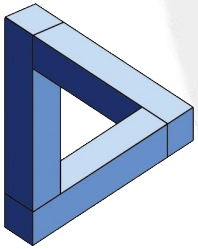
Writing Really Rad GTK+ & GNOME Applications in C, Python or Java

Andrew Cowie
Operational Dynamics



Davyd Madeley
Fugro Seismic Imaging

Who Are We?

Andrew Cowie

spends an awful lot of time programming for someone who is actually a suit. He started with C in the early 80s, picked up Java in 1997, and now, 10 years later, is the maintainer of the **java-gnome** project.

Davyd Madeley

has been programming for a long time. He now works as a software engineer, writing GTK applications for geophysical analysis. Previously he was the **gnome-applets** maintainer. He plays the tenor saxophone.

An Overview

- Why choose GTK+ for your application?
- GTK+ Fundamentals
  - Building a UI
  - Box packing
  - The main loop & signals
- Getting started (in C)
- Window tricks (in Java)
- Complex data models (in Python)

Why Would You Choose GTK+?

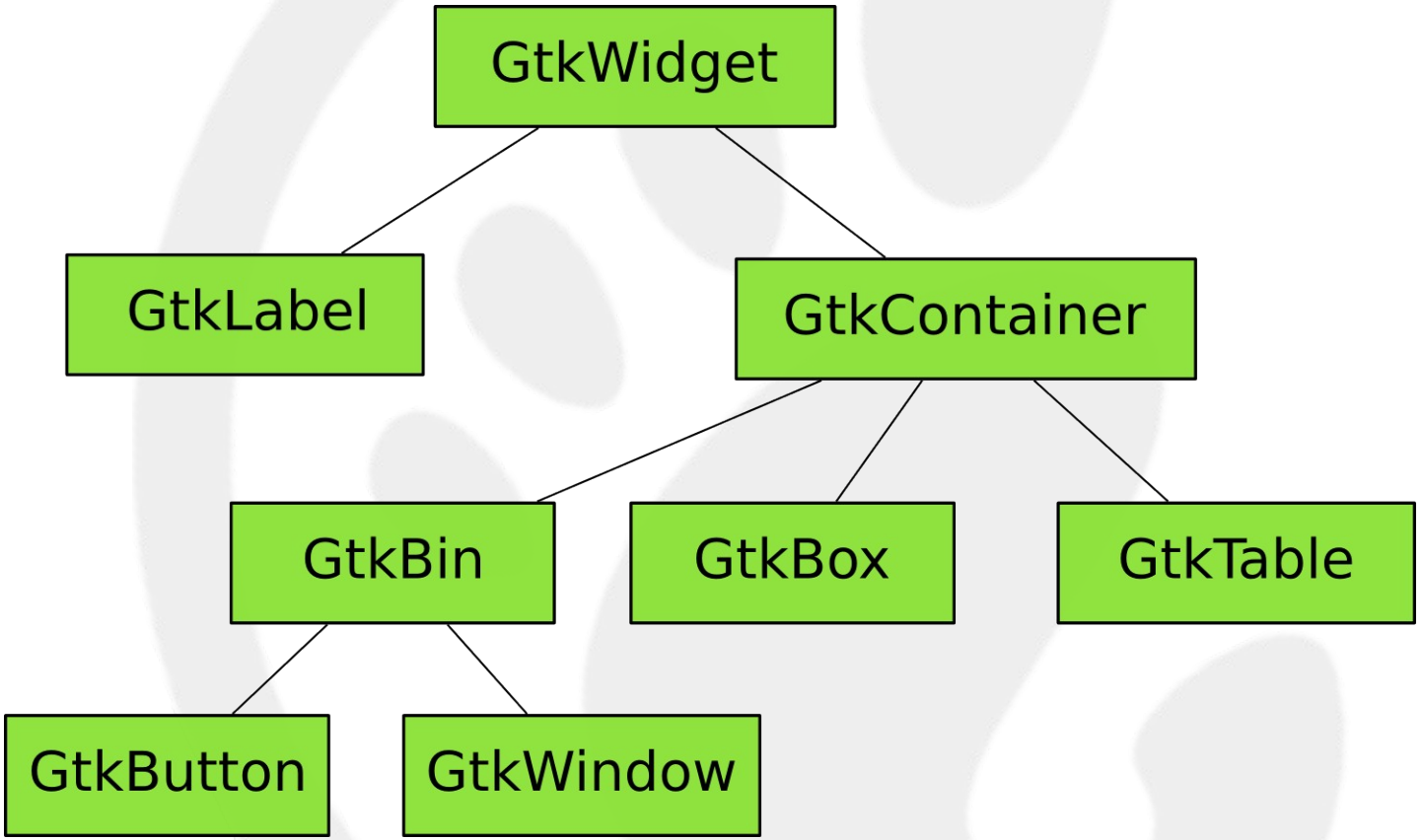
- Fast, flexible, ubiquitous
- Multi-platform
  - **Linux**, Unix, Mac OS, Win32, and more
- Many languages
  - **C**, **Python** and **Java**
  - Perl, C++, Ruby, Haskell, C#, PHP, OCml, Eiffel, Erlang, Guile/Scheme/Lisp, Lua, Octave, D, TCL, Smalltalk, and more!
- LGPL

