OpendTect Application Management Documentation version 4.6

Bert Bril

Table of Contents

Chapter 1. Data storage

Table of Contents

1.1. Data management

OpendTect was not designed for extensive data management; Although it may be used for this purpose, we realize that in many cases OpendTect maintains project-storage for data further maintained in company data stores like OpenWorks or GeoFrame.

Users can choose to put projects on any storage area they like. In addition, large data objects like seismic cubes can be relocated to other directories using for example the 'Manage-Seismics' dialog. This relocation is possible because selection of cubes is not done on basis of file name. Rather, the user specifies a name for each cube, and the system translates this automatically into a default file name. Later, location and file name may be changed, whilst retaining the same object ID and name.

Seismic cubes can have a class, like Imported, Steering, and Attribute cubes. This difference is maintained in the Object Manager, but is not apparent on the Operating System level. In the 'Object Management File' (Seismics/.omf) the type can be seen as in:

```
#Type : Steering
```

Currently all Seismic cubes are stored in the 'CBVS' file format, which is an platform-specific binary format. Although the storage is platform-dependent, all CBVS files can be read by OpendTect, fully transparently across platform boundaries. CBVS cubes can be stored in multiple files, where the first file usually contains most of the header info. Subsequent files belonging to the same cube can be recognised by the ^01 , ^02 etc. in the filename. For 2D seismics, this system is also used, now for the different lines in a line set.

OpendTect projects can be copied on the Operating System level, at the $*DTECT_DATA* level. Therefore, a command like:

```
cp -a $DTECT_DATA/Name1 $DTECT_DATA/Name2
```

will result in a fully functional new project in directory Name2 immediately. Note that the user recognizes a survey by the directory name.

1.2. DTECT_DATA: the data access point

Installation of OpendTect usually means making available a base directory from which the project data can be reached. The location of this directory can be set in the user's environment as *DTECT_DATA*, although, especially on Windows, this will usually be done 'behind the scenes' through a user setting ('Default DATA directory'). Anyway, the *DTECT_DATA* directory must be:

- reachable from every machine that needs to access the data
- accessible for the users for read/write

When users create a new project (known as 'Survey' in OpendTect), they can choose to locate the project directory on another disk than the $*DTECT_DATA* directory. In that case, OpendTect will locate the directory on the specified location and put a link in the $*DTECT_DATA* directory. Therefore, this directory does not necessarily have to have a lot of disk storage available.

The directory structure is as follows:

Table 2-1. Directory structure

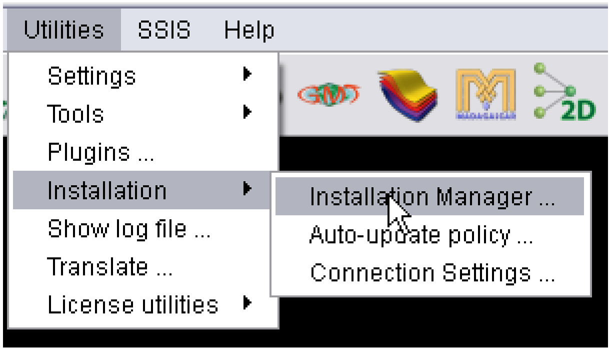
`$DTECT_DATA/`	
	`.omf`
	`project_dir/` (user defined name)

.omf	
.survey	
.defs	
`2DGeom/`	Coordinates for 2D seismic lines
`Attribs/`	Attribute sets
`Features/`	Point-related data (Cross-plot, NN training)
`GMT/`	Data related to the General Mapping Tool
`Locations/`	Pick sets, Polygons
`Madagascar/`	Data related to the Madagascar Tool
`Models/`	Modeling descriptions
`Misc/`	a.o. Sessions
`NLAs/`	Non-Linear Analysis models

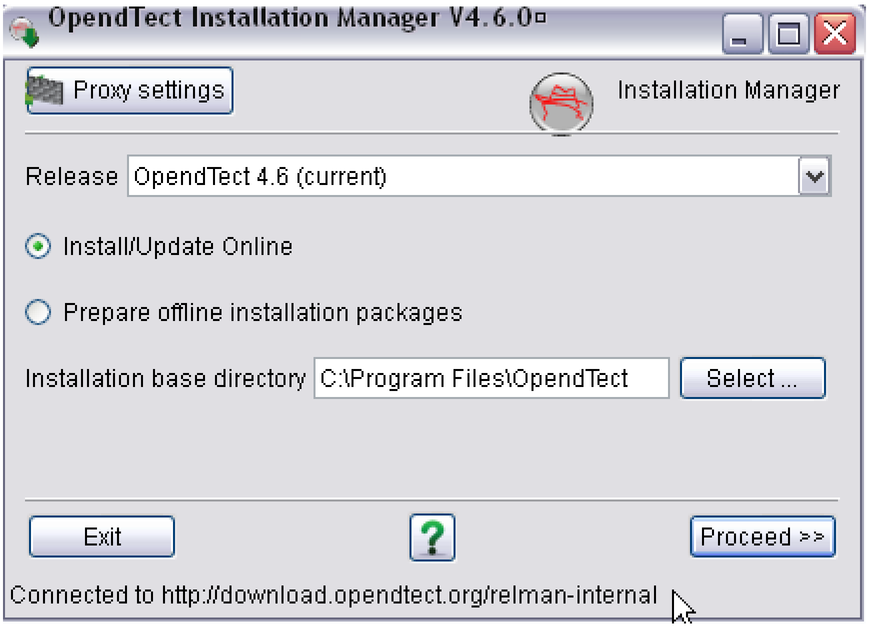
	(usually Neural networks)
`Proc/`	Processing files
`Seismics/`	Seismic data (Imported, attribute, ...), Wavelets
`Surfaces/`	Horizons, Faults
`WellInfo/`	Well data

Chapter 2. Installation

Table of Contents



2.1. Installation Manager



OpendTect Installation Manager V4.6.0

Installation Manager

Release OpendTect 4.6 (current)

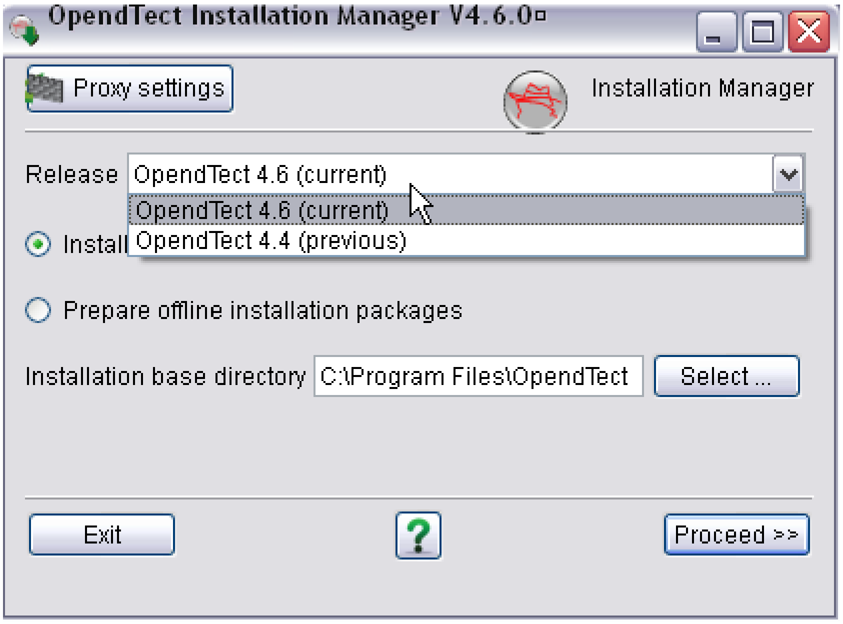
● Install/Update Online

○ Prepare offline installation packages

Installation base directory C:\Program Files\OpendTect

Connected to http://download.opendtect.org/relman-internal

The installation manager is a wizard to install/upgrade the existing OpendTect (Current / Previous) releases. The release type field is used to select the release that is needed to be installed/upgraded. In the new installer, you will have the choice as seen below:



OpendTect Installation Manager V4.6.0

Installation Manager

Release OpendTect 4.6 (current)

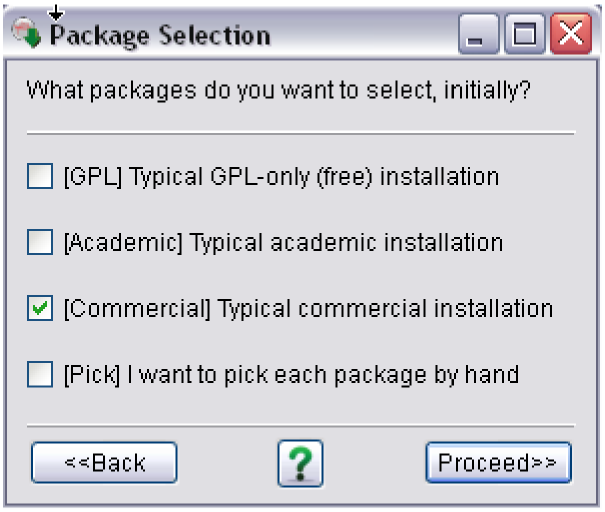
OpendTect 4.6 (current)
OpendTect 4.4 (previous)

● Install

○ Prepare offline installation packages

Installation base directory C:\Program Files\OpendTect

The information following in this section deals with online installation or upgrade. For creating offline installation packages, please see Section 2.1.2. Offline Installation



What packages do you want to select, initially?

