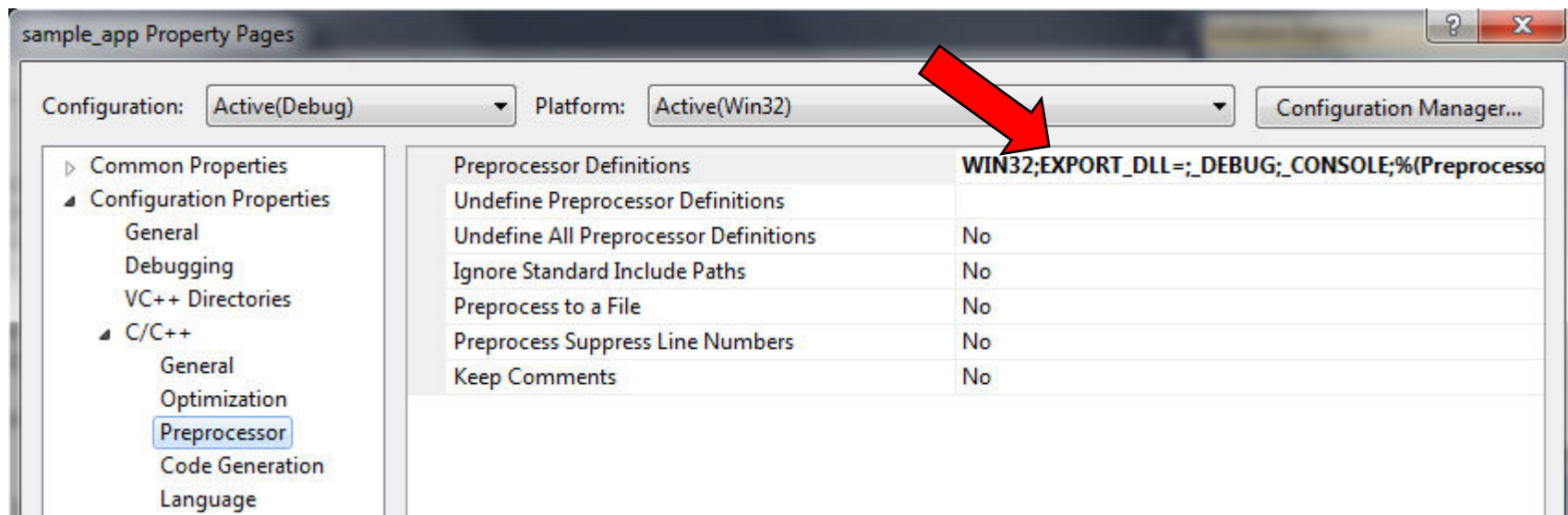
- Add a new project to the solution, or create a new separate project (e.g. “Win32 Console Application”)
- In the “C/C++” properties setting, add a reference to the SEDRIS “include” directory





## Creating and compiling user applications (cont.)

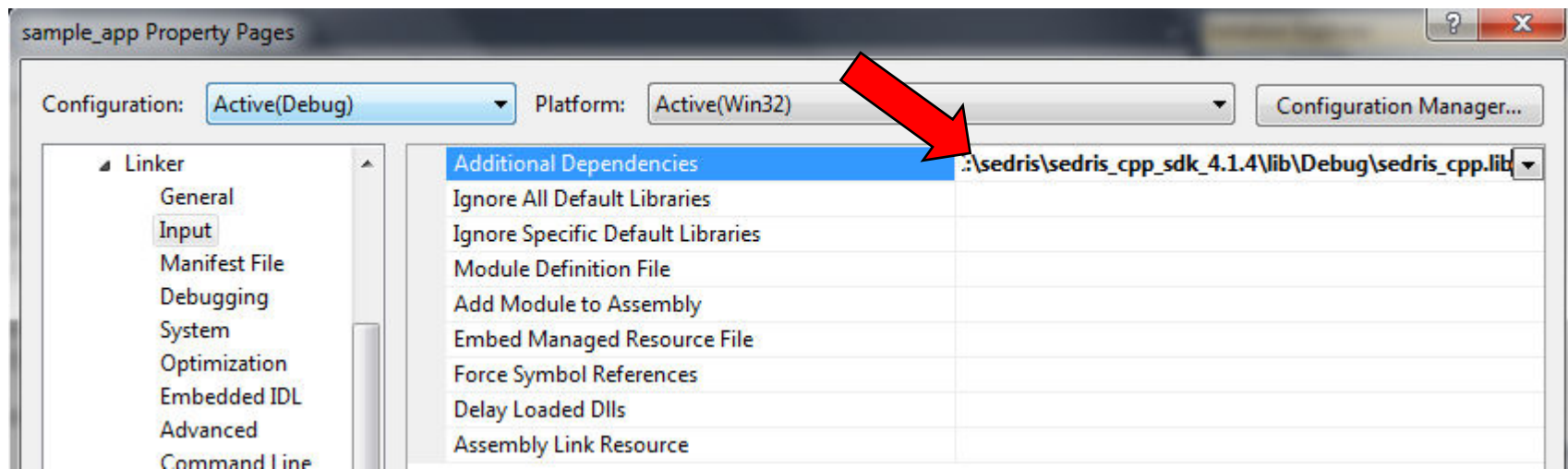
- If using a Static build, add the macro “EXPORT\_DLL=” to the “Preprocessor” definitions in the “C/C++” settings





