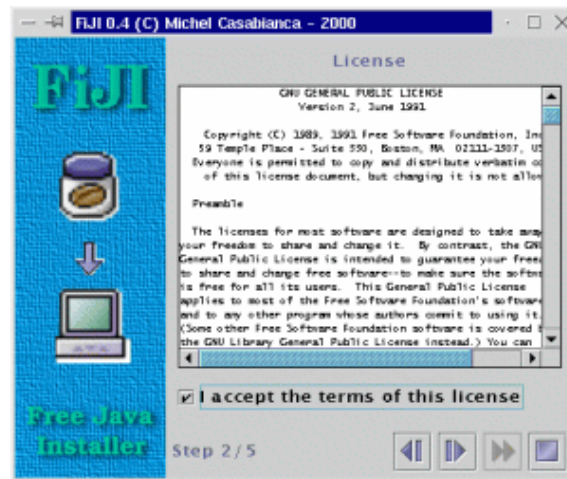


# FiJI

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FiJI is a Free Java Installer released under GPL. It enables you to distribute your applications with easy installation : the user doesn't have to edit launching scripts (to modify a CLASSPATH for instance).



## Installing FiJI

Auto installer [fiji-1.0-1.jar](#)

To install FiJI, you must first install a 1.2 or 1.3 Java Virtual Machine. You can download one for free on [Sun's web site](#).

The latest version of FiJI is on [my web page](#). To install it, go to the directory where you saved the archive and type `java -jar fiji-0.4.jar`. Windows and Solaris users can simply double-click the file. FiJI is delivered with himself has a self extracting installer, so you should have an idea of what it can do.

**Note:** Windows may complain that it doesn't have enough environment space. In this case, add the line `shell=command.com /E:8000 /P` to your `config.sys` file and reboot. Furthermore, the environment should not alter file names, there is an option under Windows NT to work with case sensitive file names.

## Building FiJI

To build FiJI, you will need Ant version 1.2. You can download it on [Apache web site](#). Simply type `ant` in the install directory to rebuild.

# Using FiJI

Let's have a look on the *install.xml* file in the install directory of FiJI :

```
<?xml version="1.0" encoding="iso-8859-1"?>

<install jar="/tmp/fiji-0.4.jar"
        logo="lib/logo.gif">
  <text title="FiJI"
        text="This program will install Fiji on\
              your computer. Hit [I>] to continue\
              or [O] to abort installation."/>
  <license file="lib/LICENSE"/>
  <copy dir="tmp"
        property="fiji.home"
        defaults="Windows=c:\Fiji,Unix=/usr/local/fiji">
    <filter file="bin/fiji" from="@HOME@" to="{fiji.home}"/>
    <filter file="bin/fiji.bat" from="@HOME@" to="{fiji.home}"/>
  </copy>
  <link from="{fiji.home}/bin/fiji"
        to="/usr/local/bin"
        mandatory="no"/>
  <append file="c:\autoexec.bat"
        line="set PATH=%PATH%;{fiji.home}\bin"
        os="Windows"
        mandatory="no"/>
  <text title="Congratulation !"
        text="FiJI have been installed succesfully.\
              Hit [O] to terminate this program."/>
</install>
```

This XML file is a script for the installation. Each element is a screen of the installer:

1. The first screen (*text* element) shows a welcome message. This message is written in the *text* attribute of this element.
2. Then the user must agree the license (in the *license* element). The path to the license file is in the *file* attribute.
3. The third screen (*copy* element) asks for an installation directory and copies files in that directory.
4. Then, if the user is running a Unix box, it will be prompt for a destination directory (in his *PATH*) for a link to the script launching the application.
5. If the user is installing the program on Windows, the next screen will append a line to his *autoexec.bat* file (to put the *bin* directory in the *PATH*).
6. The program ends the installation with another message that informs the user that the installation was successful.

As you can see, this script is quite simple and easy to code (few minutes when you know the syntax of these elements). To produce the installation Jar file, simply go the directory of the script and type *fiji*. You can indicate the location of the script on the command line and specify a verbosity argument (*-v*). Type *fiji -help* for a short help on the command line arguments.

To run the installer, the user will have to go to the directory where he saved the Jar file, and type :  
`java -jar archive-name.jar`, or double click it (on Windows or Solaris).

