Win-SUDS Utilities version 2.90

16 June 2003

1. Overview

Win-SUDS refers to a subset of the PC-SUDS Utilities that have been ported to the Win32 platform. In addition to the utility programs, the SUDS I/O library and the PlotX pen plotting graphics library have been included.

The Win32 SUDS I/O library can be used to port your existing 16-bit PC-SUDS tools to the Win32 environment. This 32-bit library is written in ANSI C but can also be called from FORTRAN (see below). The SUDS I/O and MSTime API's are unchanged from the 16-bit library allowing for a very simple and speedy porting process.

The Win32 PlotX library is used by all of the utilities that create graphics images. The Win32 version of the library can create on-screen images in a graphics window and can also create PlotX meta-files (PLX) that can be printed, plotted, viewed, and/or converted to other graphics formats. The following PLX tools are included in this distribution:

- **LJPlot** – Outputs HP Printer Control Language (PCL) level 3, 4, or 5.
- **PSPlot** – Outputs PostScript level 1.
- **HPPlot** – Outputs HP Graphics Language (HPGL) or HPGL/2.
- **PLX2WMF** – Outputs 16-bit Windows Meta-files (WMF).

Other 16-bit tools are available in PC-SUDS Utilities package that can be used to process PLX files. The View program can be particularly useful as it can display the plot on screen on some systems.

1.1. Utility programs

The utilities included in this release are all Win32 console applications. These include the following application programs:

- **SUDSPlot** – General purpose timeseries plotting.
- **SUDSSpec** – Simple spectral analysis.
- **ReSpec** – Response spectra.
- **SUDSPick** – Interactive phase picking.
- **SUDSDrum and Decimate** – "Pseudo smoked drum" plots.
- **HypoMap** – Hypocenter plotting.
- **SUDSFilt** – Causal Butterworth high and low pass filters.
- **AutoPick** – Automatic P phase picking.
- **SUDSTrim** – Waveform trimming.
- **SUDSJoin** – Waveform joining.

- **Demux and Irig** – Waveform demultiplexing and IRIG-E time code decoder.
- **XTRHY71 and PRT2SUD** – Hypo71 phase list and output tools.
- **SCSITape** – A tape backup utility for SCSI tape drives.

With very few exceptions, these programs are functionally equivalent to their 16-bit counterparts in the PC-SUDS Utilities distribution. The main differences include virtually unlimited waveform length and long filename and station/component identifier support. Please refer to the PC-SUDS Utilities documentation for detailed reference information about each of these programs.

Note that when using legacy data that contains only short station/component identifiers, you must now specify both the station name and the component identifier in the form `station:component` to programs that require a station/component identifier as an argument. Note also that station/component identifier comparisons are not case-sensitive. Programs that expect station/component identifiers as arguments include SUDSSpec and ReSpec. As an example, to specify the short station name 'VRIL' and the short component identifier 'z', one would specify `vril:z`. This differs from the behavior of the 16-bit programs where only the short station name was required.

1.2. Conversion programs

The following data format conversion programs are also included in this release as Win32 console applications:

- **SUD2ASC and ASC2SUD** – Convert to and from ASCII.
- **SUD2SEGY and SEGY2SUD** – Convert to and from PASSCAL modified SEG-Y.
- **SUD2MSED and MSED2SUD** – Convert to and from data-only SEED volumes (Mini-SEED).
- **SUD2GSE** – Convert to GSE2.0.
- **SUD2MAT** – Convert to MATLAB version 4 MAT-File format.
- **SUD2SAC** – Convert to Seismic Analysis Code (SAC).

Note that the first three conversions are provided in both directions, i.e., both to and from SUDS. The others are converted from SUDS only. Many other 16-bit conversion programs are available in the PC-SUDS Utilities distribution and from many other sources as well.

2. Installation

The Win-SUDS distribution resides in series of directories under the *SUDS home* directory. The home directory should typically be `c:\suds` but it can be on another drive or given another name as needed. Create the home directory and then copy the self-extracting archive, `winsuds-2_90.exe`, to this home directory and run it to unpack the distribution.

2.1. Home directory structure

After unpacking, the home directory contains various subdirectories:

- `bin` – This is where the Win32 executable programs reside.
- `doc` – This is where various documentation is stored.
- `etc` – This is where configuration and state files are stored.
- `lib` – This is where the pre-built libraries reside.
- `maps` – This is where maps, and various other data files for HypoMap resides.
- `src` – This is the source tree.

