

Image I/O-EXT – Setup Guide 1.1.1



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1 Introduction

This guide will provide you with the instruction instructions to build and set up all the libraries as well as the various tools needed to use the Image I/O-Ext Project.

The Image I/O-Ext project requires the same tools for both Windows and Linux operating systems. However, the set of operations needed to properly configure each tool may OS-dependent. For this reason, the instructions have been separated in OS specific chapters. You can jump directly to the one that matches your platform of choice and skip the others.

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2 Windows instructions

2.1 JAVA

First of all, you need your machine has the last JAVA 1.5.0_XX installed. You may download it from this site: http://java.sun.com/javase/downloads/index_jdk5.jsp.

As an instance, select the JDK 5.0 Update 17 and download the Windows Offline Installation on your hard-disk and run the installer.

Finally, make sure to properly set a JAVA_HOME environment variable¹ referring to the location of the JDK (As an instance, C:\ProgramFiles\Java\jdk.1.5.0_17)

NOTE: On Windows Vista you will need to choose an install location other than the default (the program files folder has access restrictions on it which will prevent maven from installing additional DLL files as part of our build process). As an example C:\java\jdk.1.5.0_17 will work just fine.

2.2 ANT

Apache ANT is another needed tool. You can download the last version from:

<http://ant.apache.org/>. When you downloaded it (as an instance, on C:\ProgramFiles\Apache-ant-1.7.0), make sure to properly set an ANT_HOME environment variable referring to that location. Then, edit the PATH environment variable by adding the Ant's bin directory (as an instance, C:\ProgramFiles\Apache-ant-1.7.0\bin).

2.3 MAVEN 2

Maven 2 (in the following instructions it will be simply called “Maven”) is another important tool needed by the Image I/O-Ext project. You can download the last version from <http://maven.apache.org/download.html>

Download the last maven-xxx-bin.zip version and unzip it somewhere on your hard-disk, as an instance on C:\ProgramFiles\Apache-maven-2.0.9.

Then, edit the PATH environment variable by adding the Maven's bin directory (as an instance, C:\ProgramFiles\Apache-maven-2.0.9\bin).

¹To set an environment variable on Windows XP, open the Control Panel -> System. Then, in the “Advanced” tab, click “Environment Variables”. Lastly, click the “NEW” button from the System variables box to add a new Environment Variable. Define the name of the Environment Variable (as an instance: JAVA_HOME) and provide a value for this variable (as an instance, the path of your JDK -> C:\ProgramFiles\Java\jdk.1.5.0_17). Note that if you open a windows command line or the Visual Studio Command Prompt prior to change or set new environment variables via the Control Panel, these changes will not be updated on your command line window. Thus you need to close your command line and open a new one.

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2.4 JAI

Go to <https://jai.dev.java.net/binary-builds.html> and select the daily builds link. Then, download the proper windows version. After you downloaded it, extract the content of the lib folder on your JAVA_HOME\lib folder as well as on your JAVA_HOME\JRE\lib. (where JAVA_HOME defines your JDK, as an instance, C:\programFiles\java\jdk1.5.0_17).

2.5 JAI-ImageIO Toolkit

Go to <https://jai-imageio.dev.java.net/binary-builds.html> and select the daily builds link. Then, download the proper windows version. After you downloaded it, extract the content of the lib folder on your JAVA_HOME\lib folder and on your JAVA_HOME\JRE\lib. (where JAVA_HOME defines your JDK, as an instance, c:\programFiles\java\jdk1.5.0_17).

2.6 SWIG

Make sure you have properly downloaded SWIG, the Simplified Wrapper and Interface Generator which allows to produce JAVA bindings for C/C++ code. You can obtain it at this site:

<http://www.swig.org/download.html>

You should download the last swigwin version which includes a prebuilt executable. (When this guide has been released, the last available swigwin version was 1.3.31 available at: <http://prdownloads.sourceforge.net/swig/swigwin-1.3.31.zip>)

After you downloaded it, extract the zipped file on your hard-disk (as an instance on C:\ProgramFiles\Swig)

2.7 GDAL

GDAL, which stands for Geospatial Data Abstraction Library, provides data access to several raster data formats. Image I/O-Ext deeply leverages on this complex library which needs to be properly configured.

