Installing Earth Dynamics Linux/FORTRAN on Windows

SOFTWARE INSTALLATION INSTRUCTIONS FOR THE FORTRAN PROGRAMMES DESCRIBED IN *EARTH DYNAMICS - DEFORMATIONS AND OSCILLATIONS OF THE ROTATING EARTH* BY D. E. SMYLIE, YORK UNIVERSITY, TORONTO

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1 Introduction

The book *Earth Dynamics - Deformations and Oscillations of the Rotating Earth*, by D. E. Smylie, includes a number of programmes that were written in Gnu FORTRAN 77. In order to compile and run these programmes, it is necessary to have a Linux (or Unix) operating system.

For your convenience, the author included with the ancillary material a Fedora Linux appliance (virtual machine) that can be loaded by the Oracle Virtual Machine Manager under Windows (or other operating system that supports the Oracle VirtualBox).

2 Obtaining and Installing the Oracle VirtualBox

The Oracle VirtualBox for x86 can be downloaded freely from http://www.oracle.com/technetwork/server-storage/vm/downloads/index.html .

Follow the instructions provided by Oracle and install the Virtual Machine on your computer.

3 Obtaining and Installing the Earth Dynamics Linux/FORTRAN Distribution

3.1 Installing on your own existing Linux system

If you have an existing Linux distribution, you simply need to download the "tar-ball" archive "EarthDynamicsBook.tar.gz" or ZIP archive "EarthDynamicsBook.zip" from the author's web site at http://www.yorku.ca/smylie and extract the files into a directory of your choice on your Linux computer.

NOTE: *This step is necessary only if you intend to run the FORTRAN software on your own Linux distribution. Note that the FORTRAN source code is already installed on the author-supplied Linux appliance*.

```
$ tar -xvzf EarthDynamicsBook.tar.gz
```

The "$" character above represents the Linux command line prompt.

The entire archive will be extracted into a folder named "work". In order to successfully compile and run the code in "work" using the instructions provided within, you may need to set your default command interpreter and/or login shell to "/bin/tcsh" and have the following aliases set (e.g. as "/etc/profile.d/xlocal.csh")

```
alias physica /usr/local/triumf/physica/physica.script
alias edgr /usr/local/triumf/edgr/edgr.script -c
alias ed cd /home/ed/
alias work cd /home/ed/work/
setenv TRIUMF_FONTS /usr/local/triumf/fonts
```

In addition, the TRIUMF graphics utility GPLOT may need to be installed in "/usr/local/triumf" and the executable "/usr/local /bin/g77gplot" may need to be installed. These files are available for download as "triumf-system.tar.gz" from the author's web site at http://www.yorku.ca/smylie.

3.2 Using the Author-supplied Fedora Linux appliance

If you do not have an existing Linux distribution, and wish to run the Fedora Linux installation that was prepared by the author, then simply download the Fedora Linux appliance "FedoraEarthDynamics.ova" from the author's web site at http://www.yorku.ca/smylie.

WARNING: The size of the "FedoraEarthDynamics.ova" file is approximately 8 GB. It may take a few hours to download over slow internet connections.

Import the appliance into the Oracle VirtualBox environment and start Fedora. For more information on the process, please consult the online manual at http://www.virtualbox.org/manual/ch01.html.

For best results it is recommended that you allocate at least 1 GB of memory to the operating system and 64 MB of memory to video.

Once the Earth Dynamics Fedora operating system starts, you will be presented with a logon screen. Simply click on the "Earth Dynamics" user. No password is necessary. Start a terminal console and then type (only the text in **bold** letters)

```
$ work
```

where the "$" character above represents the Linux command line prompt. This gets you into the work directory with all of the Fortran codes and data files. To compile and link a particular code, type

```
$ g77 code.for -o code
```

Then, to run the code, type

```
$ ./code
```

Some codes (e.g. eigens.for) may require the TRIUMF graphics utility GPLOT. For these, using eigens as an example, type

```
$ g77gplot eigens.for -o eigens
```

Again, to run the code, type

```
$ ./eigens
```

The code eigens.for is a good example of why it is advantageous to have all the Fortran codes and data files in one directory. Before eigens.for can be run, it is necessary to run decomp.for to produce the decompression factor in the file decomp.dat required by eigens.for. The code decomp.for requires only the Earth model file as input. In turn, love.for produces the file love.dat with only the Earth model as input. However, eigens.for requires matres.dat (the output file produced by mat.for) with decomp.dat and love.dat as input.

4 Testing your Installation

Lines beginning with a "$" represent your command or input. Do not type the "$" symbol. All other lines represent the programme prompts.

```
$ work
$ ./icfs
 Type in Earth model file name.
cal8.dat
Enter period in hours, azimuthal number and inertial and Coriolis switches
(1 for in, 0 for out).
4.0 1 1 1
     BOLT AND UHRHAMMER MODEL CAL8


     Radius       Rho     Lambda        Mu      Gzero
      (km)      (gm/cc)   (kbars)     (kbars)  (cm/sec/sec)
        0.0      13.58    13912.7     1760.0       0.0
      171.0      13.59    13923.0     1761.0      76.0
      771.0      13.55    13645.0     1737.0     294.0
      971.0      13.49    13310.7     1700.0     368.0
     1171.0      13.38    12735.3     1639.0     442.0
     1216.0      13.34    12570.7     1625.0     459.0
 Enter degree N of fundamental solutions to be computed
1
```

The data files "fs1.dat", "fs2.dat", "fs3.dat" and "fsolns.dat" should have been created.

You can compare your result files ("fs1.dat", "fs2.dat", "fs3.dat" and "fsolns.dat") against the sample files found in the "work/book/example" folder.

5 Compiling with g77gplot

The script "g77gplot" is installed for your convenience as "/usr/local/bin/g77gplot" and it is accessible to you from the command line as follows:

```
$ g77gplot -o <outfile> <file-1> [<file-2> ... <file-n>]
```

where ***<outfile>*** should be replaced with the location of the target executable, and ***<file-1>, <file-2> … <file-n>*** are the file names of the FORTRAN source code files that need to be compiled. The brackets "[" and "]" should not be typed. They are used to show the placement of optional file names.

For example, assume that you have the FORTRAN source code file "eigens.for". You may execute the following command to produce the run-time executable "eigens" in the "work" folder.

```
$ g77gplot eigens.for –o eigens
```

Then to run the eigens programme, execute the following command:

```
$ eigens
```