## Creating and compiling user applications (cont.)

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

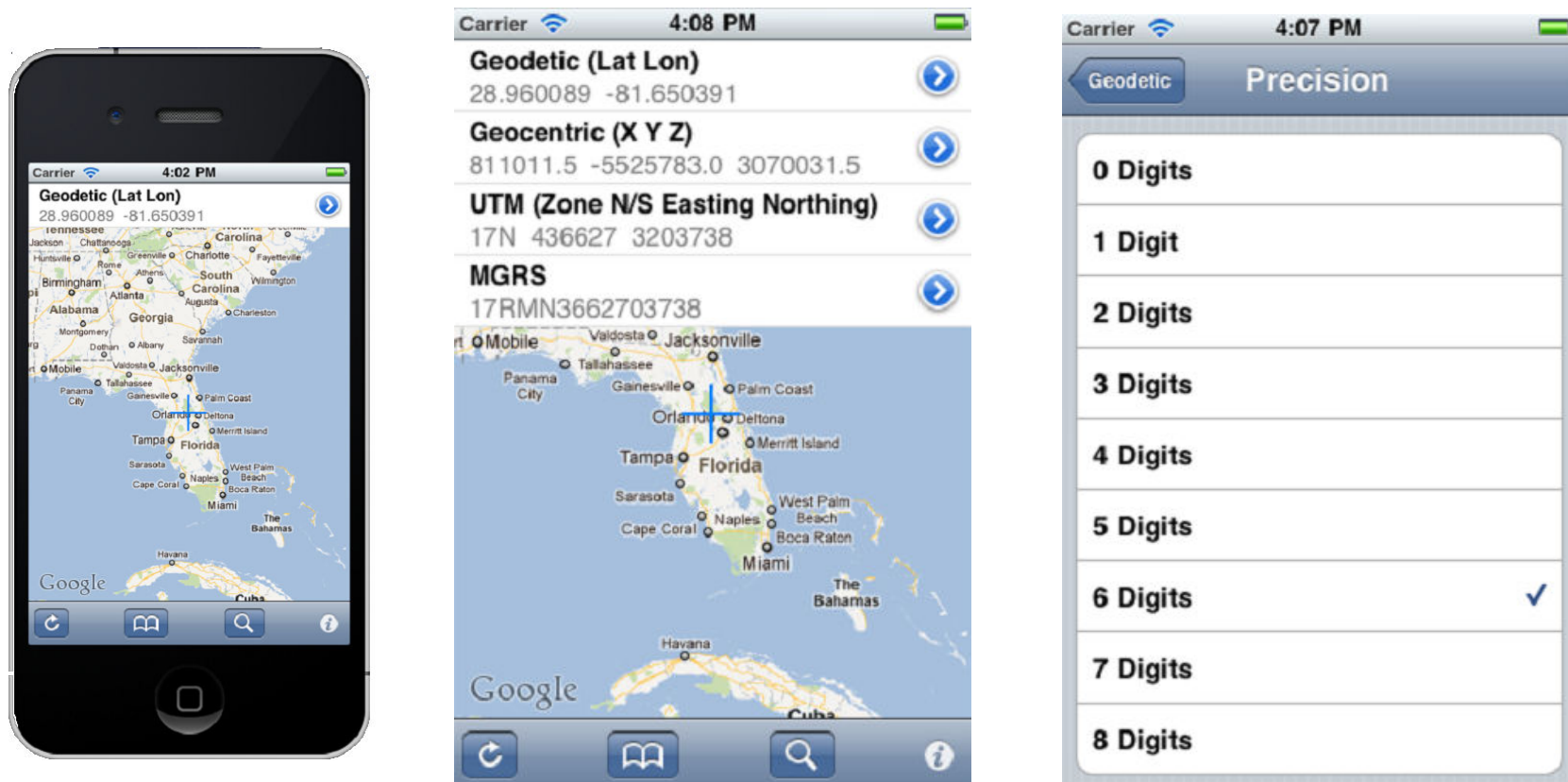


- Build and test



# Creating and compiling user applications (cont.)

- Using the SRM SDK in Xcode for iPhone apps





# Sample Data, Documentation, Getting Help

- Sample Data in STF is available from [data.sedris.org](http://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 SEDRIIS C++ SDK docs
  - “docs” directory in SDKs
- SEDRIIS Help Line at [help@sedris.org](mailto:help@sedris.org)



# Working with SEDRIS Tools

The image displays three screenshots from the SEDRIS software interface:

- Left Screenshot:** A 3D wireframe model of a terrain with a grid overlay. The grid is composed of small squares, and the terrain features are represented by green and white polygons. A legend on the right side of the window lists various features: "Edges and Fill", "Edges Only", "Fill Only", "Shaded (no edges)", and "Shaded with Edges".
- Top Right Screenshot:** A search results window titled "Search". It shows a search engine understanding boolean expressions using "and", "or", "not", and parenthesized grouping. The search criteria are "All Dictionaries" and "For: building". The total search results are 325. A list of results is shown, including "CRAFT\_HANGAR", "CRAFT\_MAINTENANCE\_SHOP", "FIELD", "EMBASSADORIAL\_RESIDENCE", "ENTHATRE", "ITE\_ROOM", "ARTMENT\_HOUSE", "MOURY", "SEMIPLY\_PLANT", and "BIM".
- Bottom Right Screenshot:** A detailed property grid window titled "EDCS Classification : AIRFIELD". It displays various metadata fields for the selected object, including:
  - URN: 0.0.18
  - Object ID: 0.0.18
  - Class: SE\_CLS\_DRM\_PROPERTY\_GRID
  - spatial\_axes\_count: 1
  - location\_index: 0
  - location\_index: 0
  - srf\_context\_info.angular\_unit: EUC\_DEGREE\_ARC
  - srf\_context\_info.linear\_unit: EUC\_METRE
  - srf\_context\_info.linear\_scale: ESC\_UNI
  - srf\_context\_info.use\_dss\_code: SE\_TRUE
  - srf\_context\_info.dss\_code: SRM\_DSSCOD\_MSL
  - srf\_context\_info.srf\_parameters\_info.srf\_params\_info\_code: SRM\_SRFPARAMINFCOD\_TEMPLATE
  - srf\_context\_info.srf\_parameters\_info.rt\_code: SRM\_RTCOD\_WGS\_1984\_IC
  - srf\_context\_info.srf\_parameters\_info.value.srf\_template.template\_code: SRM\_SRFTECOD\_CELESTIODETC
  - srf\_context\_info.srf\_parameters\_info.value.srf\_template.orm\_code: SRM\_C
  - srf\_context\_info.srf\_parameters\_info.value.srf\_template.parameters.cd\_sr
  - 0
  - data\_present: SE\_TRUE
  - relative\_to\_hook\_point: SE\_TRUE
  - View/Edit Data Table data