☐ [GPL] Typical GPL-only (free) installation

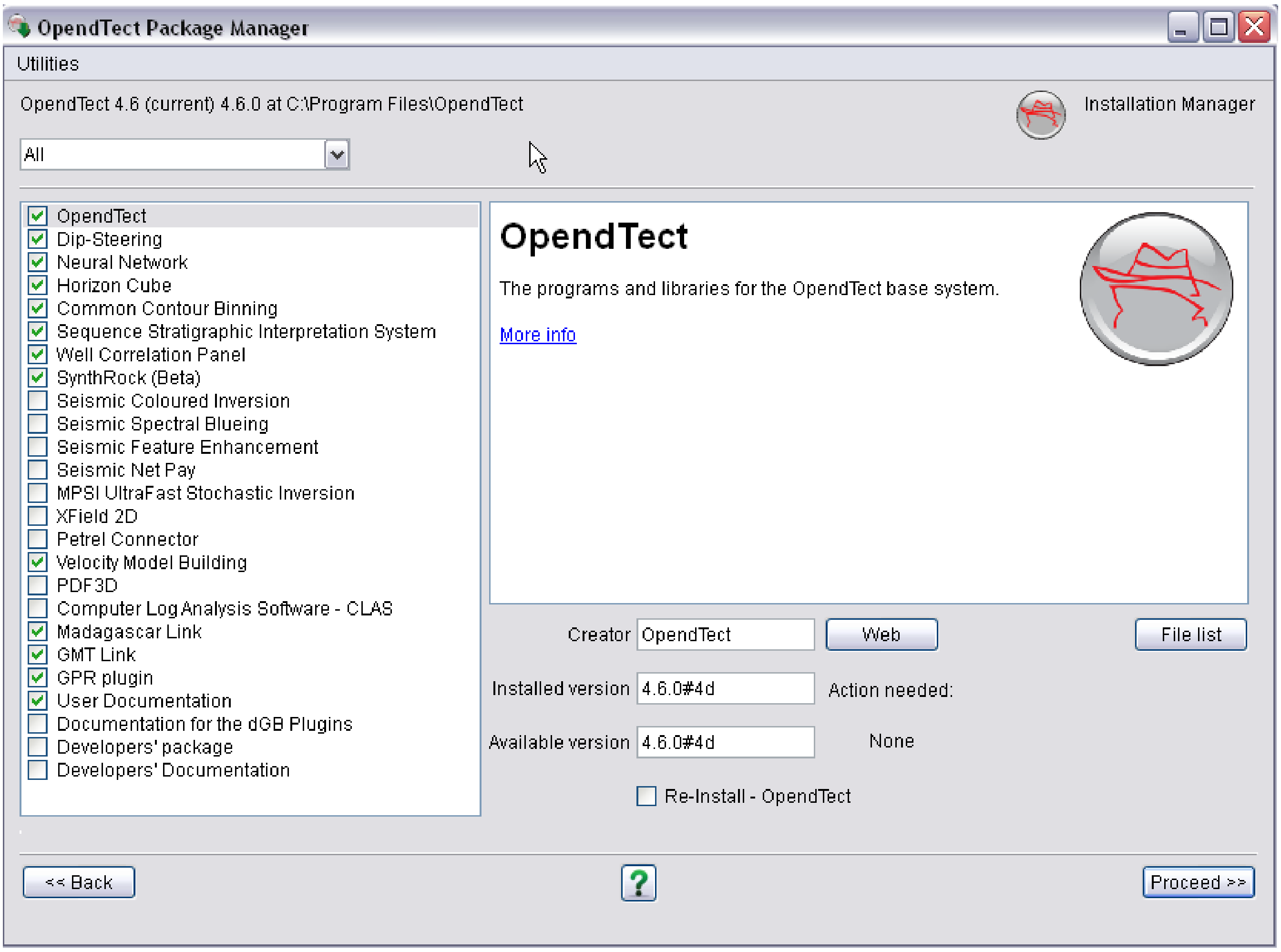
☐ [Academic] Typical academic installation

☑ [Commercial] Typical commercial installation

☐ [Pick] I want to pick each package by hand

The figure above suggests to select the package type of OpendTect. To read more about OpendTect packages type, please refer to our web-page of licensing types (http://www.opendtect.org/index.php/download.html).

2.1.1. Package manager



OpendTect 4.6 (current) 4.6.0 at C:\Program Files\OpendTect

All

- ☑ OpendTect
- ☑ Dip-Steering
- ☑ Neural Network
- ☑ Horizon Cube
- ☑ Common Contour Binning
- ☑ Sequence Stratigraphic Interpretation System
- ☑ Well Correlation Panel
- ☑ SynthRock (Beta)
- □ Seismic Coloured Inversion
- □ Seismic Spectral Blueing
- □ Seismic Feature Enhancement
- □ Seismic Net Pay
- □ MPSI UltraFast Stochastic Inversion
- □ XField 2D
- □ Petrel Connector
- ☑ Velocity Model Building
- □ PDF3D
- □ Computer Log Analysis Software - CLAS
- ☑ Madagascar Link
- ☑ GMT Link
- ☑ GPR plugin
- ☑ User Documentation
- □ Documentation for the dGB Plugins
- □ Developers' package
- □ Developers' Documentation

OpendTect

The programs and libraries for the OpendTect base system.

Creator OpendTect

Installed version 4.6.0#4d

Action needed:

Available version 4.6.0#4d

None

□ Re-Install - OpendTect

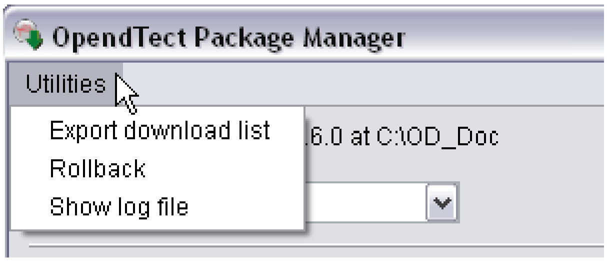
The last window of the wizard is the OpendTect Package Manager (see above figure). Multiple items can be selected from the list by checking-in or -out. Optionally, the relevant package combination could also be selected from the top list box.

The installation manager will automatically recognize the previously installed version at the selected path and will prompt it in the *Installed version* field.

To read more about a particular item in the list, select the item by clicking on it and read the description on to the right panel.

2.1.1.1. Utilities menu

On the top left corner of the package selection window there is a *Utilities* menu, which offers some useful functions for the installation manager:



The utilities menu has the following options.

1) Export download list
2) Rollback
3) Show log file.

Each of these options are explained below in details.

2.1.1.1.1. Export download list

This option allows the user to download the list of URLs of the individual packages from the download site. This list is stored in a text file which can be used later to download these files directly without the help of the installer program. After downloading, user can run his/her own unzipping scripts to install the packages manually. This facility was only developed for the Linux users. Windows users can use this feature, provided they can prepare their own installation scripts for the installation.