A Word on Versions

- Today we're using the following:
  - gcc 4.1.x
  - GTK+ 2.12.x
  - Python 2.5
  - pyGTK 2.10
  - Sun Java 1.5 (& Free Java too!)
  - Eclipse 3.3.x
  - java-gnome 4.0.6rc1
  - Glade 3.4.x

Widgets 'n stuff

- all displayed items are a **`GtkWidget`**; all interfaces are built down from a “top level”, inevitably **`GtkWindow`**



Building a UI

- You can write code ...
  - Programmatically create elaborate custom content, dynamic layouts, and smaller Widgets

C Demo!

A
GtkWindow
with a
GtkButton
in it!

Compiling

```
gcc -o demo \
`pkg-config --cflags --libs \
 gtk+-2.0` demo.c
```

Building a UI

- You can write code ...
  - Programmatically create elaborate custom content, dynamic layouts, and smaller Widgets
- or use Glade ...
  - Great for big, complex windows with lots of Layout

C Demo!

A
`GtkWindow`
with a
`GtkButton`
with Glade!

Building a UI

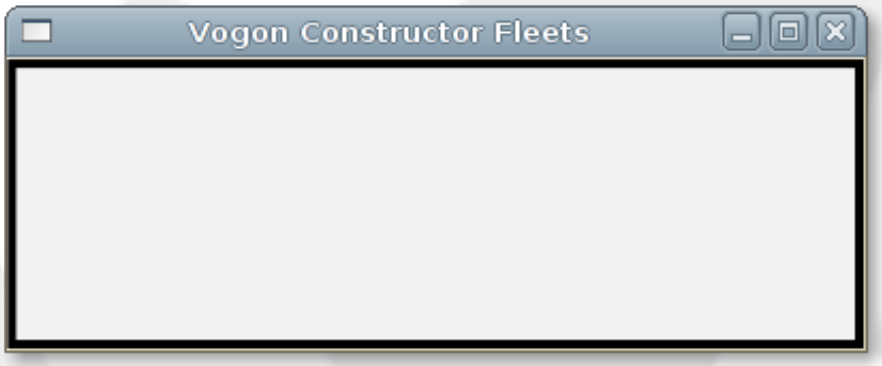
- You can write code ...
  - Programmatically create elaborate custom content, dynamic layouts, and smaller Widgets
- or use Glade ...
  - Great for big, complex windows with lots of Layout
- or do both simultaneously!
  - No point using Glade if coding it directly is less lines of code
  - Use Glade for most of Window (ie, Labels) and code for the dynamically generated bits

Box Packing

GTK+ uses a “box packing” model.