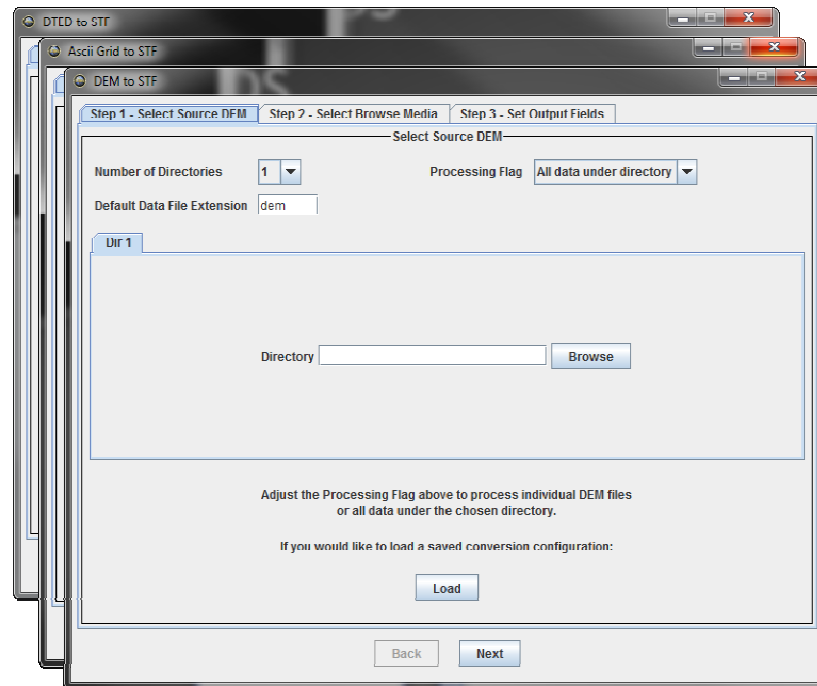
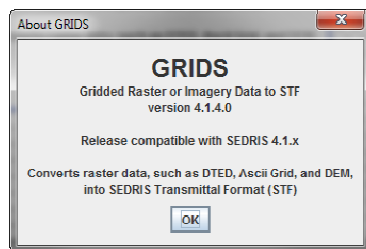
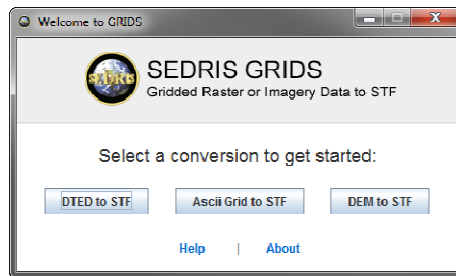
# Tools Overview

- Download from [tools.sedris.org](http://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:**
  - EDCS Query Tool (search for EDCS terms)



# GRIDS

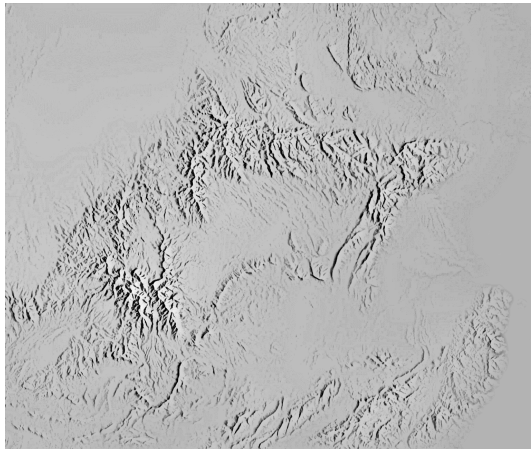
- Converts gridded raster data to STF:
  - NGA DTED
  - USGS DEM
  - ArcInfo ASCII Grid





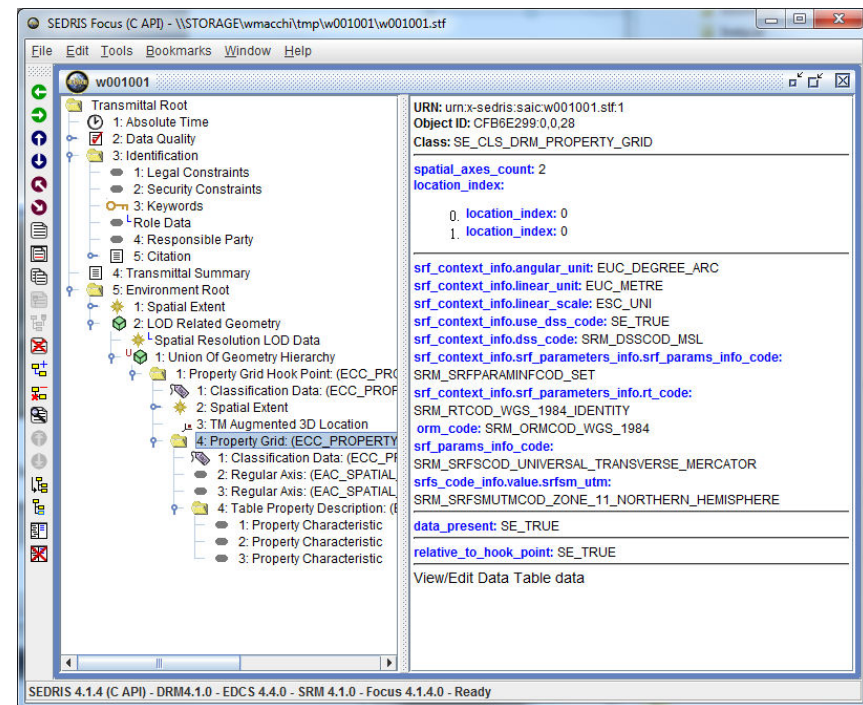
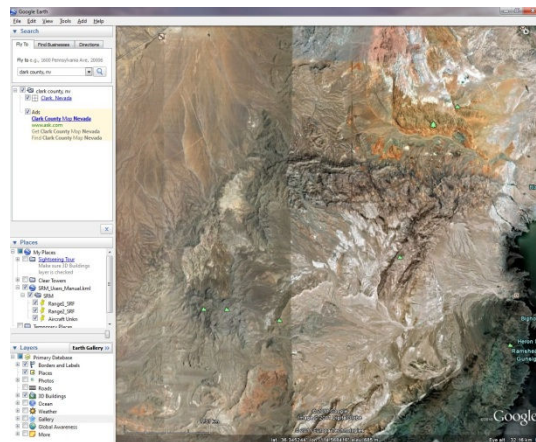
# GRIDS (cont.)