The `home\bin` directory should be added to your search path so that these programs can be ran from anywhere on your system.

The various programs that read a configuration file will look for that file in the directory pointed to by the environment variable named `SUDS_ETC`. This variable should be set to point to the `home\etc` directory.

2.2. environ.bat

A convenient way to set up the environment for both Win-SUDS and PC-SUDS in a simple and compatible way is to call the `environ.bat` batch program that is provided in the home directory within the distribution. If you have installed to a home directory other than `c:\suds`, or if you have the PC-SUDS utilities installed somewhere other than `c:\pcsuds`, you will need to edit this file to reflect these differences before proceeding.

Below are the contents of the default `environ.bat` file provided in the distribution. Edit the `SUDS_HOME`, `PC_SUDS`, `SCSI_HOST`, and `SCSI_TAPE` variables as needed for your system.

_____*environ.bat*

```
@ECHO OFF

ECHO Setting up the SUDS environment...

REM - Edit these next two paths as appropriate for your system:
SET SUDS_HOME=c:\suds
SET PC_SUDS=c:\pcsuds

REM - SCSITape host (bus) and drive identifiers...
SET SCSI_HOST=2
SET SCSI_TAPE=1

SET SUDS_ETC=%SUDS_HOME%\etc
SET SUDS_BIN=%SUDS_HOME%\bin

PATH=%PATH%;%SUDS_BIN%;%PC_SUDS%
```
_____*environ.bat*

This batch program handles setting the path and the other environment variables based on the home directory. Note that it is important that the `SUDS_BIN` directory always appear in the path *before* `PC_SUDS` so that when both 16-bit and Win32 versions of a particular program exist, the Win32 program will be executed instead of the 16-bit one.

The `SCSI_HOST` and `SCSI_TAPE` variables set the SCSI host adapter (bus) identifier (0-3) and the SCSI device identifier (0-7) of a tape drive attached to that host that the SCSITape program should use by default. Note that on 32-bit Windows systems, the IDE buses are accessible through ASPI library

and typically appear as hosts 0 and 1. Please refer to the PC-SUDS Utilities manual for more information about the SCSITape program.

The shortcut(s) that you use to open a command prompt can call `environ.bat` so that the environment will be ready each time that you open command prompt window. On Windows 9*x* systems, there is a 'Batch File' entry on 'Properties' dialog box on the command prompt shortcut. Simply enter `c:\suds\environ.bat` in this box and click OK. On Windows NT or 2000 systems, you must add the name of the batch program to the 'Target' which starts the command interpreter using the `/K` switch. The 'Target' box on the command prompt 'Properties' should look something like this:

```
%SystemRoot%\system32\cmd.exe /K c:\suds\environ.bat
```

The bold portion above is what should be added.

On either system, once this has been done, you should see the message below in the upper left hand corner of each new command prompt window indicating that the environment is set up:

```
Setting up the SUDS environment...
C:\>
```

3. Building

In order to build the Win-SUDS utilities and libraries you must have both Microsoft FORTRAN PowerStation 4.0 and Microsoft Visual C/C++ 4.2 installed on your system. These compilers integrate together in the Microsoft Developers Studio IDE (integrated development environment). Workspaces for this IDE are provided that allow you to easily rebuild the entire distribution.

You can build C language applications in later versions of Microsoft Visual C/C++ (versions 5 and 6) by either building only the library code or simply linking to the pre-built libraries in the *home*/lib directory.

3.1. The source tree

The key to understanding the software is in understanding the source tree. The source tree is always based at *home*\src. There are three main subdirectories under `src`: `src\bin` contains subdirectories for various programs that will end up the `home\bin` directory, `src\include` contains various common include files, and `src\lib` contains subdirectories for each library.

There is a *project workspace* file (.mdp) for each of the two libraries, `src\lib\suds`, and `src\lib\plotx`, and one that builds everything under `src\bin`. To build the entire distribution:

1. Start Developer Studio
2. Open the `src\lib\suds\suds.mdp` workspace. (File->Open Workspace…)
3. Open the 'Batch Build…' dialog box from the 'Build' menu and select only the release configuration check boxes for the four projects.
4. Click the 'Build' button to begin the build process. The output windows at the bottom of the display should show each configuration being built. There must be 0 warnings and 0 errors reported on each, otherwise, something is very wrong and must be corrected before proceeding.
5. The SUDS I/O and MSTime library and its test harnesses in C and FORTRAN are now built. Note that the library resides at *home*\lib\release\suds.lib and the executables reside at *home*\bin\release. These paths get created as needed and note that the executables that may have been installed in *home*\bin have not been overwritten.