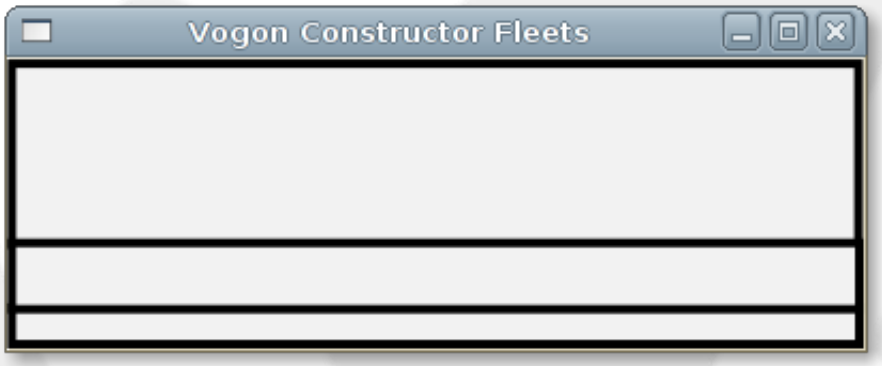
Box Packing

- Start with a **`GtkWindow`**



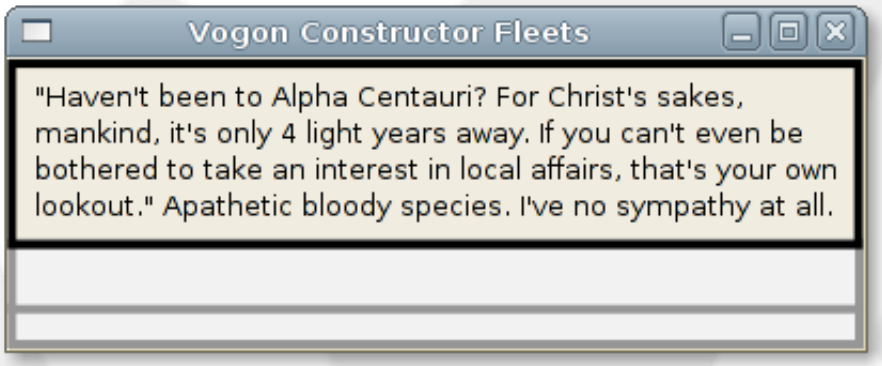
Box Packing

- Start with a **`GtkWindow`**
- Pack a **`GtkVBox`** into the Window



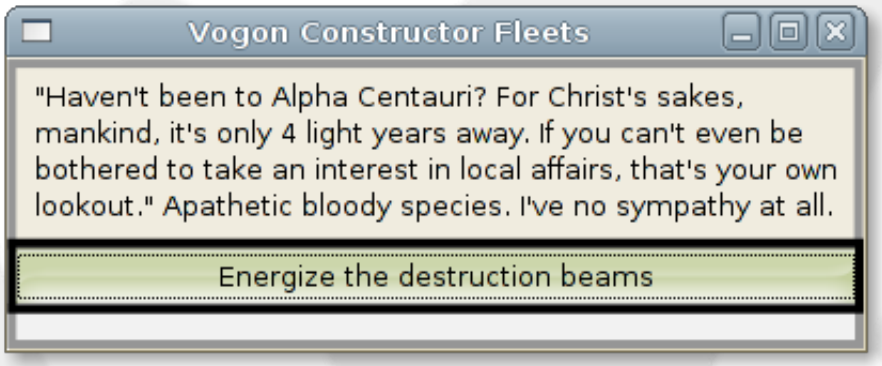
Box Packing

- Start with a **GtkWindow**
- Pack a **GtkVBox** into the Window
- Pack a **GtkLabel** into the VBox