w001001.asc



w001001.stf

w001001\_00000.stf





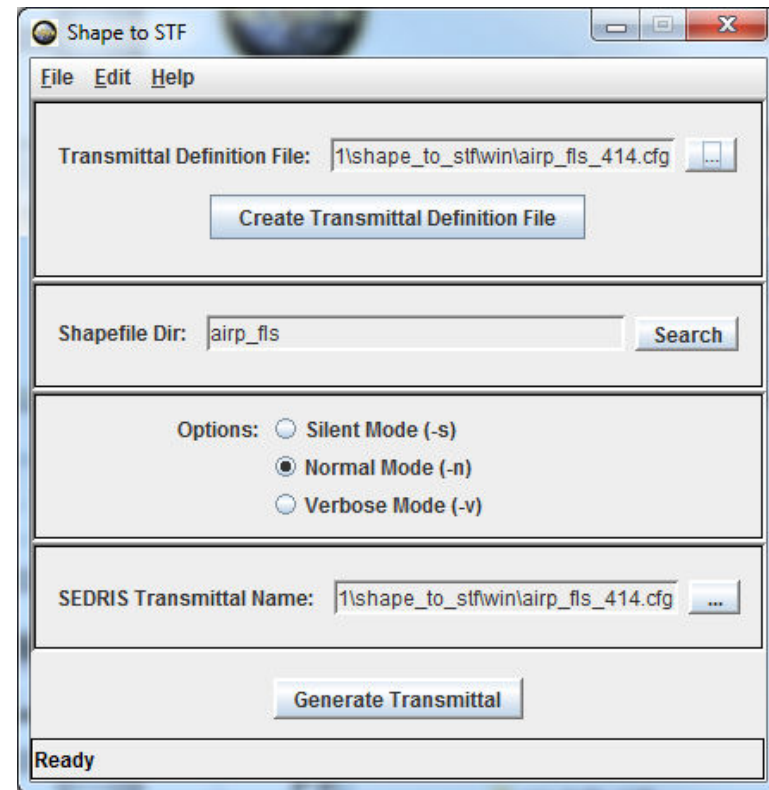
# GRIDS (cont.)

- 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



# Shape to STF

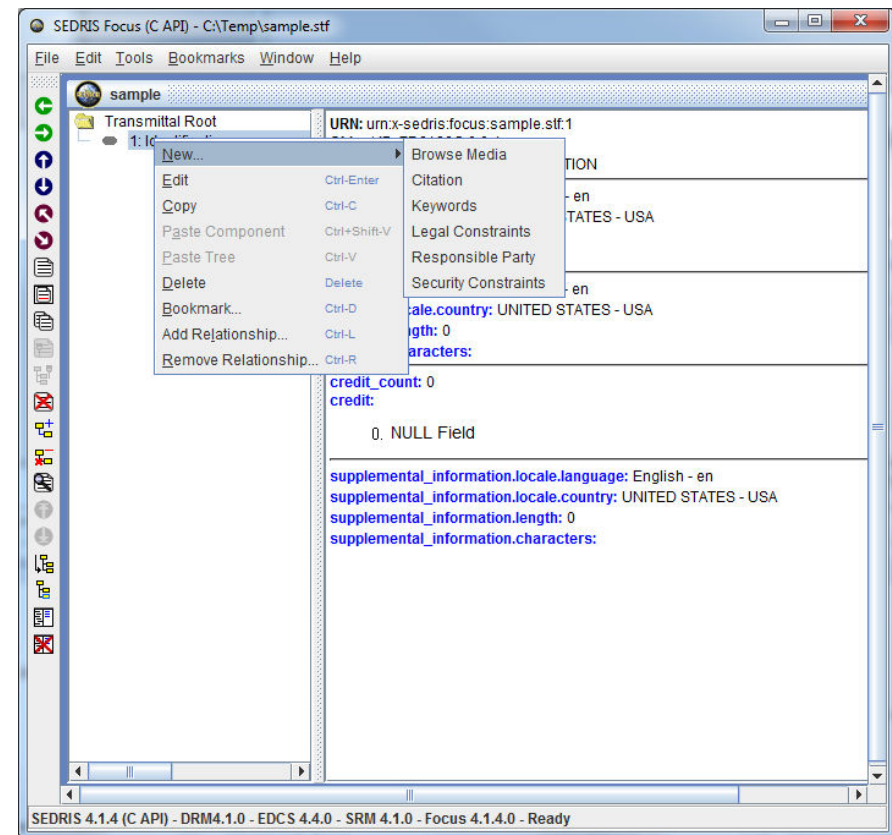
- Converts ESRI Shapefiles to SEDRIS transmittals
- Uses DIGEST FACC 2.1 to EDCS 4.x Mapping library to create Classification Related Features
- First column of Shapefile's DBF file should be named FCODE, F\_CODE, FEATURE\_AT, FEATURE, or FEATURE\_NA
- Can read the associated projection (".prj") file 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)





# Focus

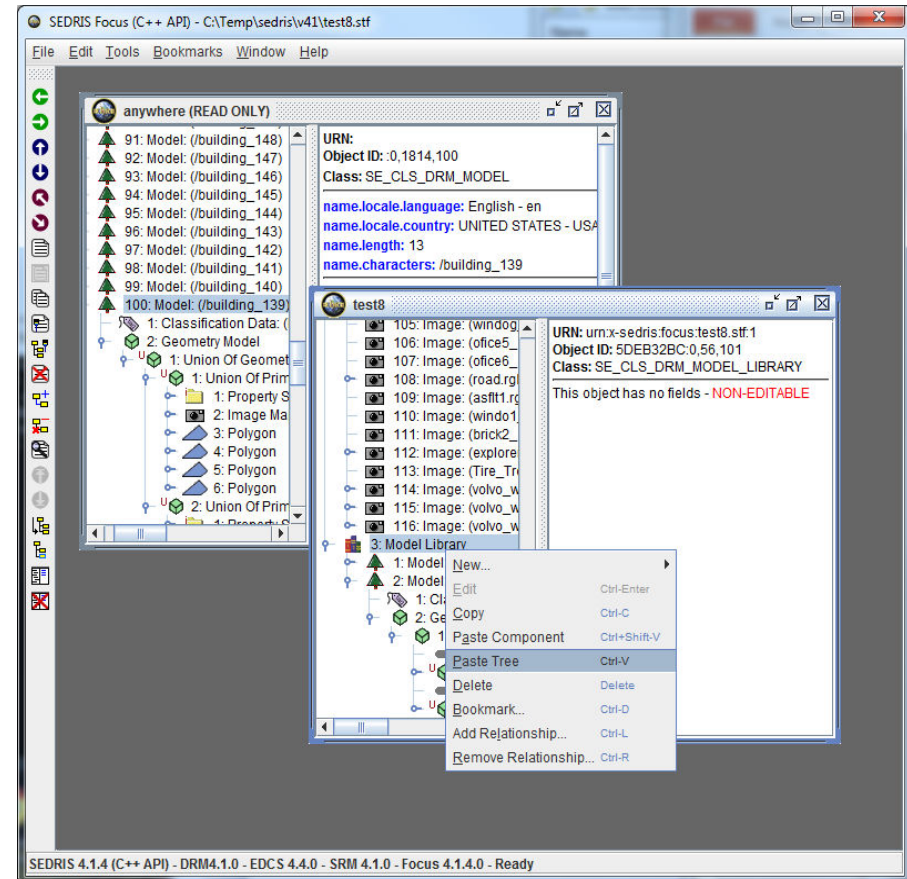
- Examine, create, and edit SEDRIS transmittals
- Edit SEDRIS transmittals:
  - Create/delete DRM objects
  - Edit DRM fields
  - Copy objects and object trees (including from other transmittals)
  - Add/remove object relationships
  - View/edit Data Table Data
- Find objects by DRM class or Object ID
- Bookmark hierarchy locations for easier browsing