2.7.1 GDAL requirements

Depending on the format you wish to support, you need to properly download and setup several libraries prior to build GDAL. The following instructions describe how to achieve this for the following formats:

- Kakadu (v. 5.2.6)
- MrSID (v 6.0.7 or v 7.0.0)
- ECW (v 3.3)
- HDF4 (v. 4.2r1)

NOTE: If you have no time to follow all the instructions contained in the following sections or if you encounter problems which you cannot solve, you may leverage on the ready-to-use DLLs available for the Image I/O-EXT project using the deploy module. This module will deploy all the DLLs in the proper

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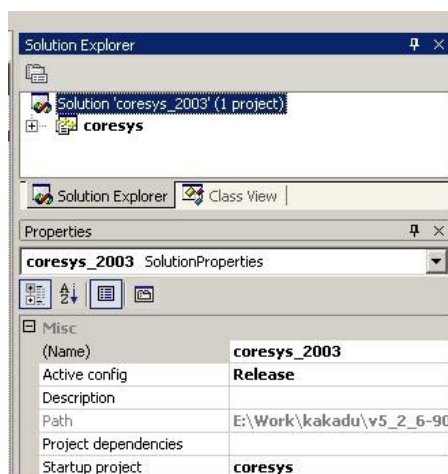
location (In such a case, the available GDAL DLL is built to support MrSID, ECW and HDF4). **However** it is worth to point out that this approach is not recommended and it should be used only as last resort. Anyway, the instructions to auto deploy DLL are contained in section 2.9.1

2.7.1.1 Kakadu

Supposing you have your own Kakadu licensed source code, you need to build the Kakadu DLL.

The visual studio solution for kakadu allows to build a shared Debug DLL. We need to change some settings to build a shared Release DLL. Otherwise, sometimes, memory allocations errors could occur especially when you build GDAL with support for several external formats (which need additional DLLs) since some libs may use MSVCRT71D and some others MSVCR71.

First step is opening the proper ready-to-use Visual Studio Solution² of kakadu coresys (located in kakadu\VERSION\coresys) and change the solution properties (right click on the solution -> Properties). Select “*Configuration Properties*” and switch the *Configuration* value from “*Debug*” to “*Release*”.



Then, you are ready to build your solution. After you done this, open the Kakadu apps solution (located in kakadu\VERSION\apps). Change the Configuration properties to Release in the same way you just do it for Coresys solution and build this solution. If some errors occur for a specific project, rebuild that one.

2.7.1.2 MrSID

As a first requirement, you need the LizardTech Decoding Software Development Kit (DSDK). You can download it free of charge from this site: <http://developer.lizardtech.com> (You need to be registered in order to download it). After logged in, select “*Download*” -> “*Software Development Kits*” -

²As an instance, if you are using Visual Studio .Net 2003, open the coresys_2003.sln solution file.

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> “Download SDK's”. Select the proper version of SDK to be downloaded (select the **GeoExpress SDK for Windows - VC7.1**).

When your download is completed, unzip the DSDK somewhere on your hard disk, as an instance, on C:\work\libs\MrSid. Note that the lib/Release_md folder will contain the lti_dsdm_dll.dll.

2.7.1.3 ECW

Download the Image Compression SDK (source code) from ERDAS site at this address:

<http://www.erdas.com> (You need to be registered in order to download it).

From the main site, select the menu “products” -> “ECW JPEG2000 Codec SDK”. Download the *ECW JPEG2000 Codec SDK Source Code 3.3* file and extract this somewhere on your hard disk, as an instance on C:\work\libs\libecwj2-3.3.

Make sure you have *Microsoft Windows® Server 2003 R2 Platform SDK installed*. If not yet installed, download it from this location: <http://www.microsoft.com/downloads/details.aspx?FamilyID=484269e2-3b89-47e3-8eb7-1f2be6d7123a&DisplayLang=en>

After you have installed *Microsoft Windows® Server 2003 R2 Platform SDK* you will need to register the header files with Visual Studio. Select from the start menu **Visual Studio Registration > Register PSDK Directories with Visual Studio**.

Then, open the ready-to-use Visual Studio Solution available in C:\work\libs\libecwj2-3.3\Source\C\NCSEcw\NCSEcw\NCSEcw.sln.

Edit the properties of the solution (right click on it) and select the *Configuration Manager* button to open the Configuration Manager. Finally, set “Release” as Active Solution Configuration and close the windows.