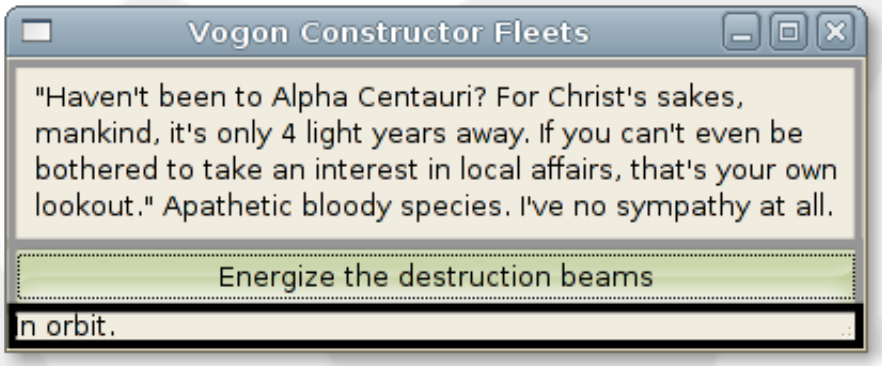
Box Packing

- Start with a **GtkWindow**
- Pack a **GtkVBox** into the Window
- Pack a **GtkLabel** into the VBox
- Pack a **GtkButton** into the VBox



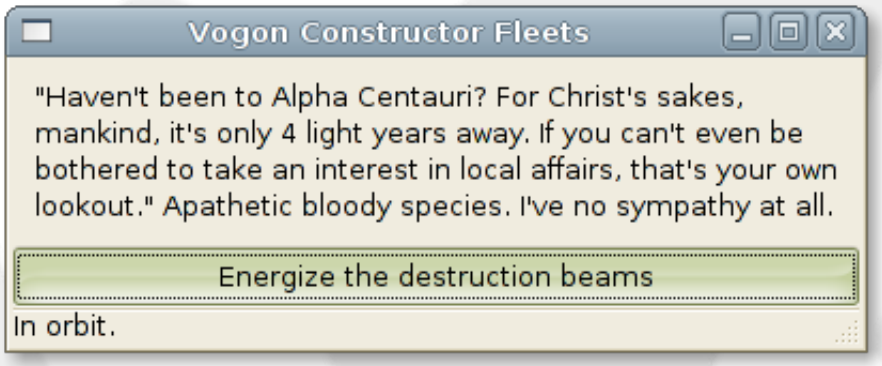
Box Packing

- Start with a **GtkWindow**
- Pack a **GtkVBox** into the Window
- Pack a **GtkLabel** into the VBox
- Pack a **GtkButton** into the VBox
- Pack a **GtkStatusbar** into the VBox



Box Packing

- Start with a **GtkWindow**
- Pack a **GtkVBox** into the Window
- Pack a **GtkLabel** into the VBox
- Pack a **GtkButton** into the VBox
- Pack a **GtkStatusbar** into the VBox