# 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





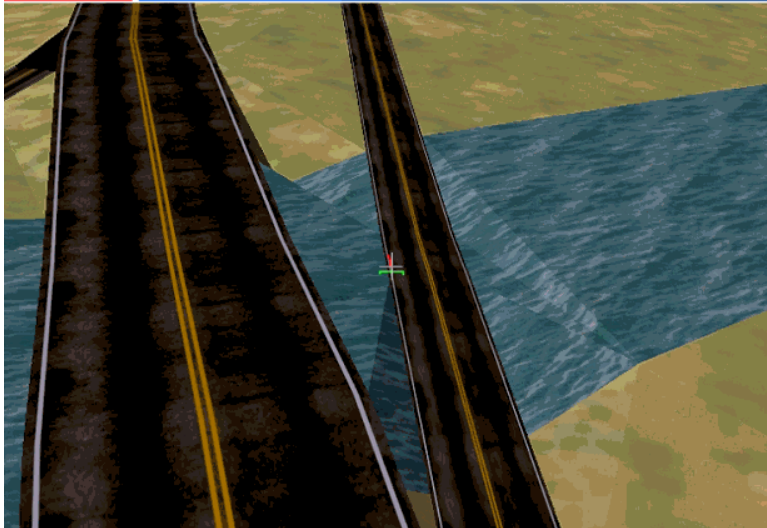
# SEE-IT

- 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

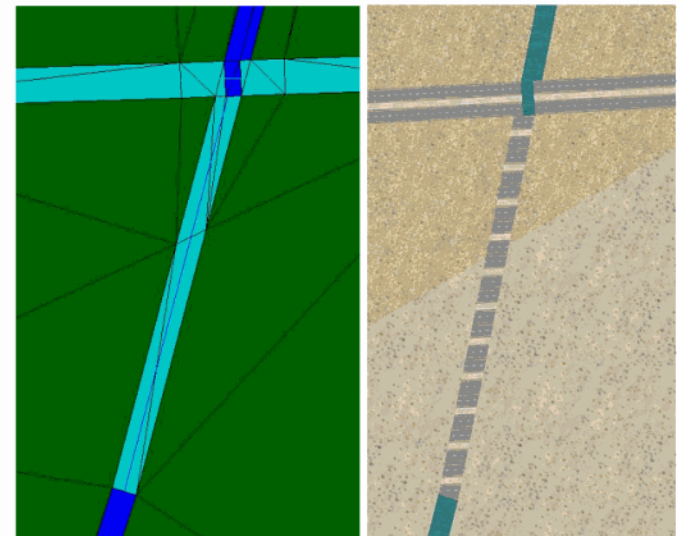


Simulation Center

## 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

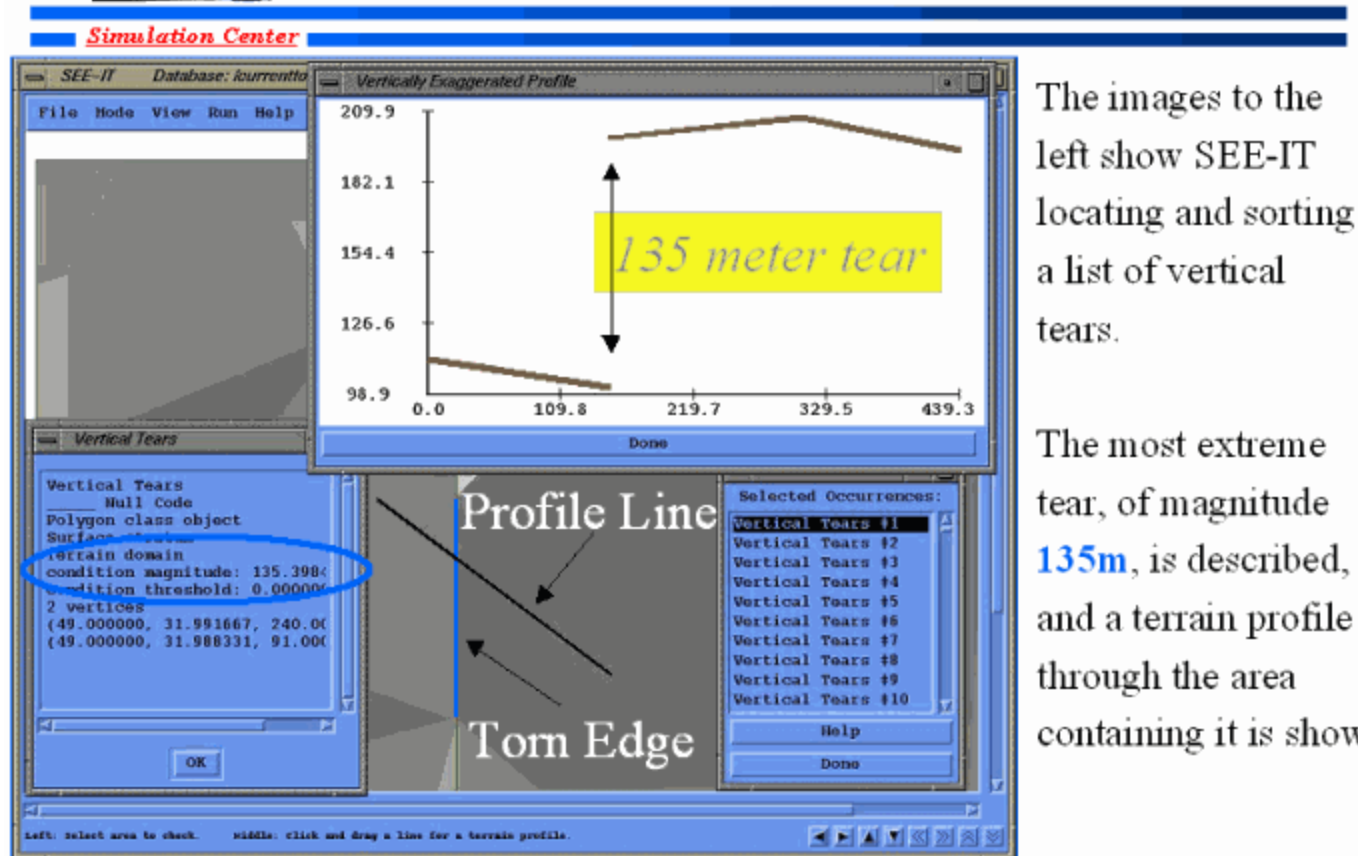




# SEE-IT (cont.)



## Vertical Tears



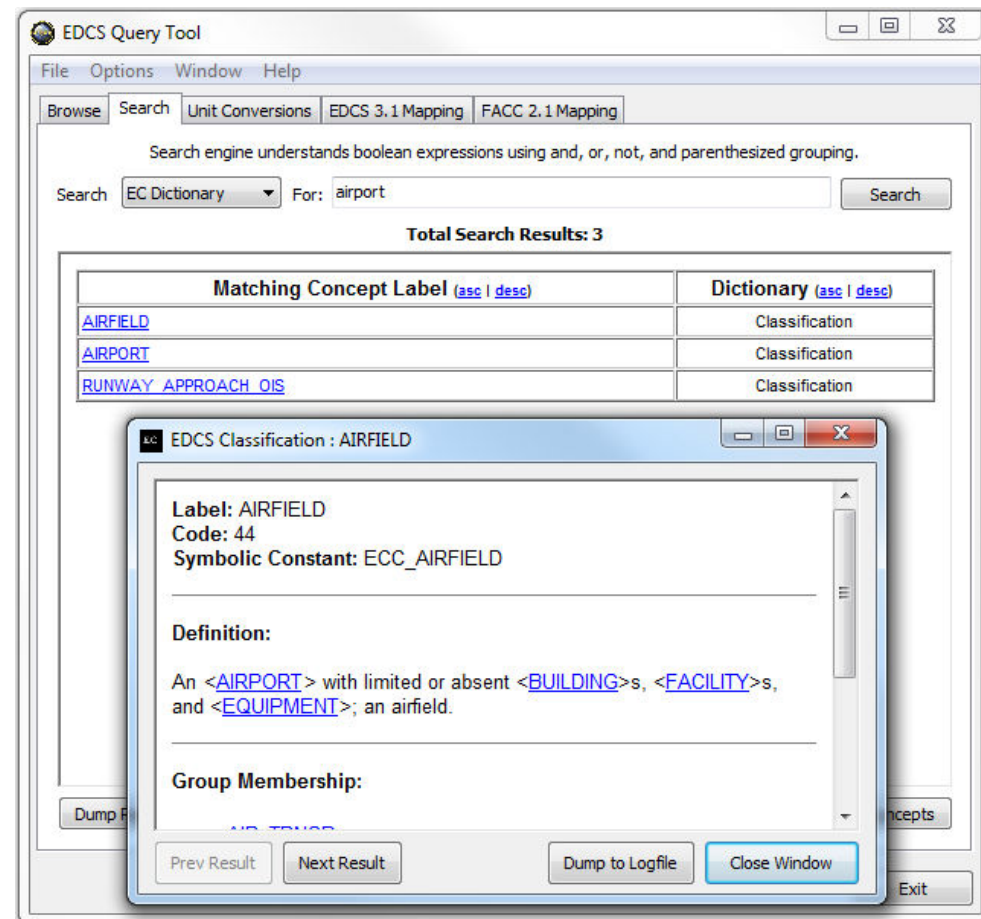