Then, you are ready to build your solution which will produces NCScnet.dll, NCSEcw.dll, NCSUtil.dll.

2.7.1.4 HDF4

As a first requirement, you need to download the binary distribution of HDF4 release from this site:

<http://hdf.ncsa.uiuc.edu/release4/obtain.html>

Scroll this page until you find the link to the binary distribution file for Windows and download it. When your download is completed, unzip the binary somewhere on your hard disk, as an instance, on C:\work\libs\HDF4.

Then, enter in the release subfolder and create a libpath folder where you need to copy 4 *.lib files contained in release\lib and release\dll subfolders. They are: hd421.lib, hd421m.lib, hm421.lib, hm421m.lib

This could seem a strange workaround but it avoids errors when building GDAL against HDF4.

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It is finally worth to point out that HDF4 leverages on some external libs: JPEG, ZLIB, SZIP. Make sure you have them. <http://hdf.ncsa.uiuc.edu/release4/obtain.html> also contains 3 links to download the required libraries: From the *External Software* section -> *External Libraries used by HDF*, for each library, you need to select the “Pre-Compiled Binaries” link and select the Windows version.

2.7.2 GDAL Configuration

Firstly, you need to download GDAL 1.7.3 from OSGeo SVN.

You may use Tortoise SVN (available at: <http://tortoisesvn.net/downloads>) to download it.

Create a GDAL folder on your Hard-disk and open the contextual menu on it (It's the menu which appears when you click on some element with the right's button of your mouse) and select “SVN Checkout...”. Finally, specify <http://svn.osgeo.org/gdal/tags/1.7.3/gdal> as “URL of repository”.

Although TortoiseSVN is a very helpful/easy-to-use program, it can reduce the performances of your machine. If you need a very light SVN client³ you can download the Collabnet Subversion Command Line client, available at: <http://downloads.open.collab.net/collabnet-subversion.html>

When installed SVN, to checkout GDAL, you simply need to run the following command:

```
svn co http://svn.osgeo.org/gdal/tags/1.7.3/gdal gdal-1.7.3
```

Finally, you need to modify your GDAL\NMAKE.opt as explained in the following sections.

2.7.2.1 Preliminar variables settings

As a first step, edit the GDAL_HOME variable by linking it to the folder where you just downloaded GDAL.

For future JAVA bindings creation, make sure the SWIG variable is properly set. Check this by finding the following lines:

```
# Set the location of your SWIG installation
!IFDEF SWIG
SWIG = C:\ProgramFiles\swigwin-1.3.31\swig.exe
!ENDIF
```

Make sure SWIG variable refers to the proper swig.exe path.

Finally, depending on the specific format you wish to support, follow the instructions contained in the following sections.

2.7.2.2 Kakadu specific configuration option

Find the KAKADU Setting properties in GDAL\NMAKE.opt by looking for the following line:

³Alternatively, you could also download SmartSVN at: <http://www.syntevo.com/smartsvn/download.html>

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Uncomment if you have Kakadu 4.0 or newer

Supposing your KAKADU library has been placed in C:\work\libs\kakadu, edit the next line, like this: KAKDIR = C:\work\libs\kakadu\v5_2_6-90032L

Make sure the proper version subfolder is set. (In this case: v5_2_6-90032L).

To enable kakadu support we need to change only another property. Go ahead in the NMAKE.OPT and look for the following line:

Any extra libraries needed on this platform?

Then, edit the ADD_LIBS variable by adding the kakadu lib, like this:

ADD_LIBS = C:\work\libs\kakadu\lib\kdu_v52R.lib

2.7.2.3 MrSID specific configuration option

Find the MrSID Setting properties in GDAL\NMAKE.opt by looking for the following line:

#Uncomment the following for MrSID support

Supposing your MrSID library has been placed in C:\work\libs\MrSid, edit the next lines, like this:

In case you have a MrSID SDK 6.0.7:

MRSID_DIR = C:\work\libs\MrSid

MRSID_INCLUDE = -I\$(MRSID_DIR)\include\base -I\$(MRSID_DIR)\include\support \
-I\$(MRSID_DIR)\include\metadata \
-I\$(MRSID_DIR)\include\mrsid_readers \
-I\$(MRSID_DIR)\include\j2k_readers

MRSID_LIB = \$(MRSID_DIR)\lib\Release_md\lti_dsdk_dll.lib advapi32.lib user32.lib

Lastly, if you also need to enable JPEG2000 support by means of MrSID library, you need to add the following line:

MRSID_FLAGS = -DMRSID_J2K

2.7.2.4 ECW specific configuration option

Find the ECW Setting properties in GDAL\NMAKE.opt by looking for the following line:

Uncomment the following and update to enable ECW support.