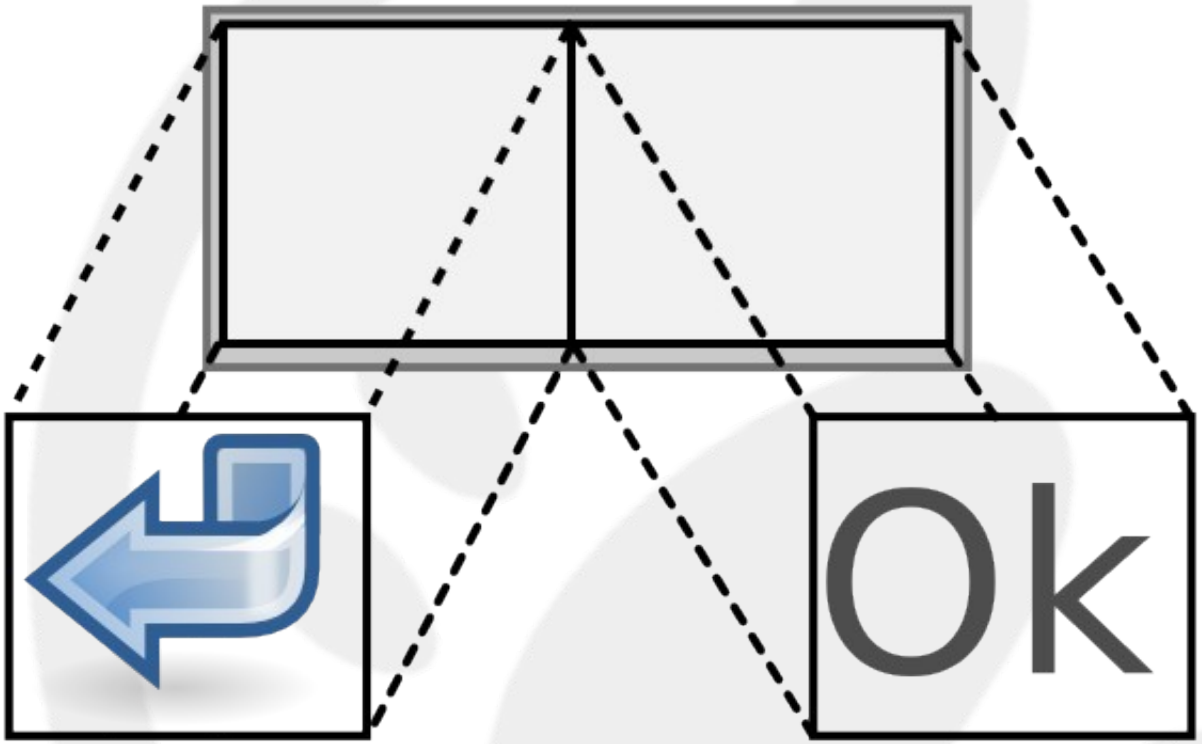
Button an atomic element, right?

GtkButton

Button is a composite Widget too!

GtkHBox

Button an atomic element, right?



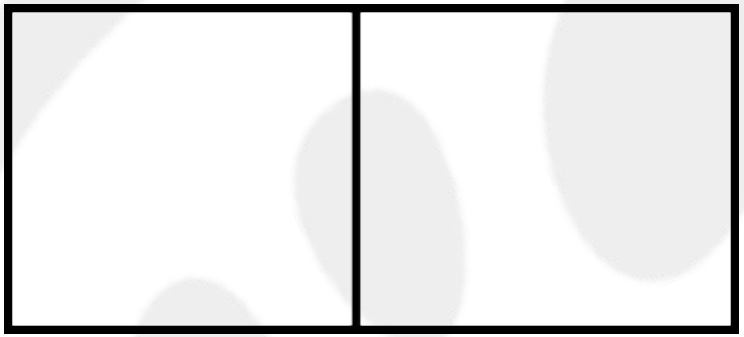
Or go the other way. Your icon,

`GtkImage`

...some text...

GtkLabel

a Container to hold them



GtkHBox

pack 'em in

GtkImage **GtkLabel**

and you've got your Widget

MyCustomButton

Glade Demo!

Using
Glade
to do complex
Box packing
layouts

Packing Containers

- **GtkVBox** – vertical packing
- **GtkHBox** – horizontal packing
- **GtkTable** – rows and columns
- **GtkHButtonBox** – Buttons horizontally
- **GtkAlignment** – fine grained layout control.

Also,

- **GtkSizeGroup** – child Widgets share same horizontal/vertical size.