The images to the left show SEE-IT locating and sorting a list of vertical tears.

The most extreme tear, of magnitude **135m**, is described, and a terrain profile through the area containing it is shown.



# EDCS Query Tool

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



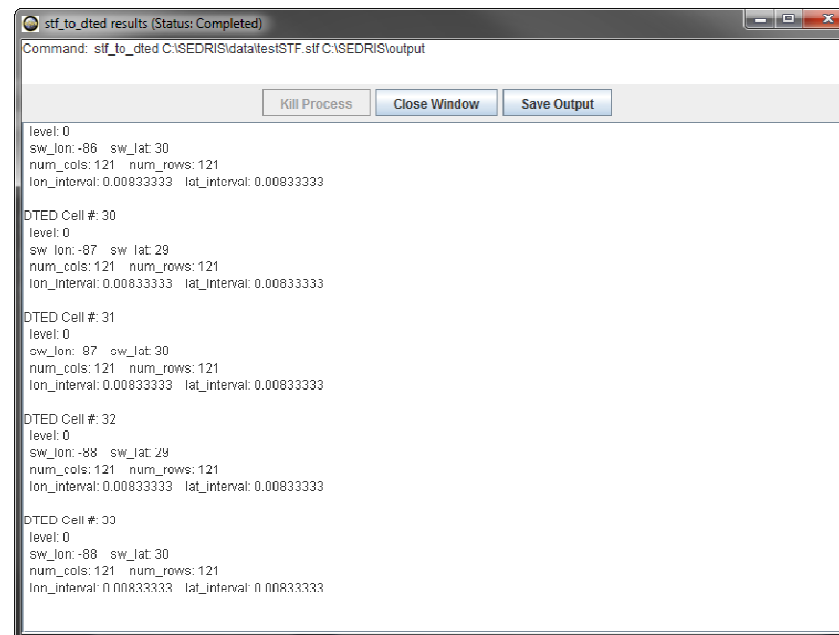
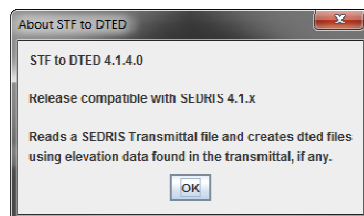
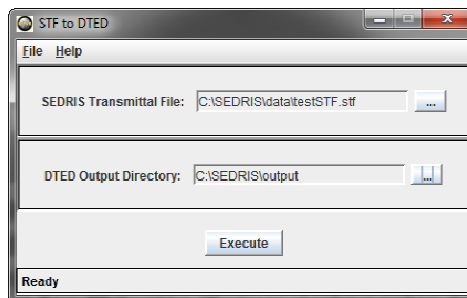