Supposing your ECW library has been placed in C:\work\libs\libecwj2-3.3, edit the next 2 lines, like this:

ECWDIR = C:\work\libs\libecwj2-3.3

ECWLIB = \$(ECWDIR)\lib\NCScnet.lib \$(ECWDIR)\lib\NCSEcw.lib \$(ECWDIR)\lib\NCSUtil.lib

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2.7.2.5 HDF4 specific configuration option

Find the HDF4 Setting properties in `GDAL\NMAKE.opt` by looking for the following line:

```
# Uncomment the following and update to enable NCSA HDF Release 4 support.
```

Supposing your HDF4 library has been placed in `C:\work\libs\HDF4`, edit the next 2 lines, like this:

```
HDF4_DIR = c:\work\libs\HDF4\release  
HDF4_LIB = /LIBPATH:$(HDF4_DIR)\libpath
```

2.7.3 Building GDAL

Now, you are ready to build GDAL. Open Visual Studio Command Prompt, and enter in your `GDAL` home folder. At this point, you are ready to start the build process by running the following command:

```
nmake /f makefile.vc
```

When the build is terminated, you need to generate JAVA bindings.

2.7.3.1 Generating JAVA Bindings

Variable settings

Then, check your `GDAL\SWIG\JAVA\java.opt` is properly configured. (Basically, you need to check the `JAVA_HOME` and `ANT_HOME` variables are properly set)

Running SWIG

Now, you are ready to generate java bindings. From the command line, enter in your `GDAL\SWIG` folder and run `nmake /f makefile.vc java`

This command will automatically generate wrappers and bindings.

2.7.3.2 Final Settings

At this point, you should have:

- some external DLLs (for Kakadu, ECW, MrSID, HDF4)
- a GDAL DLL (`gdal17.dll`)
- 4 JNI DLL (`gdalconstjni.dll`, `gdaljni.dll`, `ogrjni.dll`, `osrjni.dll`)
- a jar file (`gdal.jar`)

You need to place all the DLLs in the folder where your application will look for libraries. Your `JAVA_HOME\BIN` folder could be a typical location where to place them.

Finally, make sure you properly set the `GDAL_DATA` environment variable. This needs to be set with your `GDAL\DATA` location in order to properly evaluate EPSG codes.

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2.8 ImageMagick & Jmagick

The Image I/O-Ext project provides an additional plugin to handle JPEG format, leveraging on Jmagick. In order to build and use this plugin, you need to download and build the ImageMagick library from this site:

<ftp://ftp.imagemagick.org/pub/ImageMagick/windows/ImageMagick-windows.zip>

Prior to build ImageMagick you need to configure it:

Run the Visual Studio IDE and from the “Open->Project” menu, select the configure workspace available at the ImageMagick-6.X.X\VisualMagick\configure folder and press Open. Choose “Build->Build Solution” to compile the configuration tool and, when finished, you will find a configure.exe tool on the configure folder. Now, you are ready to configure the build of your ImageMagick libraries:

Run configure.exe and the wizard will be opened. Press Next and click on the multi-threaded DLL. Now press, on Next twice and finally Finish. The configuration utility just created a workspace required to build ImageMagick from source. Open the VisualDynamicMT.sln Visual Studio Solution from the ImageMagick-6.X.X\VisualMagick folder. Change the solution properties (right click on the solution -> Properties). Select “Configuration Properties” and switch the Configuration value from “Debug” to “Release”.

Finally, choose Build->Build Solution to compile and build the ImageMagick distribution. (Advanced Users may manually disable unrequired modules. Actually, the Image I/O-Ext plugin module leveraging on Jmagick, only provides support for JPEG files.

When finished, you need to place all the DLLs from the ImageMagick-6.X.X\ VisualMagick\bin folder in the folder where your application will look for libraries. Your JAVA_HOME/BIN folder could be a typical location where to place them.

Future versions of this document will provide better instructions about how to customize the ImageMagick build.