The Main Loop

- GUI programming is ***event driven*** programming
- The main loop polls *sources* for events
- events include user activity (keyboard or mouse), I/O, or a timeout
- events issued as named signals; register callbacks for signals you want to react to

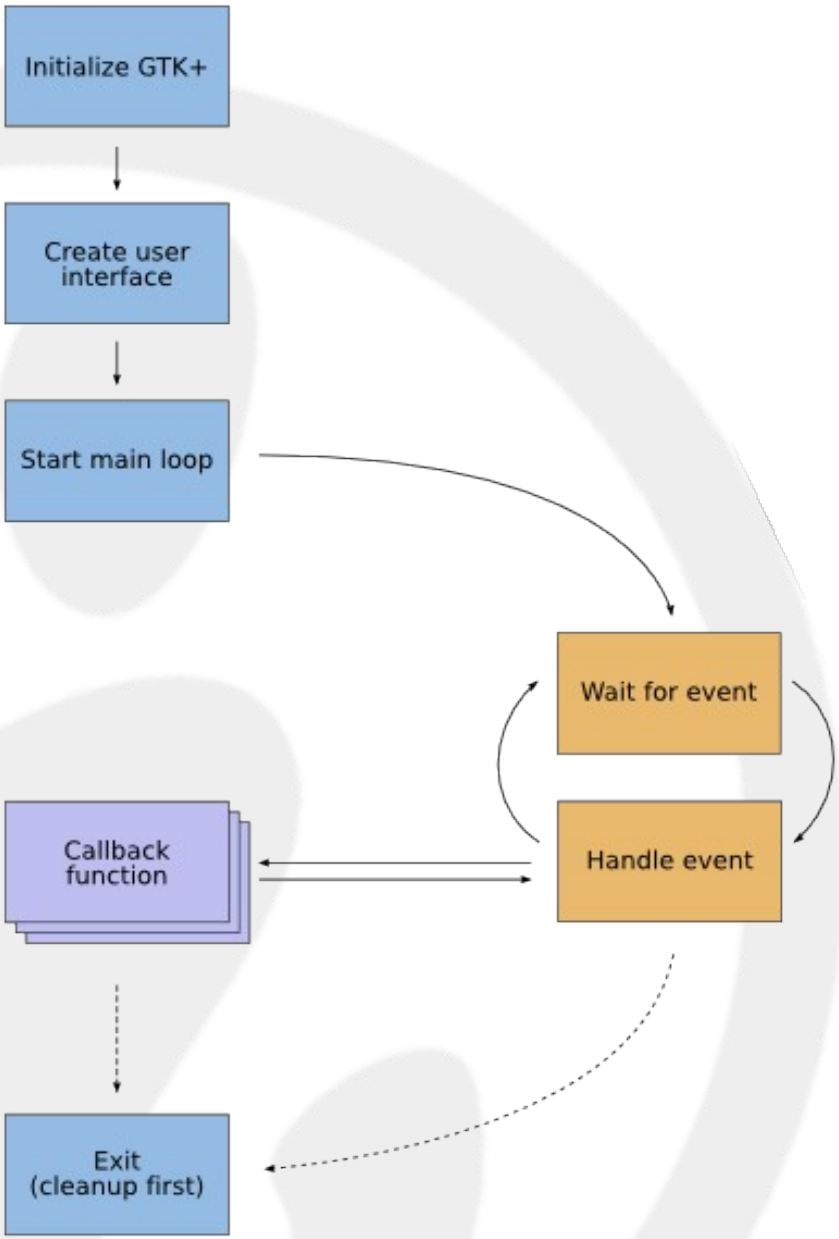
The Main Loop

Callbacks for events are issued from the main loop...

... one at a time

... and it's single threaded!

DON'T BLOCK THE MAIN LOOP!



Signals

- Signals are connected to **`GObject`**s
- Often you pass 4 things:
  - object
  - signal name
  - callback function
  - optional free-form “user data”
- Prototype for each callback in API docs
- Some callbacks return information to GTK+ (eg a **`gboolean`**)

Signals – C

```
g_signal_connect(my_gobject,
                 “notify::parent”,
                 G_CALLBACK(notify_parent_cb),
                 NULL);



void notify_parent_cb(GObject *my_gobject,
                      GParamSpec arg1,
                      gpointer user_data)
{
    ...
}
```

Hooking up a signal

Signals

- Some signals already have handlers registered
  - eg. expose-event
- Some signals are passed up the widget tree from your widget all the way to the toplevel
  - eg. expose-event, enter-notify-event
  - You can choose whether or not to stop these in your signal handler by returning True or False

Java Demo!