## FiJI Tasks

The elements of the install file are tasks (except for the root element and filters). The root element, *install* can accept two attributes :

```
<install jar="../../fiji-0.3.jar"
        logo="lib/logo.gif">
...
</install>
```

The first one, *jar* names the produced Jar installer. The second gives the URL of the logo (the picture on the left of the frame). This attribute is not mandatory (no image is displayed if this attribute is missing).

You can customize the installer interface with the *theme* element (that comes just after *install* one). It may have up to six attributes (*primary1*, *primary2*, *primary3*, *secondary1*, *secondary2* and *secondary3*) that define a hexadecimal coded color. Those six colors define a theme for Swing (Metal look & feel), as defined [on this page](#). For instance, the following element defines the theme for the FiJI installer:

```
<theme primary2="6eb2ce"
        primary3="d5fedc"/>
```

In order the install script to be fully portable, the paths must be written in the URL notation (Unix paths). Just replace under Windows the antislash with slash. Thus, you would write *foo/bar.txt* instead of *foo\bar.txt*. Furthermore, relative paths are relative to the directory of the *install.xml* script.

Each screen of the installer is processed by a specific task. Those tasks are :

### Text

This task shows a simple text (in the *text* attribute) with a title (in the *title* attribute). For instance:

```
<text title="FiJI"
      text="This program will install Fiji on\
          your computer. Hit [>] to continue\
          or [O] to abort installation."/>
```

Produces the screen:



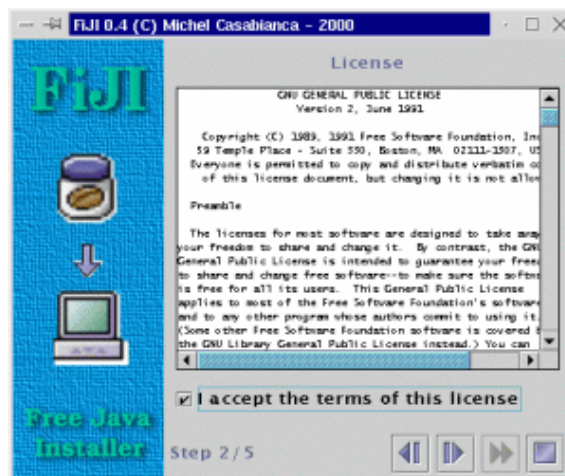
This is the first screen of the installer for FiJI itself. Those two attributes are mandatory. A new line is indicated with an antislash.

## License

This task displays a license for agreement. The user must agree (by clicking on the message *I accept the terms of this License*) this license or abort installation. For instance:

```
<license file="lib/LICENSE"/>
```

Displays the screen:



This element displays the license in the text file *LICENSE* in the *lib* subdirectory (all paths are relative to the directory of the *install.xml* script, except for absolute ones, starting with "/").

## Copy

This task installs the content of a directory (the one of the application to install) in a directory chosen by the user. This directory is zipped when the archive is being built.

```

<copy dir="tmp"
      property="fiji.home"
      defaults="Windows=c:\Fiji,Unix=/usr/local/fiji">
  <filter file="bin/fiji" from="@HOME@"
        to="\${fiji.home}"/>
  <filter file="bin/fiji.bat" from="@HOME@"
        to="\${fiji.home}"/>
</copy>

```

Displays the following screen:



The *dir* attribute indicates the source directory to copy. *property* gives to the program the property name for the installation directory. You can use this property in other tasks. For instance, the attribute *to* of the element *filter* is `\${fiji.home}`, so it will be replaced with the installation directory. The last attribute, *defaults* indicates a list of default install dirs with their targeted platform.

The *filter* elements can be nested within *copy* ones. They are usefull to filter some given files. For instance, the element :

```

<filter file="bin/fiji" from="@HOME@"
      to="\${fiji.home}"/>

```

Will filter the file *bin/fiji* (of the directory, *after* installation), replacing the string `@HOME@` with `\${fiji.home}`, which is the installation directory (which name is given by the *property* attribute of the *copy* element). Thus, the following script:

```

#!/bin/sh
java -jar @HOME@/fiji.jar -v "$@"

```

Will be replaced (after the filter applies) by:

```

#!/bin/sh
java -jar /usr/local/fiji/fiji.jar -v "$@"

```

On the user's hard disk, if he chose `/usr/local/fiji` as installation directory (the default install dir for Unix).