2.1.1.1.2. Rollback

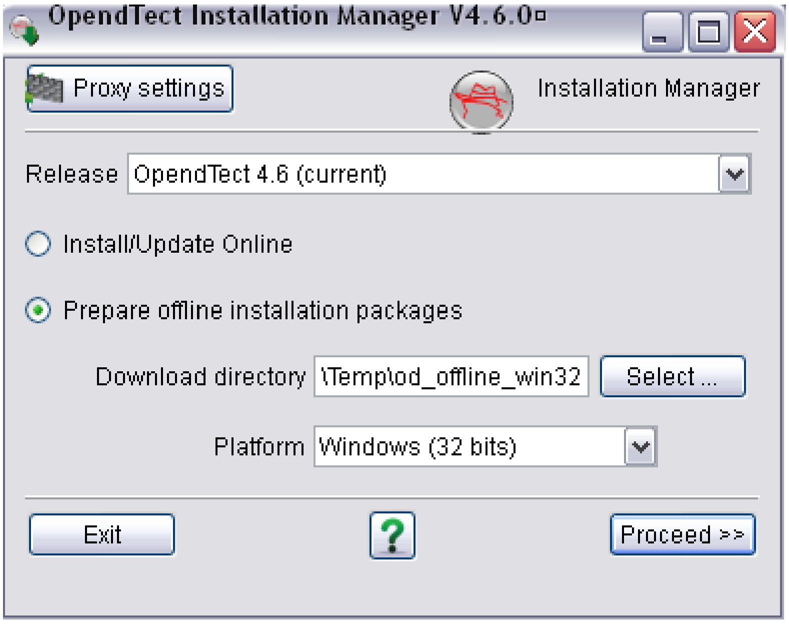
Rollback tool allows you to restore your previous version of the installation. If after updating the software you feel uncomfortable with some of the new features and want to go back to your previous installation, you have to use this tool. As this tool will change your entire installation so you have to use it cautiously.

2.1.1.1.3. Show log file

The installation manager keeps track of all the action it is executing in a log file. This log file can be viewed from this tool. This is useful for debugging purposes. If you face any trouble during the installation process you can send this file to OpendTect support if needed.

2.1.2. Offline installation

You may also choose to create packages for offline installation. These packages are created in such a way as to function cross-platform. For example, you may download the Linux 64bit package onto a Windows machine and then transfer and install it onto the Linux system or vice-versa.



OpendTect Installation Manager V4.6.0

Release: OpendTect 4.6 (current)

○ Install/Update Online

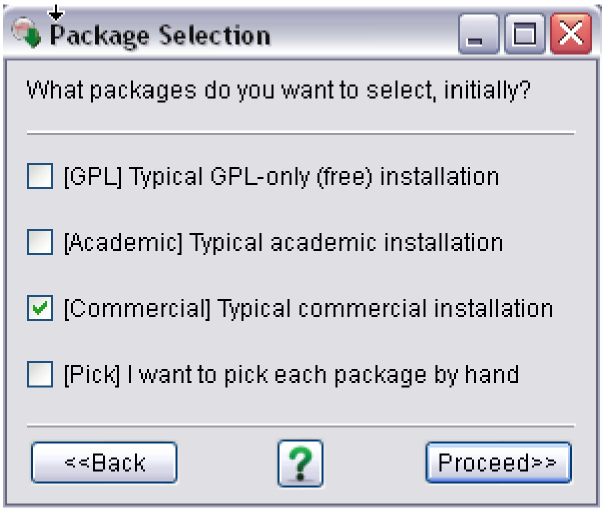
● Prepare offline installation packages

Download directory: \Temp\od_offline_win32

Platform: Windows (32 bits)

You will need to select the OpendTect version and toggle to 'Prepare offline installation packages'. You may either choose your download directory or leave the default.

You will first be prompted to select the package type of OpendTect. To read more about OpendTect packages type, please refer to our web-page describing licensing types (http://www.opendtect.org/index.php/download.html):


Package Selection

What packages do you want to select, initially?

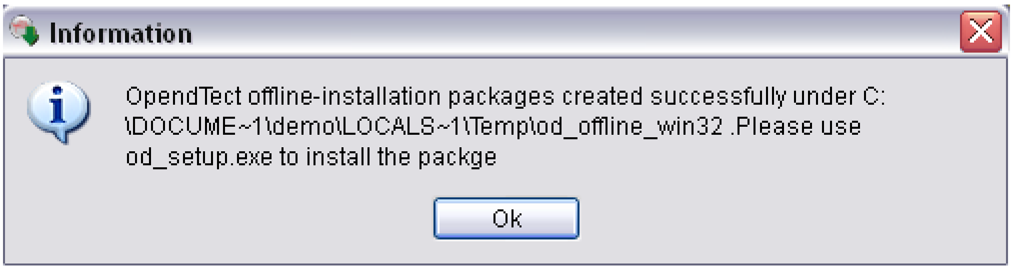
☐ [GPL] Typical GPL-only (free) installation

☐ [Academic] Typical academic installation

☑ [Commercial] Typical commercial installation

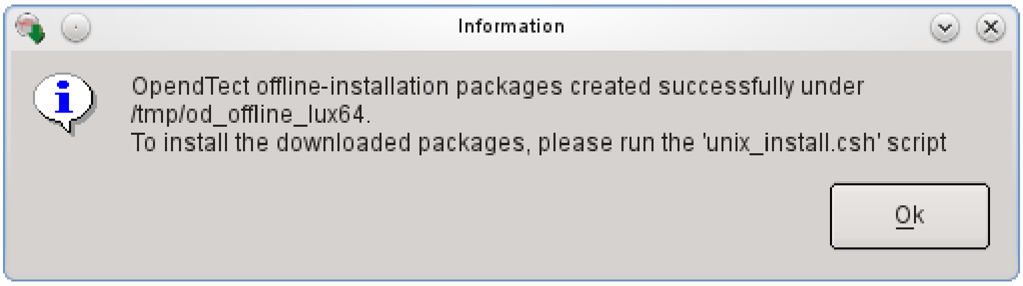
☐ [Pick] I want to pick each package by hand

On completion of the download, you will be reminded of the location in a pop-up window and informed of how to launch the installation package:


Information

OpendTect offline-installation packages created successfully under C:\DOCUME~1\demo\LOCALS~1\Temp\od_offline_win32 .Please use od_setup.exe to install the packge

Windows offline pop-up info


Information

OpendTect offline-installation packages created successfully under /tmp/od_offline_lux64.
To install the downloaded packages, please run the 'unix_install.csh' script

Linux offline pop-up info

Please note: The 'Platform' option refers to the intended installation platform, and not the platform of the machine currently being used to download the packages (if different).

(For information on how to verify packages installed offline, please look here: Offline Package Verification Procedure)

2.1.2.1. Package Verification

We generate signature files for all packages. Normally, a package is a zip file downloadable from our website.

For OpendTect version 4.4.0, please visit: http://www.opendtect.org/relman/4.4.0/
For OpendTect version 4.6.0, please visit: http://www.opendtect.org/relman/4.6.0/

For each zip-file, there is a zip.sig file containing a digital certificate that can be used to verify that the package has not been tampered with during transit.

To verify a package, download the corresponding zip.sig file and place it in the same directory as the package file. gpg (or pgp) must be used (an encryption program). These programs are normally installed in most linux installations, and can be found at http://www.gnupg.org.

dGB's public key has to be downloaded to your keyring. This is only necessary for the initial verification. To obtain the key, use gpg itself:

```
gpg --keyserver pgp.mit.edu --search-keys "support@dgbes.com"
```

You may chose any keyserver you want, as they all share data. Once you have located our key, import it to your keyring.