6. Repeat steps 2 through 4 for the `src\lib\plotx\plotx.mdp` workspace. This builds the PlotX library and its test harness. The library resides at *home*`\lib\release\plotx.lib` and the executable resides in *home*`\bin\release`.

7. Finally, repeat steps 2 through 4 for the `src\bin\bin.mdp` workspace. This builds all of the programs under the `src\bin` directory. All of the new executables will reside in *home*`\bin\release` after the build completes.

The debug configurations can be built as needed for debugging purposes. The resulting libraries and executables will end up in *home*`\lib\debug` or *home*`\bin\debug` respectively. These programs are un-optimized and contain symbolic information for use by the debugger and as such are much larger and somewhat slower than their release build counterparts. It is highly recommended that you create debug builds only as they are needed.

4. Release Notes

Below are the release notes for this release of the distribution:

```
$Id: releasenotes.txt,v 1.21 2003/06/16 16:28:27 cvs Exp $
Win-SUDS release notes...

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Version 2.90 - 16 June 2003

SUDSPlot, SUDSSpec, ReSpec - Modified plot behavior so that you must now
either click the close button or press the escape key to close the plot.
Otherwise clicking on the plot now has no effect.

Autopick - The program no longer forces short station name to upper case.

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Version 2.89 - 4 June 2003

SUDSPlot - Modified the method used to compare station/component ID's to
correct issues with data created by the DF2SUD converter from CWB.  Also
modified the program to allow SUDS_STATIONCOMP structures to be present
when the corresponding SUDS_DESCRIPTRACE structure is not.

SUDSSpec - Disabled database dump in the release build.

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Version 2.88 - 17 April 2003

SUDS2LISS - Removed this program from the Win-SUDS distribution.  Please
contact Geotech Instruments (http://www.geotech.com) to obtain this program.

Demux - Modified to work with data types larger than 16-bits.

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Version 2.87 - 11 April 2003

The SUDS2LISS station feed server added to the Win-SUDS distribution.
See the comments within %SUDS_ETC%\suds2liss.conf for a description
of how to control this program.  This program is provided as executable
only as it is built using Visual C/C++ 6.0 or later.  If you are
interested in obtaining source code, please contact Geotech Instruments.

ReSpec - Fixed pointer issues with 16-bit data and a small problem
when dealing with files containing short station/component identifiers.

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Version 2.86 - 25 February 2003
```

SCSITape - Ported to 32-bit. Now uses ASPI for Win32. Added new
SCAN command the scans all SCSI buses and displays the attached
devices. The scsitape.dir file is now created in the directory
pointed to by the SUDS_HOME environment variable.

SUDSJoin - Fixed initialization bug causing intermittent access
violations and crashes.

Version 2.85 - 3 December 2002

Released 2.84a as 2.85. No changes were made.

Version 2.84a - 4 November 2002

SUDSJoin - When joining to contiguous SUDS data files, the program
now handles all structures in the following manner:

 1) All global-level structures (meaning structures not associated
 with a particular station/component, like SUDS_ORIGIN, or
 SUDS_CHANSET) from input file #1 are copied to the output file.
 No global-level structures from input file #2 are copied as these
 would likely be duplicate structures.

 2) For each station/component with channel-level structures (meaning
 structures that contain a SUDS_STATIDENT structure) present in input
 file #1, all of these channel-level structures are copied to the
 output file.

  2a) Only the following channel-level structures for this station/
  component are copied from input file #2 to the output file:

   SUDS_RESIDUAL
   SUDS_CALIBRATION
   SUDS_TIMECORRECTION
   SUDS_FEATURE

  Again, this is to avoid having a bunch of duplicate structures in
  the output file.

  2b) The waveforms for this station/component stored in the
  SUDS_DESCRIPTRACE structures in input files #1 and #2 are joined
  together and a single SUDS_DESCRIPTRACE structure is written to
  the output file.

 3) Step 2 is repeated for the next station/component.

HypoMap - Support was added for 'event location files', local event
files using .evl extension and teleseisms using the .evt extension.

SUDSPlot - Bug fix in SUDSPlot's support of both .evt and .evl files.
West (negative) longitudes were not handled, they always came up as
east (positive).

Version 2.84 - 15 October 2002

SUDS - New SUDS_LONGIDENT structure implemented to support long
station/component identifiers. SUDS and I/O library now at
version 1.51.