2.9 Image I/O-EXT Project

You need to download the **imageio-ext** project from Java.net SVN. To do this, you need to create an imageio-ext folder and use Tortoise SVN or another SVN client as explained in section 2.7.2

The URL of repository⁴ for the *SVN Checkout* command is:

<https://svn.java.net/svn/imageio-ext~svn/branches/1.1.x/>

2.9.1 Image I/O-Ext Project building

Actually, it is possible to build the project using 2 configurations.

1. **base**: only the plugins which don't depend on external libraries are built

⁴When asked for authentication, specify user=guest , with no password

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2. full: All the available plugins are built

When executing tests, any configuration requires the proper set of DLLs. (Test will be simply skipped in case of missing libs. You will be notified through WARNING messages in case some driver or library is missing but tests will not be interrupted).

To build the Image I/O-Ext project, enter in `imageio-ext\` and run the maven command:

```
mvn install
```

in case you want run a full installation, append the “-Dall” property to the previous command. This command will build and test all required modules and plugins and store the produced JARS in the local maven repository.

In case you need to perform a fast build of the Image I/O-Ext project, without tests, just add the `-Dmaven.test.skip` option to the previous command.

2.9.1.1 Testing Image I/O-Ext modules with Maven.

In case you simply need testing some Image I/O-Ext modules, as an instance in order to check if everything is working fine, you can enter in the module you are interested in and run the maven test. As an instance:

```
C:\Projects\imageio-ext>cd plugin\gdalarcgrid
```

```
C:\Projects\imageio-ext\plugin\gdalarcgrid>mvn test
```

Lastly, if you want to perform interactive tests (which usually display data read on a windows), you should use the `interactive.tests` profile like this:

```
C:\Projects\imageio-ext\plugin\gdalarcgrid>mvn test -Pinteractive.tests
```

Anyway, displaying the image is a not blocking/not waiting operation so you will barely see the image, just for an instant (when displayed, it will be automatically closed. Future versions may include a property to customize “waiting time” before close). Note that tests require you have all the needed DLLs, otherwise they will be skipped.

2.9.1.2 Testing JPEG2000 Kakadu (GDAL) writer capabilities

The JPEG2000 Kakadu (GDAL based) plugin contains a wide suite for testing write operations with different write parameters leveraging on the available create options / Kakadu customizations. As default, the test performs only a simple write operation without testing any supported kakadu create option to reduce build time. In case you need to test all these operations simply use the `extensive.tests` profile like this:

```
C:\Projects\imageio-ext\plugin\gdalkakadujp2>mvn test -Pextensive.tests
```

Moreover, as default, when the test is terminated, all the written files are automatically deleted. In case you would like to maintain the produced files, avoiding delete, you should add the profile `tests.holdwrittenfiles` to the previous one, using the following command:

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```
C:\Projects\imageio-ext\plugin\gdalkakadujp2>mvn test  
-Pextensive.tests,tests.holdwrittenfiles
```

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3 Linux instructions

The following instructions have been tested on Linux Fedora Core 5 distribution and Ubuntu 8.04.

Note: On some Linux distributions (as an instance, Ubuntu), you can install Java, Swig and Ant using the Package Manager (with the command `sudo apt-get install "package name"`).

3.1 JAVA

First of all, you need your machine has the last JAVA 1.5.0_XX installed. You may download it from this site: http://java.sun.com/javase/downloads/index_jdk5.jsp.

As an instance, select the JDK 5.0 Update 17 and download the Linux Self-extracting file (A `jdk-1_5_0_17-linux-i586.bin` file). After you have downloaded it (as an instance on `/usr/local/java`), make sure that execute permissions are set on the downloaded file, by running this command:

```
chmod +x jdk-1_5_0_17-linux-i586.bin
```

Then, go in `/usr/local/java` and run: `./jdk-1_5_0_17-linux-i586.bin`

Usually, Fedora Core 5 distribution comes with a OLD java version (as an instance, 1.4.2). Now, you could add symbolic links on your alternatives.

Just run the following commands:

```
alternatives --install /usr/bin/java java /usr/.../jdk1.5.0_17/bin/java 2
```

next you can configure alternatives for java by using the following command:

```
alternatives --config java
```

```
alternatives --display java
```

Some Linux distributions come with Java 6 version. When building ImageIO-Ext with Java 6, an error related to `customstreams` module appears.

3.2 ANT

Apache ANT is another needed tool. You can download the last version from: <http://ant.apache.org/>

When you downloaded it (as an instance, on `/usr/local/apache-ant-1.7.0`), you may create a symbolic link as follow: `ln -s /usr/local/apache-ant-1.7.0/bin/ant /usr/bin/ant`

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3.3 MAVEN 2

Maven 2 is another important tool needed by the Image I/O-Ext project. You can download the last version from <http://maven.apache.org/download.html>.

When you downloaded it, extract the archive to the directory where you wish to install it, as an instance on `/usr/local/maven-2.0.9`

Create a folder which will contains the installed external libraries as well as the additional files:

```
cd /home/myuser
mkdir mylibs
cd mylibs
mkdir lib
mkdir include
```

At this point, on your `/etc` folder, edit the "profile" file by adding the following lines:

```
PATH=$PATH:/usr/local/maven-2.0.9/bin
export JAVA_HOME=/usr/local/java/jdk1.5.0_17/
export JRE_HOME=/usr/local/java/jdk1.5.0_17/jre/
export MAVEN_HOME=/usr/local/maven-2.0.9/
export ANT_HOME=/usr/local/apache-ant-1.7.0/
export LD_LIBRARY_PATH=/usr/local/lib:/home/myuser/mylibs/lib
```

3.4 JAI

Go to <https://jai.dev.java.net/binary-builds.html> and select the daily builds link. Then, download the proper Linux version. After you downloaded it, extract the content of the lib folder on your `JAVA_HOME/lib` folder as well as on your `JAVA_HOME/JRE/lib`. (where `JAVA_HOME` defines your JDK, as an instance, `/usr/java/jdk1.5.0_17`).

3.5 JAI-ImageIO Toolkit

Go to <https://jai-imageio.dev.java.net/binary-builds.html> and select the daily builds link. Then, download the proper Linux version. After you downloaded it, extract the content of the lib folder on your `JAVA_HOME/lib` folder and on your `JAVA_HOME/JRE/lib`. (where `JAVA_HOME` defines your JDK, as an instance, `/usr/java/jdk1.5.0_17`).

3.6 SWIG

Make sure you have properly downloaded SWIG, the Simplified Wrapper and Interface Generator which allow to produce JAVA bindings for C/C++ code. You can obtain it by simply running:

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```
yum update swig or sudo apt-get install swig
```

3.6.1 Manual SWIG installation

In case `yum` is not supported by your distribution, just download swig from:

<http://mesh.dl.sourceforge.net/sourceforge/swig/swig-1.3.32.tar.gz>. (Or a more recent version). Unzip this somewhere on your hard disk and then run:

```
./configure
```

```
make
```

```
sudo make install (As you may notice, this command requires superuser privileges)
```

3.7 GDAL

GDAL, which stands for Geospatial Data Abstraction Library, provides data access to several raster data formats. Image I/O-Ext deeply leverages on this complex library which needs to be properly configured.

3.7.1 GDAL requirements

Depending on the format you wish to support, you need to properly download and setup several libraries prior to build GDAL. The following instructions describe how to achieve this for these formats:

- Kakadu (v. 5.2.6)
- MrSID (v 6.0.7)
- ECW (v 3.3)

3.7.1.1 Kakadu

Supposing you have your own Kakadu licensed source code, browse to the main kakadu folder (as an instance on `home/myuser/work/libs/kakadu/v5_2_6`). Enter in `coresys/make` and modify the `Makefile-Linux-x86-gcc` file as follows:

- Enable the static build by setting `KDU_GLIBS = -static -static-libgcc`
- Run `make -f Makefile-Linux-x86-gcc`

This will generate libs in `kakadu/lib/Linux-x86-gcc`.

From the kakadu folder, run: `sudo cp lib/Linux-x86-gcc/* /home/myuser/mylibs/lib`

After this, enter in `apps/make` and modify the `Makefile-Linux-x86-gcc` file as follows:

- Enable the static build by setting `KDU_GLIBS = -static -static-libgcc`
- Set `LIB_SRC` as follow: `LIB_SRC=$(LIB_DIR)/libkdu.a`
- Run make: `make -f Makefile-Linux-x86-gcc`

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The following additional steps are not required by GDAL but it is needed by the Image I/O-Ext plugin which directly leverages on the Kakadu Library.