Secondly, to avoid warning messages, edit the key and tell gpg that you trust it:

```
gpg --edit-key support@dgbes.com
```

and then type "trust" as command.
Once you have our key installed, you are ready to verify the packages. This is done

by gpg:

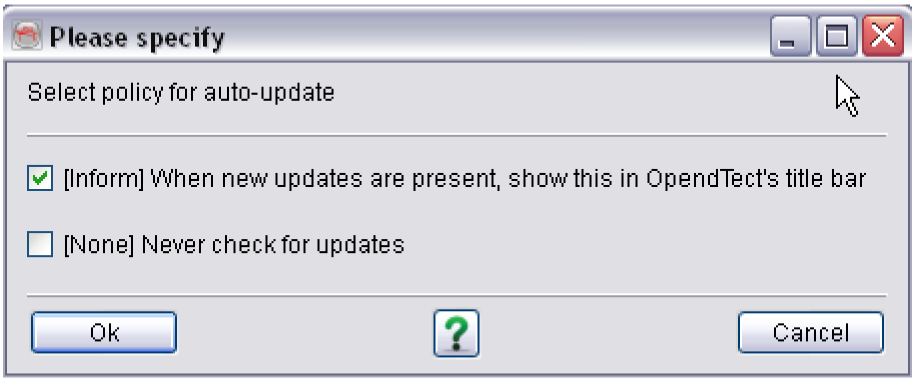
```
#bash-> gpg --verify demosurvey.zip.sig
```

This will check that demosurvey.zip has not changed since the file demosurvey.zip.sig was generated in our office. A positive output may look like this:

```
gpg: Signature made Thu Oct  4 08:46:01 2012 CEST using DSA key ID A02F407E
gpg: checking the trustdb
gpg: 3 marginal(s) needed, 1 complete(s) needed, PGP trust model
gpg: depth: 0  valid:   1  signed:   0  trust: 0-, 0q, 0n, 0m, 0f, 1u
gpg: next trustdb check due at 2022-03-13
gpg: Good signature from "dGB Earth Sciences B. V. (Software package
signing key) "
```

2.2. Auto-update policy

The auto-update policy can be defined and changed by a user. By default the option is set to *Inform* when the updates are available. This can be changed to *Never* check for updates if you prefer.



Please specify

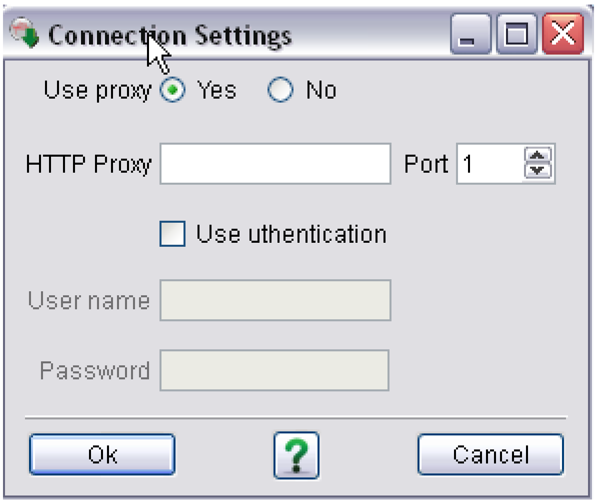
Select policy for auto-update

☑ [Inform] When new updates are present, show this in OpendTect's title bar

☐ [None] Never check for updates

2.3. Connection Settings

To enter the proxy information, the right proxy server information must be added in the *Connection Settings* before running the installation. This is done in the following dialog. This dialog is also available directly through the Installation Manager on clicking the *Proxy Settings* button.



Connection Settings

Use proxy ● Yes ○ No

HTTP Proxy

Port 1

□ Use uthentication

User name

Password

Chapter 3. User environment

Table of Contents

3.1. General

Users need to be aware of only a few things to be able to use OpendTect. Things become slightly more complicated when multiple users carry out shared projects. The specific user settings and current survey are stored in the '.od' hidden directory in the user's home directory. The file names are `settings` and `survey`, or `settings.$DTECT_USER` and `survey.$DTECT_USER` if the DTECT_USER environment variable is set (see project sharing).

3.2. Finding OpendTect

For installations not on windows, users will have to be able to find OpendTect. There is no procedure initiated by the OpendTect installation to put the startup scripts in the user's path. Whether you want to put start_dtect in their path at login, or set an alias for it, create a desktop link - or even other solutions, is simply not something we take care of. Note that this is one of the reasons why OpendTect need not be (and should preferably not be) installed by root.

3.3. Project sharing

OpendTect projects can be shared by many users. The only real obstacle in practice would be the access permissions. There are two main strategies to get this right:

- Make sure the users belong to a common (work-)group, and (on UNIX) set their umask so that files are created with group write permission by default.
- Create (a) special user id(s) for OpendTect projects. The different users can then work under the same Operating system user ID. For this strategy to work, an additional environment variable needs to be set: *DTECT_USER*. OpendTect will automatically use other settings and allow different projects for the same userID depending on the setting of $*DTECT_USER*.

The latter strategy has been used at dGB for years. At login under our 'cases' user, the user is prompted to type his/her name, which is then used to set the *DTECT_USER* environment variable.

3.4. Madagascar processing

To enable Madagascar processing, the variable RSFROOT should be set in the user's environment, pointing to an existing Madagascar installation.

To get the full benefit of the plugin, you should also make sure there is text documentation in the Madagascar installation. This should be present in $RSFROOT/doc/txt. If there is no directory $RSFROOT/doc/txt, or if it's empty, you can run:

```
$RSFROOT/bin/sfdoc -t $RSFROOT/doc/txt
```

3.5. The GMT link

To activate the GMT link, GMT needs to be installed. The download site is http://gmt.soest.hawaii.edu.

After installation, make sure the GMT binary directory ('bin') is in the user's PATH. For many purposes, the user will want a PostScript viewer to be installed, too. Make sure you have a good association for postscript files in place.

Chapter 4. Application

Table of Contents

4.1. Organization

In the OpendTect startup and initialisation scripts, the *DTECT_APPL* environment variable represents the root of the installation.

OpendTect is installed by the OpendTect Installation Manager. You can install and manage multiple release types (Stable, Development). The base directory is a directory you choose yoursef, say /apps/OpendTect, or C:Program FilesOpendTect. Within that directory you will have 'active' and inactive installations. The active installation trees simply have the version as directory name, for example '4.4.0'. Those directories contain an entire OpendTect installation. The combination of the base directory and the version directory will be set in the various scripts as $DTECT_APPL. In the above examples DTECT_APPL would be /apps/OpendTect/4.4.0 or C:\Program Files\OpendTect\4.4.0.

An OpendTect application tree is organized, on both Windows and UNIX, schematically like:

Table 1-1. Organization

```
$DTECT_APP
```

L

relinfo/ (information for the installation manager)

Installation scripts and INSTALL.txt

User startup scripts

lib/

bin/

Program scripts

lux32/, lux64/, win32/, win64/, and/or mac/

Executable s

so/

Shared libraries

plugins/

lux32/, lux64/, win32/, win64/, and/or mac/

libs/

data/

Default color tables

Default mouse button bindings

Default user settings

	Default available batch programs
	icons.Default
	BatchHosts (created by sysadm if any)
	Attribs/
	BasicSurvey/
doc/	
	User
	SysAdm
	Programmer
	ReleaseInfo

4.2. Content

4.2.1. Installation scripts and INSTALL.txt

In INSTALL.txt, the installation procedure is described. On Windows, you need to download one or more self-extracting executables. On UNIX-type systems, you may have to download a script: install.od or inst_pkgs.od. All scripts take no arguments and should be easy to complete. Please read INSTALL.txt carefully.

Regarding the selection of installation directory, you should choose a directory that is accessible on all machines that will run OpendTect (or one of its batch programs). This is especially important for multi-machine processing (which is indispensable for surveys of considerable size). Every machine that needs to be used for this multi-machine processing needs to be able to access OpendTect under the same directory name.

4.2.2. Licensing

Many commercial plugins for OpendTect use FlexLM licensing. The FlexLM end-user manual can be found at http://opendtect.org/lic/endusermanual.
The main source of information from opendtect.org
is http://opendtect.org/lic/doc/flexlm_installation_guide.html.

Some hints. There are two types of licenses: 'node-locked' and 'floating'. A node-locked license is locked to a certain machine. Node-locked licenses have only got lines like this:

```
FEATURE dTectNN lm_dgb 4.400 1-jan-2013 uncounted C42442D673EF

       HOSTID=000039eb8bda

FEATURE dTectDS lm_dgb 4.400 1-jan-2013 uncounted 766915A97FB6

       HOSTID=000039eb8bda
```

Also demo licenses (these have HOSTID=DEMO but look the same) are handled like this.