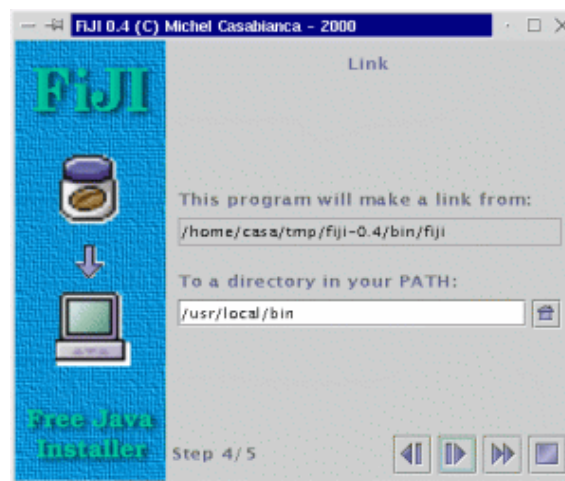
When the user clicks on the [>] button, the files will be copied and the progress bar shows the progression.

## Link

This task is specific to Unix systems (and won't be processed on other systems). Let's consider the following element:

```
<link from="${fiji.home}/bin/fiji" to="/usr/local/bin"/>
```

It will display the screen:



This task will perform two things :

1. It will make the file `\${fiji.home}/bin/fiji` (the launching script) runnable (with `chmod a+rx \${fiji.home}/bin/fiji`).
2. It will make a symlink from this file to the directory the user chose (the default value is `/usr/local/bin`), that is supposed to be in the *PATH* of the user, with `ln -sf \${fiji.home}/bin/fiji /usr/local/bin`.

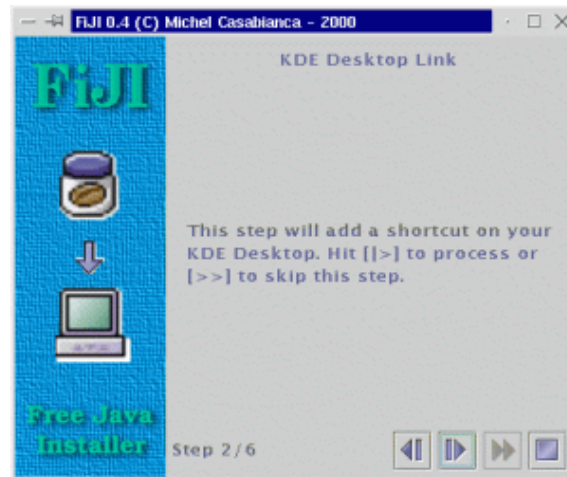
The user can now type `fiji` on the command line to launch FiJI.

## KDE Desktop

This task is for Unix systems running the KDE window manager (and will not be processed on other systems). Let's consider the following element:

```
<kdeDesktop exec="fiji"
icon="\${fiji.home}/prj/fiji/lib/fiji.gif"
term="1"/>
```

It will display the screen:



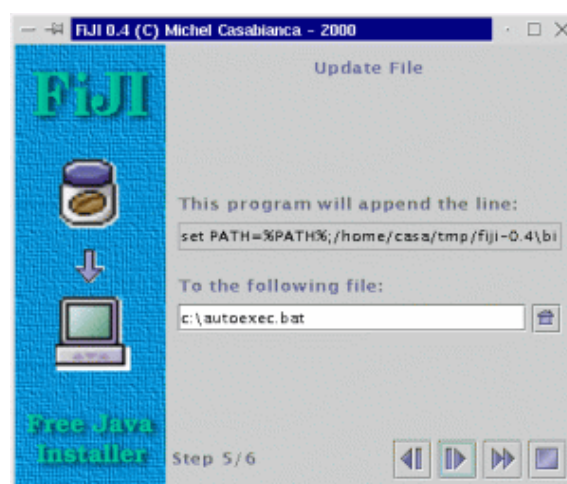
This task prompts for adding an icon on the desktop of the user to launch the application. The *exec* attribute indicates the command line to launch the application. *icon* is the path to the icon file (on the system where the program have been installed). *term* indicates if the program must be launched in a terminal (*1* value) or not (*0* value).