Enter in `managed/make` and modify the `Makefile-Linux-x86-gcc` file. You will notice the presence of a `INCLUDES += -I../all_includes` row. In top of this, add the following additional setting:

```
INCLUDES += -I$(JAVA_HOME)/include -I$(JAVA_HOME)/include/linux
```

Run make: `make -f Makefile-Linux-x86-gcc`

Then, from the `kakadu` folder, run: `sudo cp /lib/Linux-x86-gcc/libkdu_jni.so /home/myuser/mylibs/lib`

Finally, run `sudo ldconfig`

3.7.1.2 MrSID

As a first requirement, you need the LizardTech Decoding Software Development Kit (DSDK). You can download it free of charge from this site: <http://developer.lizardtech.com> (You need to be registered in order to download it). After logged in, select “Download” -> “Software Development Kits” -> “Download SDK’s”. Select the proper version of SDK to be downloaded (select the **GeoExpress SDK for Linux (x86) - gcc 3.4** or **GeoExpress SDK for Linux (x86)-gcc 4.1**)⁵

3.7.1.3 ECW

Download the Image Compression SDK (source code) from ERDAS site at this address:

<http://www.erdas.com> (You need to be registered in order to download it).

From the main site, select the menu “products” -> “ECW JPEG2000 Codec SDK”. Download the *ECW JPEG2000 Codec SDK Source Code 3.3* file and extract this somewhere on your hard disk, as an instance on `/home/myuser/libs/libecwj2`

From the command line, just enter this folder and simply run:

- `./configure --prefix=/home/myuser/mylibs`
- `make`
- `sudo make install`

3.7.2 GDAL Configuration

Firstly, you need to download GDAL 1.7.3 from OSGeo SVN. Enter the folder where you want to download GDAL and run:

```
svn co http://svn.osgeo.org/gdal/tags/1.7.3/gdal gdal1.7.3
```

⁵Select the proper gcc version depending on your system. Run a “gcc --version” to know the available version

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Make sure you properly set the `GDAL_DATA` environment variable. This need to be set with your `GDAL/DATA` location in order to properly evaluate EPSG codes. As an instance, supposing you installed GDAL on `/home/myuser/gdal1.7.3`, you can use the following command:

```
export GDAL_DATA=/home/myuser/gdal1.7.3/data/
```

Next step is configuring GDAL by means of the `./configure --prefix=/home/myuser/mylibs --with-threads --without-grib -without-geos --without-vfk -without-pg` command. Such a command allows to specify several options to enable formats, change build properties, customize libraries and much more. Depending on the required formats you wish to enable on GDAL, you need to add some options to this command as explained in the following sections.

3.7.2.1 Kakadu configuration option

Add `--with-kakadu=KAKADU_FOLDER` option to the `./configure` command, where `KAKADU_FOLDER` represents the path where your Kakadu library is located.

3.7.2.2 MrSID configuration option

Add `--with-mrsid=MRSID_FOLDER` option to the `./configure` command, where `MRSID_FOLDER` represents the path where you previously downloaded GeoSDK.

Note: During the future build process (3.7.3) a similar error could occur:

```
/...../include/base/lti_sceneBuffer.h:356:  
error: extra qualification 'LizardTech::LTISceneBuffer::' on member
```

You need to fix the issue in the header `MRSID_FOLDER/include/base/lti_sceneBuffer.h` by simply removing the class scope declaration from the `inWindow` method declaration. Line 356 should look like this:

```
bool inWindow(lt_uint32 x, lt_uint32 y) const;
```

Then repeat build process as suggested in 3.7.3.

3.7.2.3 ECW configuration option

Add `--with-ecw=/home/myuser/mylibs` option to the `./configure` command, where `/home/myuser/mylibs` represents the path where you previously installed ECW.

3.7.3 GDAL Building

Finally, you are ready to build GDAL. Supposing you have properly configured it as explained in section 3.7.2, run the following commands:

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- `make clean`⁶
- `make`
- `sudo make install` (As you may notice, this command requires superuser privileges)

When the build is terminated, run `sudo ldconfig`.

Next step is generating JAVA bindings.

3.7.3.1 Generating JAVA Bindings

SWIG will generate java bindings for you.

As a first step, check your GDAL/SWIG/JAVA/`java.opt` is properly configured.