# DEMOS



# STF to DTED

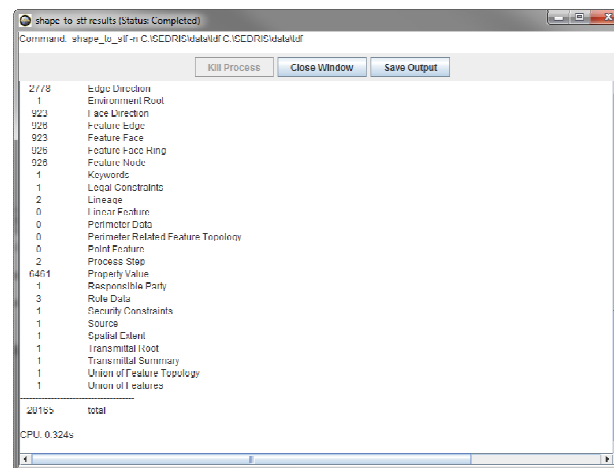
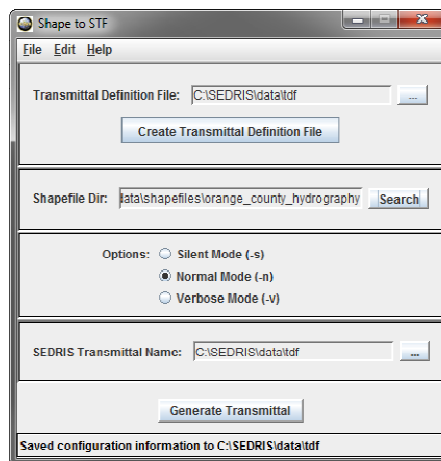
- Extracts gridded terrain elevation data from a SEDRIS Transmittal and produces NGA DTED data files
- Example conversion
  - Step 1: Choose the source Transmittal
  - Step 2: Choose the desired directory for the converted DTED data
  - Step 3: Click the “Execute” button to perform the conversion





# Shape to STF

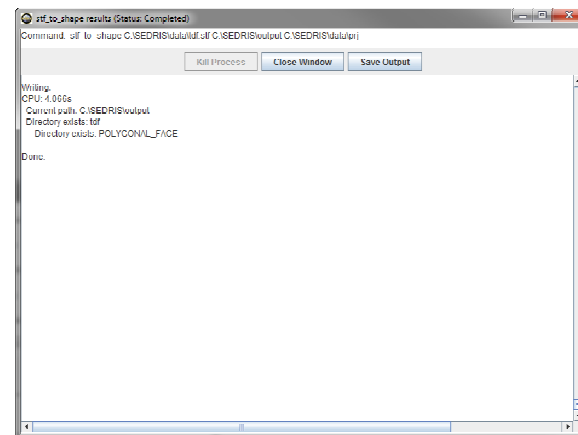
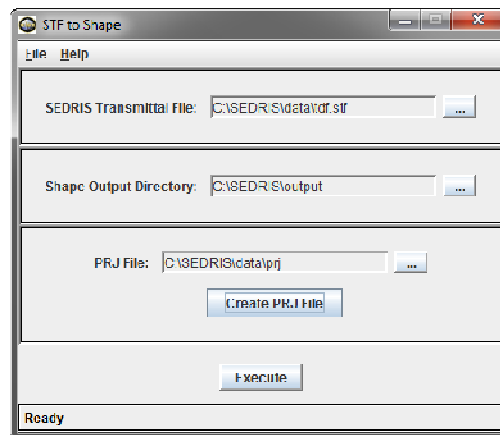
- Converts objects from ESRI Shape files into a SEDRIS Transmittal
- Example conversion:
  - Step 1: Create a Transmittal definition file to specify the appropriate spatial reference frame, mandatory STF meta data, and area of interest
  - Step 2: Choose the directory containing the source Shape file 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

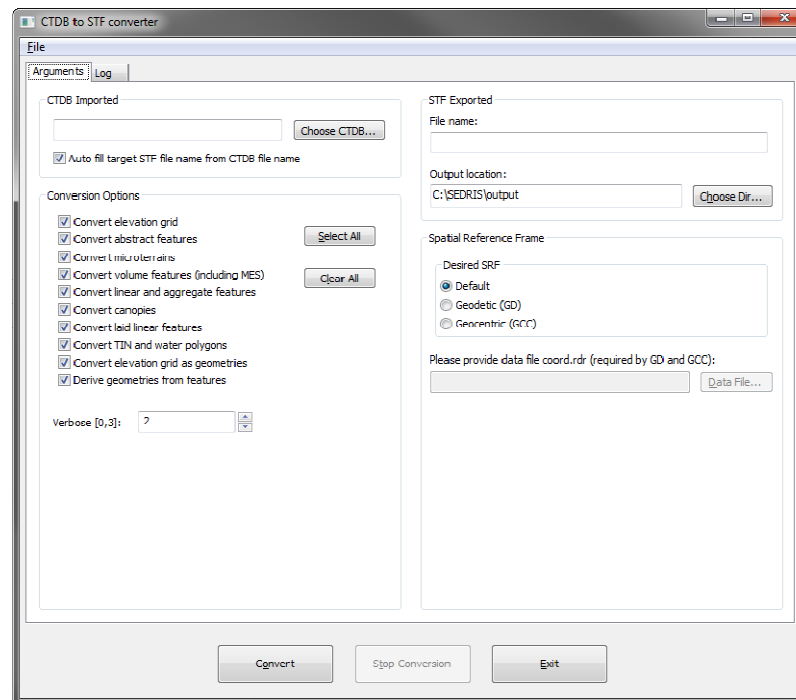
- Extracts features from a SEDRI Transmittal and creates ESRI Shape files
- Example conversion
  - Step 1: Choose the source Transmittal
  - Step 2: Choose the desired directory to place the converted Shape files
  - Step 3: Create a Projection File, providing projections for the new Shape files
  -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