SUD2ASC, ASC2SUD - Added full support for all SUDS 1.51 structures.

SUDSPlot - Added full support for SUDS 1.51 long identifiers. First
five character of station and first three characters of component now

displayed at left end of waveform along is actual DC level and peak values. Full formatted long identifier now displayed in upper right of waveform area. Support was also added for 'event location files', local event files using .evl extension and teleseisms using the .evt extension.

SUDSSpec - Added full support for SUDS 1.51 long identifiers. The same basic modifications made to SUDSPlot were also made here. Some additional cleanup of plot annotation was made as well.

SUDSPick - Added full support for SUDS 1.51 long identifiers.

AutoPick - Added full support for SUDS 1.51 long identifiers. Note that 'verticals only' is determined by examining the single character component ID (Z, z, V, v, U, or u) in the SUDS_STATIDENT substruct within the SUDS_DESRIPTRACE struct for a given waveform, not by any long component ID in SUDS_LONGIDENT substructs that may be present.

ReSpec - Added full support for SUDS 1.51 long identifiers.

SUDSDrum and Decimate - Added full support for SUDS 1.51 long identifiers.

SUDSFilt, SUDSJoin, and SUDSTrim - These programs have no SUDS_LONGIDENT issues and were simply rebuilt with the new 1.51 library and tested. Output files from all of these programs now are 1.51 SUDS files with structures extended with empty SUDS_LONGIDENT structures as appropriate.

Demux and Irig - Added full support for SUDS 1.51 long identifiers. Long identifiers in SUDS_STATIONCOMP structures within multiplexed data files will be properly propogated into SUDS_DESCRIPTRACE structures within non-multiplexed data files and SUDS_TIMECORRECTION structures.

FuncGen - Added support for SUDS 1.51 long identifiers. Long identifiers are of the form: 'FuncGen:Stn#:SHZ', where # is the channel number starting from zero. The short identifiers are unchanged with the network name undefined ("unk"), station name 'Snnn', where nnn is the channel, and the component ID 'v'.

HypoMap - This program is already compatible with long (<=80 character) station names.

SUD2GSE - Added support for SUDS 1.51 long identifiers. If SUDS_LOGIDENT structures are present, the first five characters of the station name and the first three characters of the component name are used as the station:component names in the output WID2 record.

SUD2MAT - Added support for SUDS 1.51 long identifiers. When SUDS_LOGIDENT structures are present, the matrix name will be of the form: 'station_component', otherwise the short name and component will be used.

SUD2MSED and MSED2SUD - Added support for SUDS 1.51 long identifiers. The first 2 characters of long network, 5 characters of long station name, and 3 characters of long component names are used when present.

SUD2SAC - Added support for SUDS 1.51 long identifiers. Long network and component names are supported and up to 7 characters of long station names are used.

SUD2SEGY and SEGY2SUD - Because the PASSCAL-modified SEG-Y format does not contain station identifier information, the new SUDS_LONGIDENT has little impact on these programs. The SUD2SEGY program does use the long names to generate its output filenames if they are present.

Version 2.83 - 3 September 2002

HypoMap - Fixed problems when using the -i switch to specify the
initialization filename on the command line.

FuncGen - Replaced the random number generator with Gaussian
noise generator.

SUDSTrim - Fixed seek problem that caused corruption of first
few samples when using the /m switch.

Version 2.82 - 10 April 2002

PlotX library - Cleaned up extended key handling which impacts the
SUDSPick program mostly. Added portrait mode support for SUDSPlot.

SUDSPlot - Now plots in portrait mode on the display.

SUDSPick - Cleaned up key handling issues and added crosshair
to mimic the behavior of the 16-bit PlotX library.

ReSpec - Changed curve colors to get rid of light blue.

Version 2.81 - 4 April 2002

ReSpec: Added this program to the distribution.

SUDSPick: bug fix, null pointer assignments on single component records.

HypoMap: bug fixes, Y2K issue in event file reader causing various null
          pointer assignment issues.

Version 2.80a - 15 March 2002

Minor bug fixes to autopick and sudsplot.

Version 2.80 - 6 March 2002

Added graphics window functionality to PlotX library bringing it to
version 2.20. All graphical tools now use this functionality to do
on-screen graphics in plot modes 1 and 2.

Version 2.70 - 25 February 2002

This is the first Win32 version of the libraries and utilities that
will be called 'Win-SUDS'.