Another kind of license files require a machine designated as license server. On this machine, a daemon (UNIX) or service (Windows) will keep track of the licenses available. These are typically used when OpendTect can run on multiple computers. These license files look like this:

```
SERVER ourserv 000c6e00bbb8

DAEMON lm_dgb full_path_to/lm_dgb

FEATURE dTectDS lm_dgb 4.400 1-jan-2013 4 B47BBC613640 DUP_GROUP=D

FEATURE dTectNN lm_dgb 4.400 1-jan-2013 4 3FC4443E7619 DUP_GROUP=D
```

The file is read like this: FlexLM needs to start a server on machine 'ourserv' with FlexLM host ID 000c6e00bbb8. To start this server, use a program lm_dgb(.exe). Until 1-Jan-2013 you can use 'dTectDS' and 'dTectNN' with 4 concurrent users, version 4.4 and lower.

4.2.2.1. Windows

The normal way to specify a FlexLM license file on Windows is to simply start OpendTect. If you did not specify a license file yet, OpendTect will ask for one. Simply follow the instructions on the screen. Sometimes, this doesn't work (for example if you want to use another license file). Then you can use the FlexLM utility program available in the Windows start menu for OpendTect: 'License Manager Tools' (LMTOOLS.exe).

Everything should be manageable from this program, although things can be a little confusing. If you need to install on a Windows server, you should really take a look athttp://opendtect.org/lic/doc/flexlm_installation_guide.html, in particular http://opendtect.org/lic/doc/flexlm_inst_win.html. The main choice you have is whether you need to install using services or with a license file. Which of the two depends on the license file you have got and the machine you are on. If you have a node-locked license, you always have to choose to set up using a license file. Also demo licenses (where HOSTID=DEMO) and machines that are not designated to be SERVER of a floating license. In the start tab, select 'Configuration using License file'. You can then select the file to use, but that often doesn't work. Then go to the 'Utilities' tab and enter Vendor Name dgbld and select the path to the license file. Then press 'Override Path'.

If you have a floating license, you must start the service on the machine mentioned in the header of the license file. On that machine, start the License manager Tools. In the start tab, select 'Configuration using services'. Then click the 'Config Services' tab (which has now appeared). Enter a name for the service, for example 'OD-dGB lic man'. Confusing here is that the combo box is an editable field. You have to find the path to the lmgrd.exe. This may be vendor-specific, for example, dGB has all license-related files in a directory: C:\Program Files\OpendTect\bin\winlm.dgb The path to the license file is something you have chosen yourself (for example in C:\Licenses), and the normally the debug log file can be placed in the same directory. Now, you can press the 'Save service' button. Then, you can start the service in the Start/Stop/Reread tab. If you want to run OpendTect from another computer, you need to copy the license file to that computer, and use the same utility. Now, go to the 'Utilities' tab and enter Vendor Name dgbld and select the path to the license file. Then press 'Override Path'. That should be enough to make the computer find the license manager service on the remote machine.

For simple node-locked and demo licenses, there is also a menu in OpendTect, for end-users.

4.2.2.1.1. Installation using a license file

Your main source of information is http://opendtect.org/lic/flexlm_inst_win.html.

Very often you just need to install a new license file. Then, on the local machine, you can use the license manager tools to specify/override the license file OD is supposed to look at. Once you have fired up the "License Manager Tools", you can see a tab "Utilities". That one contains a button "List All Vendor Paths". There you can see that there is a path "lm_dgb", which is the one used by OpendTect. You can override this, if you

1. enter lm_dgb in the "vendor name" field
2. click the "..." button and select a license file
3. press the "Override Path" button

4.2.2.1.2. Installation using a license server

Again: your primary source of information is http://opendtect.org/lic/flexlm_inst_win.html.

If you want to share a common site license amongst multiple users and/or hosts, you can install the Flexlm license manager as a Windows service -- the equivalent of Unix daemons. However, this does not work for demo licenses. These have to be installed on the local host.

Note 1: One not so obvious thing is that in the 'Config services' tab, the 'Service name' combobox is editable.

Note 2: If OD complains, it might be that the console window contains some info about what is wrong.

4.2.2.2. Unix

Your main source of information is http://opendtect.org/lic/flexlm_inst_unix.html.

Some remarks. Make sure you work under the same user that installed OpendTect. The 'start.vendor_name.lmgrd' scripts can be used when you have no company policy on start/stop of FlexLM daemons. The script takes one optional argument; if this argument is 'stop' then the daemon(s) will be stopped rather than started. If the 'start' mode is used, the output of the daemons is redirected to license.package_name.log.

For every commercial plugin package you should find a UNIX script 'install.package_name.license' in the installation directory that reads obtained license files and writes those to the correct position in the OpendTect tree. If you have your own FlexLM management procedures (e.g. FlexAdmin), you still have to make sure that a file 'license.package_name.dat' is present in the application directory containing the necessary license information.

The FlexLM end-user manual can be found at http://opendtect.org/lic/endusermanual.

The two things needed by your plugin vendor to issue a license are the hostname, obtainable on UNIX with the 'hostname' command (Windows: Start-Settings-Control panel-System, tab Network identification), and the host identification. That identification can be obtained by running the FlexLM utility 'lmhostid'. After installing OpendTect, the lmhostid command can be run from the Utilities-BatchPrograms menu.

4.2.2.3. FlexLM host IDs

It is, in general, possible to obtain the FlexLM hostid before installing OpendTect:

Table 1-2. FlexLM IDs

Solaris	**hostid**
Linux	**/sbin/ifconfig**' look for 'HWAddr', i.e. the MAC address of the main network card
Mac OS X	**/sbin/ifconfig** look for 'ether' - the MAC address of the main network card

MS Windows	Run **ipconfig /all** in a DOS ('command prompt') window and look for each 'Physical address' entry, choose the main network MAC address.

For license files, additionally the host name will be required, although host names can be changed at any time. On UNIX, this is simply the output of hostname, on Windows the 'Host Name' from the ipconfig /all is required.

4.2.2.4. Vendor Daemons

In FLEX lm , licenses are handled by running processes. There is one process for each vendor who has a FLEX lm -licensed product on the network. This process is called the vendor daemon . The vendor daemon keeps track of how many licenses are checked out, and who has them. If the vendor daemon terminates for any reason, all users lose their licenses.

Client programs communicate with the vendor daemon through TCP/IP or UDP/IP sockets. The client (where the application runs) and the daemon processes (the license server) can run on separate nodes on your network. Also, the traffic between the client and the license manager daemon is machine-independent, allowing for heterogeneous networks. (For a more complete explanation, please read this.)

The necessary Vendor Daemons for OpendTect can be found in the 'Vendor' sub-directory, here:

For dGB: http://www.opendtect.org/lic/Vendors/_dGB_/latest/
For ArkCLS: http://www.opendtect.org/lic/Vendors/_ArkCls_/
For SitFal: http://www.opendtect.org/lic/Vendors/_GeoInfo_/

Please select the relevant plug-in and download the package corresponding to the architecture of the licence server.

4.2.3. [UNIX] User startup scripts

The main script the user will need to run is 'start_dtect' in the installation root. Some power-users will also want to run the 'exec_prog' script (to start specific command-line or batch utilities). Essentially, start_dtect takes no arguments but arguments given will be passed to the od_main executable, which is a standard (X-

)Windows and Qt application. The exec_prog script will always have a first argument, which is the program to be executed. The rest of the arguments will be passed to the program.

If you have the GNU debugger installed (gdb), then users will be able to send crash reports to opendtect.org for feedback. This can be highly useful to solve problems for users.

4.2.4. bin: Executables

4.2.4.1. Program scripts

The program scripts are called from within OpendTect or the OpendTect startup scripts. Remote execution is always done through od_exec_rmt (UNIX only), local execution through od_exec.

4.2.4.2. Platform specific (lux32, lux64, mac, win32, win64) subdirectories

The OpendTect executables are dynamically linked against the shared libraries in the so/ subdirectory. Bug fixes or special-purpose updates usually consist of a replacement in this directory.

4.2.5. Program data

4.2.5.1. Location of Program data files

Data files for the OpendTect programs are located in the 'data' subdirectory. If you want to overrule certain defaults like a custom default empty survey, or standard color bars, then you can make changes in this directory. Note that you have to make these changes in every update or re-install.

4.2.5.2. Batch Processing Hosts (BatchHosts)

In the data sub directory in the installation directory you will find a file BatchHosts_example. It is easy to see how to use this file as an example of a BatchHosts file. If you do not place such a BatchHosts file in a location specified in the data locations section, OpendTect will ask the Operating System for remote host names (via the g/sethostent() type functions). This can result in a lot of choices for the user, or none.