## File update

This task append a line to a given file. It is useful to update a configuration file (such as *autoexec.bat* or */etc/profile*). The corresponding element is:

```
<append file="c:\autoexec.bat"
        line="set PATH=%PATH%;${fiji.home}\bin"
        os="Windows"/>
```

This element will display the following screen:



This task displays the line (in the attribute *line*) to append to a file which default name is in *file* attribute. The *os* attribute indicates the target OS.

## Common attributes for all tasks

All tasks accept the following attributes:

- **mandatory** (*yes* or *no* values) indicates if this task is mandatory (any task defaults to mandatory). If it is not, the user can click on the [ >> ] button to skip this task. If a task is mandatory, this button is disabled.
- **title** gives the title for the task (see the *text* task for more details).
- **text** is the same than *title* but for the text of the task. For the *license* task, it indicates the text to accept the license. The *link* tasks can take a second text for the second line of the screen. This text is set with the *text2* attribute.
- **error** is used to set the error text for some tasks that may display some. This is the case for *license* task (if the user did not accept the license) and *kdeDesktop* (error when creating the shortcut). Some tasks can have two error messages: *copy* (error creating the installation directory and copying files) and *link* (error changing mode and making the link). The second error message is set using the *error2* attribute.

Those attributes make it possible to customize the interface but also to translate the installer.

## How it works

To explain the principles of this program, we must consider two stages : the generation of the Jar installer and the extraction performed by the installer.

The builder generates the installer (that is a Jar file) this way :

1. The xml builder (class *casa.fiji.builder.XmlBuilder*) reads the XML file (*install.xml*) and builds an object tree while processing elements. It uses reflection (and doesn't know anything about the generated objects). When it encounters a *foo* element, it instanciates a *Foo* object. When it encounters a *bar* attribute, it calls a method named *setBar()* with the value of the attribute on the parent element. When an element *bar* is nested within an element *foo*, it calls a method *add* on the object *Foo* with *Bar* as argument.
2. The main class of the builder (*casa.fiji.builder.Main*) collects the resources needed by the classes involved in the installer and put them in the Jar file (that will be the installer itself).
3. Then the *casa.fiji.installer.Install* class (the main class of the installer, generated by the XML builder) is serialized and placed in the Jar installer. It contains references to the other classes of the installer, that are this way serialized too.

This method is a simple way to configure the classes of the installer. Their configuration is performed by the XML builder by calling their methods *setFoo()*. Furthermore, this methods is light : the serialized classes weight less than 1000 compressed bytes, that is far less than the weight of the XML file itself (and if I used an XML parser to configure the installer, I would have to carry the parser in the archive).

I have been told that there could be problems between versions of serialized classes, but I had no problems during my tests (with 1.1, 1.2 and 1.3 virtual machines).

The second stage (extraction of the archive) works this way :



1. When you launch the Jar file, the *main()* method of the main class of the installer (*casa.fiji.installer.Install*) is called. This class deserializes itself, obtaining the serialized data in the Jar file. The object tree of the installer is then rebuilt.
2. This class selects the appropriate tasks (calling the methods *isValid()* of each task in the stack). A task can be valid for a given OS or if a given directory exists for instance.
3. Then the installer calls the *init()* and *done()* method of the tasks as the user view them.
4. A task performs its work in the *done()* method that is called by the installer when the user clicks the [>] button. If it does something quick (that doesn't cause CPU starvation), it return *true*, indicating to the installer that the work is done. If a task takes a long time (such as copying many files), it returns *false*. When the work is done, it calls the method *update()* of the installer to indicate that the work is done.

This text is a rapid overview of the builder and the installer, dig the code for more details (without comments, sorry ;o).

## How to develop new tasks for FiJI

FiJI is an extensible system: it is possible to develop new tasks to meet your specific needs. I will take as example the `Link` task that makes a link (for Unix systems) from a script to a directory in the *PATH*.

### XML element

To make such a link, you must know the source file and target directory. Thus, the element for this task will be the following:

```
<link from="${fiji.home}/bin/fiji" to="/usr/local/bin"/>
```

The *link* element gives the name of the class to develop (`Link` with an uppercase in order to follow the Java naming conventions). The *from* attribute gives the name of the source file while *to* indicates the target directory for the link.