Basically, you need to check the `JAVA_HOME`, `JAVA_INCLUDE` and `ANT_HOME` variables are properly set. Make sure the following line exists: `JAVA_INCLUDE=-I$(JAVA_HOME)/include -I$(JAVA_HOME)/include/linux`⁷

A second step is required in order to customize the compiler options (This is needed to change default optimizations settings, which may cause JVM crashes). Just redefine the `CXX_OPTFLAGS` and `C_OPTFLAGS` in the `GDALmake.opt` file on your GDAL main folder. You need to set these 2 flags with the `-O1` value (Note that the minus sign (“-”) is followed by the “O” letter instead of the “zero” digit). Search the following line (`#Flags to build optimized release version`) in `GDALmake.opt` and change the flags like this:

```
#Flags to build optimized release version
CXX_OPTFLAGS =    -O1
C_OPTFLAGS =      -O1
```

Then, enter in your main GDAL folder and run:

```
cd swig
cd java
make veryclean
make generate
make build
```

This command will automatically generate wrappers and bindings. Then, copy the generated libs in `/home/myuser/mylibs/lib` using the command:

⁶In case you get errors in compiling GDAL on a linux 64 machine about *ilwis* datasets, you can disable them since they aren't actually supported by imageio-ext by editing the `GDALmake.opt` file and removing them from the `GDAL_FORMATS` entries list.

⁷Make sure to set the proper Linux path separator char “/” on the configured path by changing “\” to “/” if needed

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```
sudo cp *.so /home/myuser/mylibs/lib
```

Finally, run `sudo ldconfig`.

3.8 Image I/O-EXT Project

You need to download the **imageio-ext** project from Java.net SVN. Enter the folder where you want to download Image I/O-EXT and run:

```
svn co https://svn.java.net/svn/imageio-ext~svn/branches/1.1.x/ imageio-ext  
--username MYUSERNAME
```

(Note: MYUSERNAME need to be replaced with your own username. In case you don't have an imageio-ext user, you can use "guest" with no password to access without write permissions)

3.8.1 Image I/O-Ext Project building

Actually, it is possible to build the project in 2 configuration.

1. **base**: only the plugins which don't depend on external libraries are built
2. **full**: All the available plugins are built

When executing tests, any configuration requires the proper set of libraries. (Test will be simply skipped in case of missing libs. You will be notified through WARNING messages in case some driver or library is missing but tests will not be interrupted).

To build the Image I/O-Ext project, enter in `imageio-ext\` and run the maven command:

```
mvn install
```

in case you want run a full installation, append the `"-Dall"` property to the previous command. This command will build and test all required modules and plugins and store the produced JARS in the local maven repository.

In case you need to perform a fast build of the Image I/O-Ext project, without tests, just add the `-Dmaven.test.skip` option to the previous command.

3.8.1.1 Testing Image I/O-Ext modules with Maven

In case you simply need testing some Image I/O-Ext modules, as an instance in order to check if everything is working fine, you can enter in the module you are interested in and run the maven test. As an instance:

```
imageio-ext/plugin>cd plugin/gdalarcgrid  
imageio-ext/plugin/gdalarcgrid>mvn test
```

Lastly, if you want to perform interactive tests (which usually display data read on a windows), you should use the `interactive.tests` profile like this:

```
imageio-ext/plugin/gdalarcgrid>mvn test -Pinteractive.tests
```

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Anyway, displaying the image is a not blocking/not waiting operation so you will barely see the image, just for an instant (when displayed, it will be automatically closed. Future versions may include a property to customize “waiting time” before close). Note that tests require you have all the needed SO. libraries, otherwise they will be skipped.

3.8.1.2 Testing JPEG2000 Kakadu (GDAL) writer capabilities

The JPEG2000 Kakadu (GDAL based) plugin contains a wide suite for testing write operations with different write parameters leveraging on the available create options / Kakadu customizations. As default, the test performs only a simple write operation without testing any supported kakadu create option to reduce build time. In case you need to test all these operations simply use the `extensive.tests` profile like this:

```
imageio-ext/plugin/gdalkakadujp2>mvn test -Pextensive.tests
```

Moreover, as default, when the test is terminated, all the written files are automatically deleted. In case you would like to maintain the produced files, avoiding delete, you should add the profile `tests.holdwrittenfiles` to the previous one, using the following command:

```
imageio-ext/plugin/gdalkakadujp2>mvn test  
-Pextensive.tests,tests.holdwrittenfiles
```

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