See also the section on remote batch processing. Make sure remote machines need to have a well synchronized system time.

About the 'First port' entry: the multi-machine processing processing needs a free TCP port to do its work. It starts at a port number which is used if it's free. If not, the program will try one higher and so forth. The starting port is by default set to 19636. If this clashes with any application (that means if that other application is not flexible in its port allocation), overrule it.

The name of the BatchHosts file can be overridden using the environment variable DTECT_BATCH_HOSTS_FILENAME. You can also specify a filename + full path using the DTECT_BATCH_HOSTS_FILEPATH environment variable.

4.2.5.3. Default Color tables (ColTabs)

The ColTabs file in the data directory contains the default color tables that every new user will get. The user can never remove these tables, but (s)he can change the definition (only in their own environment). The format of the file is quite simple. The only thing to explain is the concept. A color table is seen as a series of colors (RGB, optional transparency) on a fictive measure of 0 to 1. Every color table needs a definition of the values 0 and 1, but more colors can be defined in between. For example, the well-known Red-white-black color scale is defined as:

```
2.Name:            Red-White-Black
2.Value-Color.1:  0`255`0`0
2.Value-Color.2:  0.25`255`200`0
2.Value-Color.3:  0.5`255`255`255
2.Value-Color.4:  1`0`0`0
2.Transparency.0: 0`0
2.Transparency.1: 1`0
2.Undef color:    150`200`150
2.Marker color:   0`240`0
```

On six lines, you see the definition of colors, format Red`Green`Blue (separated by back-quotes). On the Value-Color lines, these are preceded by the position in the color table, here 0, 0.25, 0.5, and 1. In the above example there is no transparency; a simple 'full transparency in the middle' example would be:

```
2.Transparency.0: 0`0
2.Transparency.1: 0.5`1
```

```
2.Transparency.2: 1`0
```

4.2.5.4. Default user settings (odSettings)

The default user settings are copied to the user's home directory when the user starts OpendTect for the very first time. The file format is straightforward, for details about what the entries mean exactly, please contact OpendTect support.

4.2.5.5. Default available batch programs (BatchPrograms)

A selection of system utilities and OpendTect batch programs will be available to the OpendTect user through the user interface. This file defines which ones are available, what parameters must be passed and provides info on the programs. Also here the file format is straightforward, for details about what the entries mean exactly, please contact OpendTect support.

4.2.5.6. Default mouse button bindings (MouseControls)

A list of standard mouse button bindings have been compiled in the `MouseControls` file. The user can select one of these setups in OpendTect. If more setups are needed, add those to this file. Even the 'new user' default can be set. The Default: 'Default' is the OpenInventor default which is also adopted by Landmark.

4.2.5.7. Default Attribute Sets (Attribs)

The attribute sets in this directory are available to users as initial sets. In principle, any set created by any user can be placed in this directory to make it available for all OpendTect users. This requires one extra step, however: addition to the Object Management File (.omf). The .omf file needs to be edited with at text editor; an entry similar to the existing ones should be added, but with another ID on the first line of the entry. Alternatively, you can copy the entry as it appears in the .omf in the user's project's Attribs subdirectory's .omf .

Plugins can put their own default attribute set in xxAttrib subdirectories. OpendTect will scan for such directories automatically.

4.2.5.8. The Initial survey (BasicSurvey)

This directory is copied in its entirety when a user creates a new survey (i.e. a new project). Like all OpendTect surveys, the directory can be copied on the UNIX or Windows level (note: make sure hidden files are copied, too!). Therefore, companies can customize and extend initial survey contents by changing/adding to this survey.

4.2.5.9. OpendTect documentation (doc)

The OpendTect documentation - if installed - can be reached from inside OpendTect via the Help menu. From outside OpendTect, index.html in the directory doc/User/base can be opened. For printing, PDF files may be available on the opendtect.org web site.

Documentation for plugin packages may also be present in the doc/User directory. The name of such a directory should be package_name, and a '.mnuinfo' file is mandatory. This file contains the menu name, start url and optional a shortcut.

Open the file 'about.html' for version and contributors to the OpendTect project.

Chapter 5. Running OpendTect

Table of Contents

5.1. First Start-Up

There are a couple of considerations on first start-up.

The Data Access Point

This will be $DTECT_DATA

Installation of OpendTect usually means making available a base directory from which the project data can be reached. The location of this directory can be set in the user's environment as DTECT_DATA, although, especially on Windows, this will usually be done 'behind the scenes' through a user setting ('Default DATA directory').

Anyway, the DTECT_DATA directory must be:

reachable from every machine that needs to access the data

accessible for the users for read/write

(See Section 1.2 DTECT_DATA)

Licenses

On first start-up (for example following (re-)installation), you will be prompted to install license(s). It is vital to ensure that they are correctly installed and findable.

There are other ways to achieve this same result.

1. Soft link: Place the license in the root of the installation directory or make a link there to where the license is located.
2. Set up an environment variable: LM_LICENSE_FILE=port@host (for multiple entries use port@host1:port@host2:port@hostetc)
3. In Windows you see a pop-up on start up for dGB (and on usage for the ArkCLS and SITFAL plugins) asking you to specify the license server system (this needs to be done as Administrator to set this for all users).

In the License file you may change the host name and add a port number or port@host to the right-hand side of the Mac address (though you may not change the Mac address). For example:

SERVER myodtserver 00145ebc6210 3456@host

Note that this needs to be done for both the server's and the client(s) license file(s).
Using this last option (set port@host) is very useful when circumventing Firewall issues.

5.2. General

There are a number of requirements to be able to run OpendTect. First of all, OpendTect will not start without a proper OpenGL installation, which foremost and above all means good, recent drivers. Furthermore, some minimal, reasonable preconditions must be met (see environment). Lastly, some plugins have their own requirements. For example, a proper SeisWorks or GeoFrame installation is required for the ArkCls WorkStation Access plugin.

5.3. OpenGL

The OpendTect 3D graphical engine is based upon the OpenInventor clone COIN made by SIM (http://www.sim.no, http://coin3d.org). This package in turn relies on a proper installation of OpenGL to do its work. Some features of OpendTect, like stereo viewing, are only available if the OpenGL implementation supports it. The OpenGL version is 1.2 or higher on all platforms.

All mainstream graphical cards are nowadays delivered with OpenGL drivers for windows. High end ATI Radeon- and nVidia-based cards are very well up to the task. Those cards work nicely under Linux, too. Unfortunately, most Intel chipsets will not be usable. For more information, consult the system requirements.

IMPORTANT: Make sure you **update the drivers** at least every half year (also on Linux!). This is essential, not doing it can and will cause all sorts of problems for the users, from small details to all-out crashes.

5.4. [UNIX] OpenWorks, GeoFrame, and Petrel

ARK CLS maintain a series of plugins accessing the mainstream platforms commonly used in the industry. The ARKCLS WorkStation Access (WSA) plugin is commonly used for import and export SeisWorks or GeoFrame data directly. There is also a Petrel/OceanView access plugin. The WSA servers support OpenWorks R2003 and R5000, and GeoFrame 4.0-4.4.

To use these plugins, OpendTect needs to be started from a properly prepared environment. Essentially, OpenWorks, GeoFrame or Petrel must also be runnable in that environment. The startup script will check for this - For OpenWorks, the *OWHOME* variable is checked, for GeoFrame, *GF_PATH*. The full initialization and checking sequence can be found (if the plugin is installed) in odinit.arkcls. Starting OpendTect from a GeoFrame or OpenWorks xterm is recommended.

You will need one or more licenses for the WSA and POA connections.

5.5. Remote Batch Processing

OpendTect users need a lot of processing power. Therefore, chances are that they want lots of processing access to other machines. The OpendTect multi-machine batch utility provides this. It relies on remote shell execution and NFS mounting or Windows shares to do its work.

Therefore, Unix (i.e. Linux and Mac) users should have a valid `$HOME/.rhosts` file writeable by the *user only* (i.e. file permissions *must* be: -rw-r--r--). ; The Unix systems that need to be available for processing need to have rsh or ssh enabled.

NFS or Windows network shares are needed to make the application directory and the data directory available on all hosts that are used for processing. On Unix, in case rsh access is not possible you can use ssh, which must then be set up with public key authentication without passwords.