### Initialisation de l'installeur

When the FiJI XML parser encounters such an element, it tries to instantiate the `Link` class, the invokes the `setFrom()` and `setTo()` methods on it. The FiJI task system is extensible because the program knows nothing about the tasks it builds, but uses reflexion instead. Thus, it is not necessary to modify FiJI's source code to add new tasks.

Furthermore, your class must extend the abstract class `casa.fiji.installer.Task` in order to be a valid task. It must also live in the `casa.fiji.installer` package.

To finish about tasks, I have to talk about the resources and classes to add in the installer file. Because this file must contain all the necessary classes and resources to run, you must indicate those in the *install.xml* file.

Task classes are automatically added (using reflexion) by the Task class: it adds the class for the task and the GUI (which name is the one of the class plus *UI*, so if the class for the task is called *Link*, the class for the GUI is called *LinkUI*) in the list of files to add in the archive. If your code uses another class, it must do so using the `addClass()` method in its constructor and passing the list of qualified class names (with package) to this method. In our example, adding new classes in the archive is not necessary, so we don't have to call this method.

If your task uses resources (such as an icon file), you declare it invoking the `addResources()` method, passing the list of files as argument. Note that the GUI reference is marked *transient* because this GUI must not be serialized (as it is dangerous and useless to serialize this object).

You know enough now to understand the first part of the class Task that is following:

```
/*
 * This program is free software; you can redistribute it and/or
 * modify it under the terms of the GNU General Public License
 * as published by the Free Software Foundation; either version 2
 * of the License, or any later version.
 *
 * This program is distributed in the hope that it will be useful,
 * but WITHOUT ANY WARRANTY; without even the implied warranty of
 * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
 * GNU General Public License for more details.
 *
 * You should have received a copy of the GNU General Public License
 * along with this program; if not, write to the Free Software
 * Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA.
 */

package casa.fiji.installer;

import casa.fiji.util.Misc;
import java.awt.*;
import javax.swing.*;
import java.io.*;
import java.util.*;

/**
 * The link task. It creates a link from a script (or executable) to a
 * directory in the PATH. For Unix systems only.
 */
public class Link extends Task {

    /**
     * The from part of the link.
     */
    String from=null;

    /**
     * The from part of the link, expanded.
     */
    String fromExpanded=null;

    /**
     * The to part of the link.
     */
    String to=null;
}
```

```

/**
 * The to part of the link, expanded.
 */
String toExpanded=null;
/**
 * The reference to the GUI.
 */
transient LinkUI ui=null;
/**
 * The resources used by this task.
 */
static final String[] resources={"lib/home.gif"};

/**
 * Constructor. Adds resources to the jar installer.
 */
public Link() {
    super();
    addResources(resources);
}

/**
 *Sets the from part of the link.
 */
public void setFrom(String from) {this.from=from;}

/**
 * Sets the to part of the link.
 */
public void setTo(String to) {this.to=to;}

```

This first part is called when the installer archive is built (to initialize the `Link` task). All the tasks rely in a `Vector` in the `casa.fiji.install.Install` class (that is the main class of the installer). This object (and other tasks it contains) is serialized in the installer file. When running the installer, this object is deserialized and launched, which launches the install procedure.

## Installer initialization

We will now study the part of the code running at installation time.

First, that installer must know if the task is to be runned on the host sytem (some tasks run only on given systems and/or configurations). To do so, it calls the `isValid()` method that returns a boolean. In our task, we simply return *true* if the system is Unix.

Then, the installer must retrieve the task's GUI. It is done by calling the `getUI()` method. Our method simply instantiates a `LinkUI` object and returns it.

Those methods are called during installer initialization. The following ones are called when the task is processed:

The `init()` method is called when the task's GUI is shown. It evaluates the *from* and *to* expressions, that is, it replaces property references with their value. For instance, it will replace

\\${fiji.home}/bin/fiji with /usr/local/fiji/bin/fiji if the installation directory is /usr/local/fiji. Note that the expanded values are stored in fields suffixed with *Expanded* in order another evaluation to remain possible if the user come back to a previous task.

When the user clicks on the [>] button (to call the next task), the installer calls the `next()` method of the current task. This method returns *true* if everything is OK and *false* if something went wrong during the operation. In this case, the next task is not shown.