# CTDB to STF

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





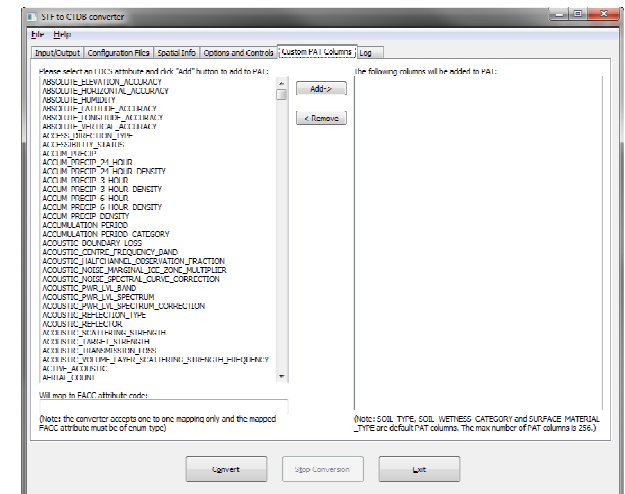
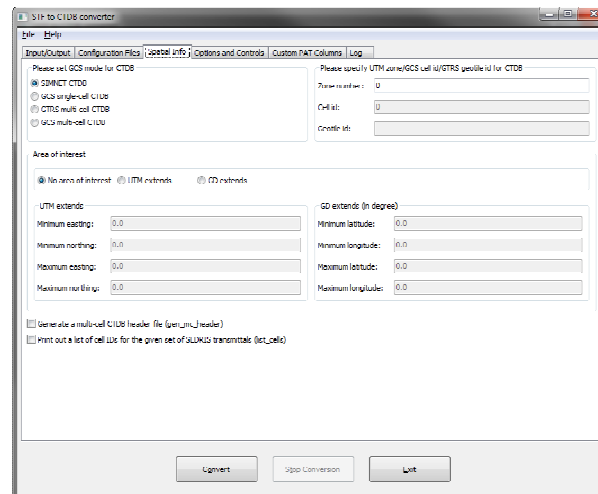
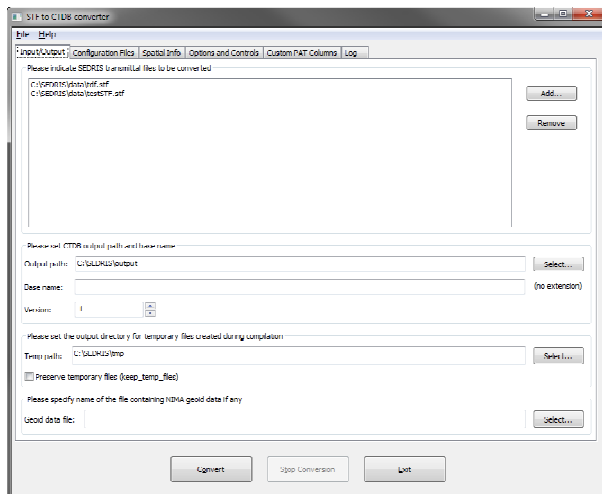
# CTDB to STF

- 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

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





# 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 SEDRIIS 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/tdm2sedris`

```
C:\Windows\system32\cmd.exe
GeoTIFF to STF Converter v4.1.4.0
  (compatible with SEDRIIS SDK 4.1.x)

Usage: geotiff_to_stf <path/geotiff.tif> <path/transmittal.stf>
      <path/tdn2sedris> [tolerance]

[ERROR] Please specify GeoTIFF data, STF, and paramater 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 SEDRI 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 SEDRI 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
              (optional) 0  no debugging output (default)
              -1  write to /tmp/<transmittal_name>_dump
```



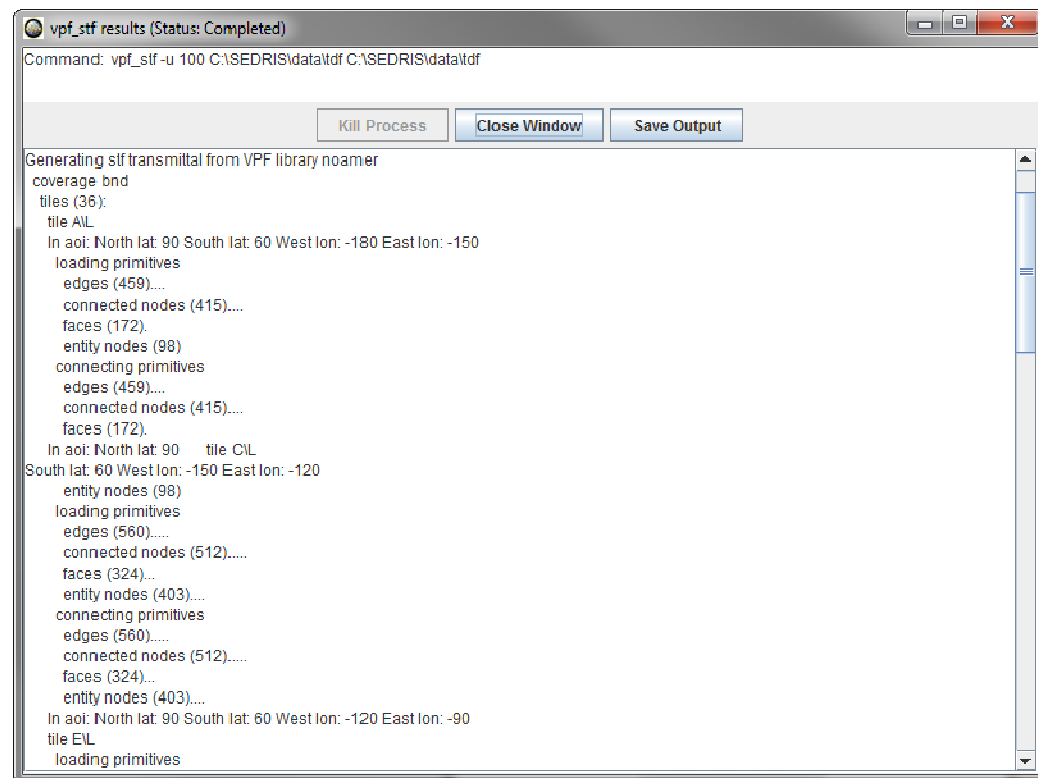
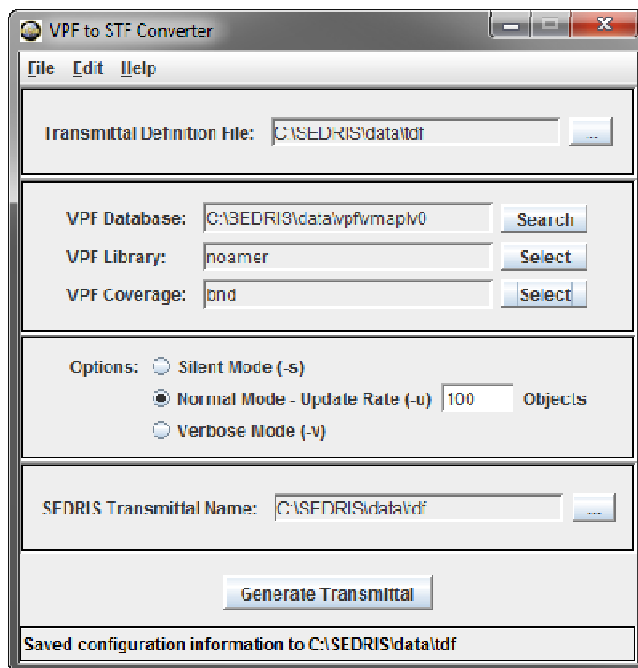
# GRIB to STF

- 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 SEDRIS 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 SEDRIS Transmittal (using the current SEDRIS SDK) from an existing Transmittal created with a previous version of the SEDRIS 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 SEDRIS 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
```