If on Unix machines no 'BatchHosts' file is present, OpendTect calls the system utilities of the 'hostent' (sethostent, gethostent, etc.) type to get a table of hosts for the user to select from. How the Operating System builds the lists is dependent on the particular system setup; most likely `/etc/hosts` and/or the NIS tables are consulted. The 'hostent' functions are old and not very good up to the task. We recommend to always create a BatchHosts file.

The program will try to use the machines that are selected when necessary. So when a job is finished on a machine, it will see which machine from the 'used machines' list is free (most likely the same machine) and start the next job on that machine. Sometimes, the machine selected has problems, is down or the network is overloaded. In any case, if the machine does not react within 5 minutes, the program considers the machine dead. It will remove the machine from the 'used machines' list, and allocates the job to the next machine that is selected or becomes free. Note: the 5 minutes timeout can be overridden using the environment variable *DTECT_MM_CL_FAIL_TO*, which can be used to set the desired timeout in seconds.

This leads us to the thing that needs to be checked, on Unix-based systems. NFS has an option to cache file attributes. This can cause NFS to report that a file is not there when it in fact does exist. We recommend this attribute caching is turned off, which is in fact the default on Solaris systems. On Linux, the default caching time can be as high as 30 seconds. For mounting, we therefore recommend 'noac' (Not available on Linux) and 'actimeo=0' as extra mount options for remote disks.

In terms of licensing, we encourage to tie any licensing to actual users working with it. Although we have no control on plugin builders, we advocate to never license per-cpu, per-machine and so forth. No extra licenses should be needed for processing on remote hosts. The licensing should be per actual user and therefore on the GUI level.

5.5.1. Setting up BatchHosts file

The BatchHosts file should actually be a text file containing the list of remote machines and some relevant details about these machines. A BatchHosts_example file already comes with the installation inside the OpendTect data folder, this file could either be renamed or its contents copied and pasted in the newly created BatchHosts file. OpendTect will use this file to communicate to the remote hosts and launch processes remotely on them. Follow the example file format to add the list of remote machines and their details in the respective fields. Things are done in a bit different way on Unix and Windows, so some of the configuration are different on these platforms, which is mentioned in details later in the chapter.

5.5.2. Multi-Machine Batch Processing on Windows

Running Multi-Machine batch processing on Windows requires few pre-configurable steps, like adding the list and specifications of the remote hosts to the batch hosts file, sharing the survey folder, and starting the remote_processing service daemon on each of these remote host machines. All these steps are clarified below.

On Windows we assume that the survey folder(DataRoot) is on a central server and the user works from a workstation(local host) along with some other machines connected to the network which can be used as remote hosts for processing. The survey folder has to be shared and mapped on each of the host machine. Then install OpendTect on all the hosts and start the daemon service(which comes with the installation) in each of them. In case of local host machine the daemon is not needed. Create the "BatchHosts" file on the local host which contains information about remote host's IP-address/host names and the mapped survey folder corresponding to each of the machines. All these sections are explained below in details.

5.5.2.1. Configuring BatchHosts file on Windows

As mentioned earlier, the BatchHosts file has to be created and configured so that OpendTect can communicate with the remote hosts. A BatchHosts_example file comes with OpendTect installation and could be found in the data folder. The file consists of a header section followed by information about the remote host machines. The header section contains details about the remote shell, nice-level and the port number, for Windows the port number is only used but nice-level and remote shell are Unix specific. The structure of the remote host section is like this.

IP-Address : Description : Platform : Survey folder.

Each of fields are described below.

IP-Address The IP address of the machine, or the name of the machine in the network.

Description more informative description which users see in the list of available hosts in Multi-Machine processing window.

Platform The platform on which the local host is running, i.e "win" if the remote host is a Windows machine.

Survey folder The full path of the survey folder along with the mapped drive. Here ';' is used in place of ':' for drives, as ':' is already used as the field separator.

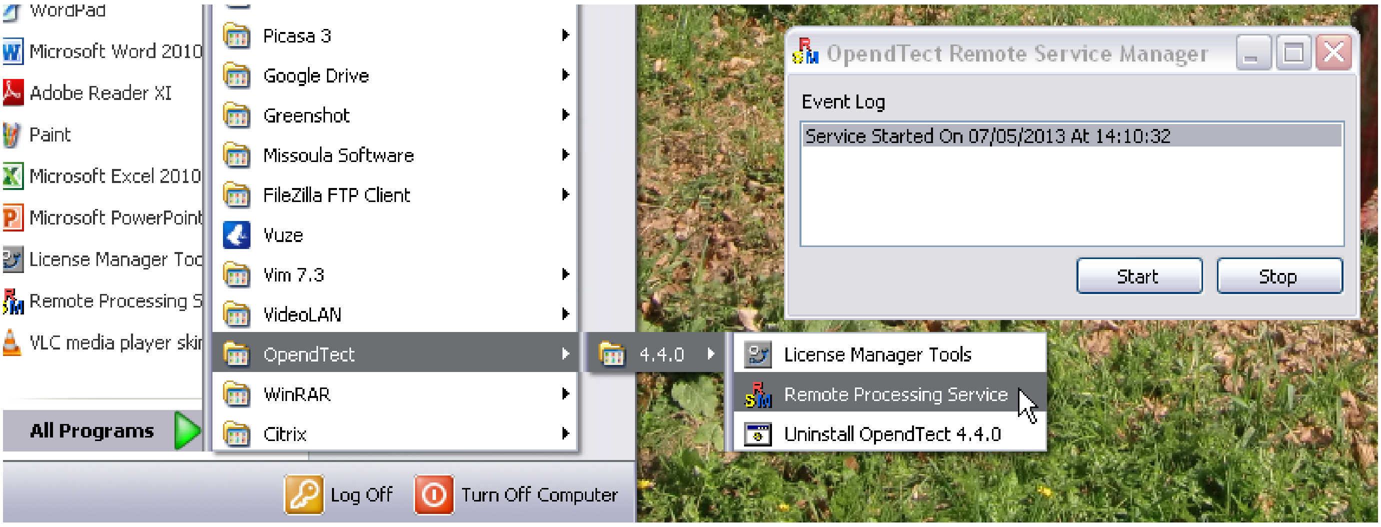
Please note that the local host is automatically added to the list, so there is no need to add the IP address of the local host here.

5.5.2.2. Mapping Survey folder

It is assumed that the survey folder is in a server which has to be shared and mapped on all host machines to be used for multi-machine processing. So if the survey folder is on the C drive on the server e.g. C:\Surveys then map the C drive from this machine to other host machines by choosing an available drive letter (like C:, D: S: etc). So the survey folder now becomes S:\Surveys or F:\Surveys on each of the machines depending on drive letter that is used.

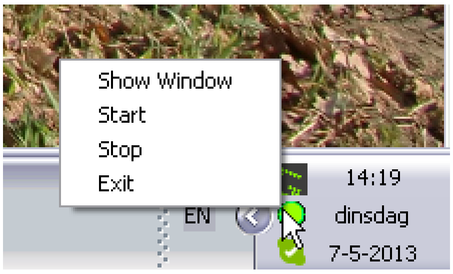
5.5.2.3. Start the daemon on remote machines

Start the daemon on every remote machine by selecting Start-menu -> programs -> OpendTect-4.6.0 -> Remote Processing Service. This tool will add a notification icon to the system tray. Once the service starts, the remote machines are ready to be used as multi-machine processing nodes. The screen-shots below shows the user interface of the Remote Processing Service and its notification icon in the system tray. The service can be controlled by right-clicking on the tray icon and selecting appropriate menu item like start, stop or exit.



Service Started On 07/05/2013 At 14:10:32

Remote Processing service



System tray notification

5.5.3. Multi-Machine Batch Processing on Linux

On Linux the process is quite simple, only modifying the BatchHosts file with relevant information about the remote host machines is enough. As the communication is performed using remote shell commands, so there is no need for running the daemon here. The process is described below.

5.5.3.1. Configuring BatchHosts file on Linux

On Linux the multi-machine communication is done using remote shell commands like rsh or ssh. In the BatchHoats file the default is already set to rsh. The user can also change this to ssh if needed. The list of computers to be used has to be entered in the following format.