Here is the code for this part of the task:

```
/**
 * Indicates if the system running the installer should run this task.
 * That is if it is a Unix like system.
 */
public boolean isValid() {
    return isUnix();
}

/**
 * Returns the GUI for this task.
 */
public Component getUI() {
    ui=new LinkUI(this);
    return ui;
}

/**
 * Init is called when the task is shown in the installer. It expands
 * the from and to parts of the link (evaluating expressions).
 */
public void init() {
    fromExpanded=Misc.expand(from);
    toExpanded=Misc.expand(to);
    ui.setFrom(fromExpanded);
    ui.setTo(toExpanded);
}

/**
 * Creates the link (when the user clicks on the next button).
 */
public boolean next() {
    // build the chmod command
    toExpanded=ui.getTo();
    String command="chmod a+x "+fromExpanded;
    String error=Misc.execute(command);
    // if error, display an error message
    if(error!=null) {
        JOptionPane.showMessageDialog(ui,
            "Unable to change the mode:\n"+command+"\n"+error,
            "Error",JOptionPane.ERROR_MESSAGE);
        return false;
    }
    // build the ln command
    command="ln -sf "+fromExpanded+" "+toExpanded;
    error=Misc.execute(command);
    // if error, display an error message
```

```

        if(error!=null) {
            JOptionPane.showMessageDialog(ui,
                "Unable to make the link:\n"+command+'\n'+error,
                "Error",JOptionPane.ERROR_MESSAGE);
            return false;
        }
        return true;
    }
}

```

## Graphic Interface

We must code a GUI for our task. This interface is implemented in the `LinkUI` class which source code is:

```

/*
 * This program is free software; you can redistribute it and/or
 * modify it under the terms of the GNU General Public License
 * as published by the Free Software Foundation; either version 2
 * of the License, or any later version.
 *
 * This program is distributed in the hope that it will be useful,
 * but WITHOUT ANY WARRANTY; without even the implied warranty of
 * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
 * GNU General Public License for more details.
 *
 * You should have received a copy of the GNU General Public License
 * along with this program; if not, write to the Free Software
 * Foundation, Inc., 59 Temple Place - Suite 330, Boston, MA 02111-1307, USA.
 */

package casa.fiji.installer;

import casa.fiji.util.Misc;
import java.io.*;
import java.awt.*;
import java.awt.event.*;
import javax.swing.*;

/**
 * The GUI for the link task.
 */
public class LinkUI extends JPanel implements ActionListener {

    /**
     * The refernce to the task.
     */
    Link link=null;

    /**
     * The text field for the directory.
     */
    JTextField field=new JTextField();

    /**
     * The label for the from part of the link.
     */
}

```

```

JTextField label=new JTextField();
/**
 * Home button.
 */
JButton buttonHome=new JButton(new
    ImageIcon(ClassLoader.getResource("lib/home.gif")));

/**
 * The constructor. GUI initialization.
 */
public LinkUI(Link link) {
    this.link=link;
    ui();
}

/**
 * GUI initialization.
 */
void ui() {
    setLayout(new GridBagLayout());
    Misc.add(this,new JLabel("Link"), 0, 0, 2, 1, 0.0, 0.0,
        GridBagConstraints.NORTH, GridBagConstraints.NONE,
        new Insets(10, 10, 10, 10));
    Misc.add(this,new JLabel("This program will make a link from:"),
        0, 1, 2, 1, 0.0, 1.0,GridBagConstraints.SOUTHWEST,
        GridBagConstraints.NONE,new Insets(10, 10, 5, 10));
    Misc.add(this,label, 0, 2, 2, 1, 1.0, 0.0,
        GridBagConstraints.SOUTHWEST, GridBagConstraints.HORIZONTAL,
        new Insets(0, 10, 10, 10));
    Misc.add(this,new JLabel("to a directory in your PATH:"),
        0, 3, 2, 1, 0.0, 0.0,GridBagConstraints.NORTHWEST,
        GridBagConstraints.NONE,new Insets(10, 10, 5, 10));
    Misc.add(this,field, 0, 4, 1, 1, 1.0, 1.0,
        GridBagConstraints.NORTHWEST, GridBagConstraints.HORIZONTAL,
        new Insets(0, 10, 10, 5));
    Misc.add(this,buttonHome, 1, 4, 1, 1, 0.0, 1.0,
        GridBagConstraints.NORTHEAST, GridBagConstraints.NONE,
        new Insets(0, 0, 10, 10));
    buttonHome.addActionListener(this);
    buttonHome.setMargin(new Insets(0,0,0,0));
    label.setEditable(false);
}

/**
 * User actions processing.
 */
public void actionPerformed(ActionEvent e) {
    if(e.getSource()==buttonHome) {
        JFileChooser chooser=new
            JFileChooser(System.getProperty("user.home"));
        chooser.setDialogType(JFileChooser.OPEN_DIALOG|
            JFileChooser.DIRECTORIES_ONLY);
        int returnVal=chooser.showOpenDialog(this);
        File dir=chooser.getCurrentDirectory();
        if(dir.isDirectory()) field.setText(dir.getAbsolutePath());
    }
}