Same code, different language: Java

gtk_widget_show_all()

A Widget must be **`show()`**n to be seen

Size request and allocation does not happen until the Widget is mapped.

Closing a Window != Terminating application

Beware the main loop!

GtkFileChooser

Choose a file,
any file

Python Demo!

Same code, different language: Python

GtkTreeView

- Can display trees or lists of data
- Uses an model, view, control (MVC) paradigm
- You need three things:
  - a **GtkTreeView**
  - a **GtkTreeModel**
    (**GtkTreeStore**, **GtkListStore** or write your own)
  - **GtkCellRenderer**s
- You can store more data in a row than you display (handy!)

Python Demo!

See the
`gtk.TreeView` for
the Forrest

Getting More Out of GTK+/GNOME

- GConf – store configuration data
- GNOME-VFS – access data over networks
- Cairo – antialiased vector graphics
- GooCanvas – Cairo based canvas widget
- D-BUS – cross-desktop IPC with GLib tie-in
- Soup – HTTP, XML-RPC and SOAP libraries
- libwnck – Access window information
- libnotify – Popup balloons

GConf

GConf

What GConf is for:

- user preferences and settings

What GConf is **not** for:

- storing application state
- IPC
- general purpose data storage (use a DB)

GConf

- GConf keys are stored in a hierarchy and have a type (e.g. String, Boolean, Integer, List):
  - /apps/nautilus/desktop/computer_icon_visible
  - /desktop/gnome/background/picture_filename
- Don't go creating your own top level directories. Your application's settings go in /apps.
- You can **get** or **set** keys or connect a signal for when they change

A GConf Example

Getting that **GNOME** Style

Design and Usability

- Dialog button order matters!
- Use stock icons whenever possible
- Use default fonts, sizes, and colours; theme is the user's choice, not yours.
- Be consistent with other applications
- Human Interface Guidelines (“the HIG”) just that: *guidelines*

Translation

Translation (i18n/l10n)

- Native language only:

```
g_print(“Hello World”);
```

Translation (i18n/l10n)

- Translatable...

```
g_print(_(“Hello World”));
```

Translation (i18n/l10n)

- fr.po (French Translation)

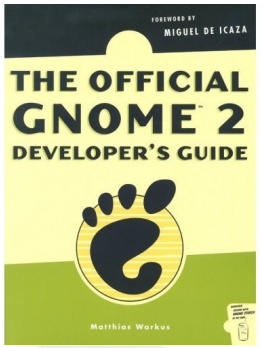
```
# ../src/hello.c:4
msgid “Hello World”
msgstr “Bonjour Monde”
```

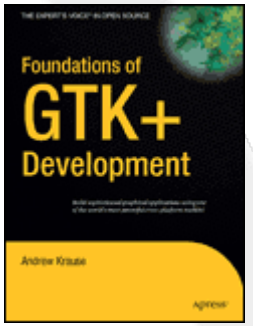
Translation (i18n/l10n)

- Provided via GNU gettext
- Requires some build infrastructure
- GNOME's enthusiastic translation team can help!

Would Ye Like To Know More?

- In C:
  - http://www.gtk.org/tutorial/
  - Matthias Warkus, *The Official GNOME 2 Developer's Guide* (No Starch Press, 2004)
  - Andrew Krause, *Foundations of GTK+ Development* (Apress, 2007)
- In Java:
  - http://java-gnome.sourceforge.net/4.0/doc/
- In Python:
  - http://www.pygtk.org/pygtk2tutorial/index.html





Fin ;)

Questions?

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