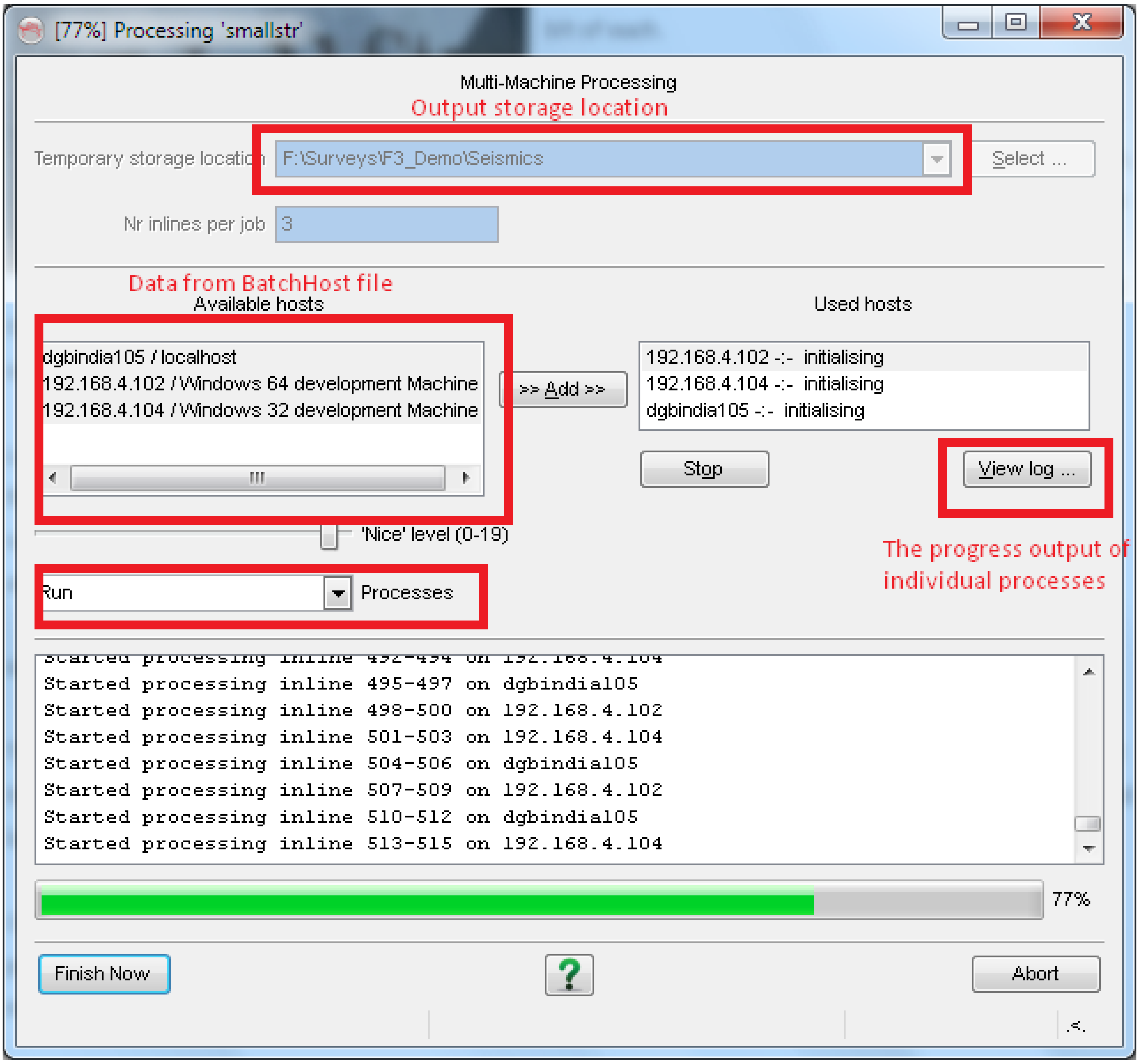
IP Addresss : Name in user display : platform : Shared data location

e.g.

192.168.4.10: 32 bit Linux Machine: lux32 : /dsk/d2/Surveys

5.5.4. Start Processing

Multi-Machine processing feature could be used from several utilities in OpendTect like creating seismic/attribute output or creating a steering cube. All these utilities have a "Multiple machines" options which will launch the Multi-machine Processing window. Now on the left of this window a list box will contain all the available hosts based on the BatchHosts file, select any of the machines from this list and start processing. The annotated screen-shot describes the fields and their purpose.



[77%] Processing 'smallstr'

Multi-Machine Processing

Output storage location

Temporary storage location: F:\Surveys\F3_Demo\Seismics

Nr inlines per job: 3

Data from BatchHost file

Available hosts:
- dgbindia105 / localhost
- 192.168.4.102 / Windows 64 development Machine
- 192.168.4.104 / Windows 32 development Machine

Used hosts:
- 192.168.4.102 -:- initialising
- 192.168.4.104 -:- initialising
- dgbindia105 -:- initialising

'Nice' level (0-19)

Run Processes

The progress output of individual processes

```
Started processing inline 492-494 on 192.168.4.104
Started processing inline 495-497 on dgbindia105
Started processing inline 498-500 on 192.168.4.102
Started processing inline 501-503 on 192.168.4.104
Started processing inline 504-506 on dgbindia105
Started processing inline 507-509 on 192.168.4.102
Started processing inline 510-512 on dgbindia105
Started processing inline 513-515 on 192.168.4.104
```

77%

5.6. [UNIX] The environment

The environment for the programs is set in the following sequence (see bin/init_dtect):

- General initialisation, e.g. *DTECT_APPL* and possibly *DTECT_DATA* are set
- *LD_LIBRARY_PATH* and *PATH* are extended with one directory. In some installations, this has been a problem because Landmark adds an incredible amount of directories to the *PATH*. We think it is not unreasonable to require the ability of adding one single directory to the executable path. Therefore, we leave it to the system administrators to shorten the *PATH* to allow at least the OpendTect binary directory to be added to the path.
- The initialisation scripts for the plugin packages are automatically sourced by init_dtect.

5.7. Madagascar processing

The Madagascar connection plugin implements a link to an existing Madagascar installation. Thus, the installation of Madagascar is out of the scope of this manual. Additional setup may be required, see part of the user environment.

On Windows, you can only use Madagascar in combination with Cygwin. Getting this to work with a native Windows program like OpendTect is not always easy. Here's how we succeeded:

- Download the latest Cygwin installator (http://www.cygwin.com/mirrors.html) and Madagascar sources (http://rsf.sourceforge.net/Download) in a temporary folder (C:\temp for instance).

- Extract the Madagascar sources to a folder that you rename from "madagacar-" to "rsf".
- Install Cygwin (accept the default settings) but select at least the following packages (per section):
  - Devel: gcc, libnetpbm-devel, make, mingw-runtime, subversion, swig
  - Editors: vim
  - Graphics: jpeg
  - Interpreters: python
  - Python: Numeric (numpy if available)
  - X11: xorg-X11-base, libXaw(3d)-devel
- Open a Cygwin session
- Edit the .bashrc file to add some madagascar environment variables:

```
# Madagascar initialization
export RSFROOT=/usr/local/rsf
if [ -n "$PYTHONPATH" ]; then
export PYTHONPATH=${PYTHONPATH}:$RSFROOT/lib
else
export PYTHONPATH=$RSFROOT/lib
fi
export PATH=$PATH:$RSFROOT/bin
export DATAPATH=/var/tmp/
```

- Enter the command "source .bashrc".
- Copy the source to your emulated linux filesystem: "cp /cygdrive/c/temp/rsf /usr/local".
- go to this folder: "cd /usr/local/rsf"
- Compile madagascar using the following successive commands:
  1. "./configure". If "Checking for SCons" returns "no" the script configure will need to be launched a second time.
  2. "make"
  3. "make install"
  4. "make clean".

  Now you can close your Cygwin terminal or test the Madagascar installation. The testing and use of Madagascar without OpendTect will require to start the X server ("xwin &") and set the display ("export=:0") before opening a terminal ("xterm&").

- In your control panel open the "System" item; Go in the "Advanced" tab, select the "Environment Variables" option. Add a new user or system variable of name "RSFROOT" pointing towards "C:\cygwin/usr/local/rsf" (if cygwin was installed at its default location C:\cygwin). Accept and exit.

This variable is setup once in the settings and does not need to be specified after each boot.

On the next startup of OpendTect Madagascar should be available.