```

```

    /**
     * Sets the to part of the link.
     */
    public void setTo(String to) {field.setText(to);}

    /**
     * Returns the to part of the link.
     */
    public String getTo() {return field.getText();}

    /**
     * Sets the from part of the link.
     */
    public void setFrom(String from) {label.setText(from);}
}

```

This class is quite obvious except that it must extend (directly or not) `JPanel`. Note that it uses the `add()` method of `casa.fiji.util.Misc` class that adds a component to a `GridBagLayout`. Please don't code graphic interfaces using absolute coordinates for components (your code would not be portable).

To use a task in FiJI, you must put the classes in the *CLASSPATH* to use it.

I hope this overview is sufficient to start coding tasks. I think the best way to do so is to modify the example source code. Please feel free to contact me for any question.

## Tasks License

This program is under GPL, so any task should have the same license. Anyway, you might use this installer to distribute a program under any license (including commercial ones).

## Ant task

To use this task in a build file, you must drop the archive *fiji.jar* in the *lib* directory of your Ant installation.

## Description

Using this task, you can generate FiJI installers from within an Ant build file.

The declarative element (after the *<project>* one) is the following:

```
<taskdef name="fiji" classname="net.cafebabe.fiji.builder.FijiTask"/>
```

## Parameters

Attribute	Description	Required
-----------	-------------	----------

Attribute	Description	Required
file	Installer definition file.	Yes
verbose	If <i>true</i> , messages are printed during installer generation.	No (defaults to <i>no</i> )

## Nested elements

This task accepts no nested element or text.

## Examples

To generate an installer which definition file is *fiji/install.xml* in verbose mode, you might write :

```
<fiji file="fiji/install.xml"
      verbose="true"/>
```

## License

This software is free and released under the [GPL](#). You can find a copy of this license in the file *LICENSE* in the installation directory.

## History

### Version 1.0-1 (2003-01-12)

This version fixes a bug when loading XML configuration file (with a message "String index out of range: 1"). Many thanks to Daphné Costantini for this bug report. Also fixes a bug in the installer of the application.

### Version 1.0 (2002-11-16)

- New Ant task to generate FiJI installers.
- New package name (`net.cafebabe.fiji`).

### Version 0.4 (2000-12-31)

- New *title*, *text* and *mandatory* for all elements.
- New *append* task that enable to update a configuration file.
- The [`>>`] button (to skip a task) and the task counter have been added to the interface.
- The installer interface may be customized using theme.

### Version 0.3 (2000-12-27)

- This version have been heavily tested on Windows.



- Error management have been improved (exception stack traces have been replaced with clear messages, for instance, the program clearly indicates that it doesn't find the configuration file).
- Some attribute names have been changed for clarity. The attribute `src` of the element *copy* have been renamed to *dir*, *prop* have been renamed to *property*. The *target* attribute of the *filter* element have been renamed *file*.
- The `Task` interface have been simplified (the `done()` method, quite tricky to implement, have been replaced by `next()` much simpler). Task writing should be much easier.
- The source code is commented and API docs rely in the *api* subdirectory of the docs.
- UML diagrams rely in the *uml* subdirectory.

## Version 0.2 (2000-06-11)

- The documentation have been translated in French.
- A bug in the launching script for Windows have been corrected (thanks to Romain Guy).
- A bug related to Windows platform detection have been corrected.
- The jar file for the Sun's XML parser have been included.

## Version 0.1 (2000-06-07)

- The entire architecture have been improved.
- First fully fonctionnal version.
- First distributed version.

## Version 0.0 (2000-06-01)

- Demo version to validate the concept.

*Enjoy !*