Rapid application development with Ruby and Glade

IN THE GLADE

Application development shouldn't be a chore. We'll show you how to simplify the development process with the Ruby programming language and the Glade interface design utility. **BY RYAN PAUL**

For even the most experienced developers, the drudgery of the edit-compile-test cycle can become very oppressive. Fortunately, an assortment of open source tools cuts the fat out of the development process by helping programmers focus on functionality instead of on all the arbitrary implementation details.

With dynamic programming languages and versatile interface design utilities, even relatively inexperienced programmers can build complex applications with little effort. One promising combination of tools is the Ruby language and the Glade interface development system.

The versatile and expressive Ruby language allows developers to make programs that do more with less code. Glade brings in the power of the Gtk toolkit, letting you easily create a graphic user interface for your Ruby application.

In this article, I will take you through all the steps of building an application with Ruby and Glade. You'll watch Ruby and Glade at work while we create an example screenshot application called Screenshooter.

katikatta, photocase.com

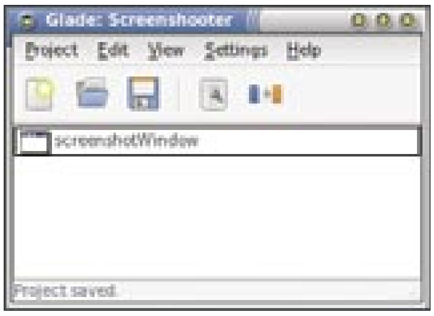


Figure 1: The project window lists all of the top-level windows and dialogs included in the current Glade project.

Ruby's concise and expressive object-oriented syntax is highly conducive to rapid development. Well-written Ruby programs are easy to read, understand, and maintain. A wide variety of useful programming libraries are available for Ruby, so Ruby is often used to tie together functionality from disparate external sources. Ruby's scalability provides a graceful glide path that makes it easy for simple command-line scripts to evolve into graphical utilities with menus, toolbars, and text boxes.

Glade is an interface development system based on the Gtk toolkit. The Glade development system consists of an interface construction program and a set of programming libraries that facilitate interface loading and manipulation.

The Glade interface builder, which supports rapid point-and-click user interface design, produces simple XML interface description files. Developers use the Glade programming libraries to parse the XML files and automatically generate Gtk interfaces in memory at run time. The program can then display and manipulate these interfaces as if they were manually coded with Gtk.

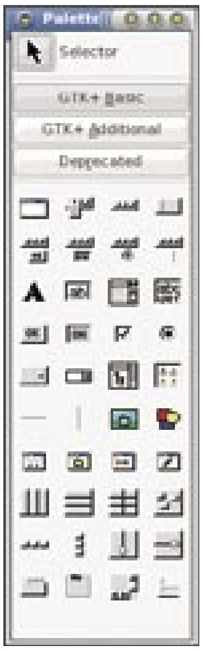


Figure 2: The Palette window provides access to all of the widgets and components that you can include in Glade projects.

Glade provides several unique advantages over other interface design tools. Because Glade uses runtime loading instead of code generation, it is language-neutral, which means that individual Glade files can be used with any programming language for which Glade library bindings are available. Runtime loading also makes testing less time intensive, since one doesn't need to perform any additional processing steps between modifying an interface and running the program in which it is used.

Getting Started with Glade

The Glade builder utility comprises four floating windows. The project window lists the forms associated with the current project, the Palette window provides access to all of the Gtk widgets and controls accessible in Glade, the Properties window displays various widget attributes, and the widget tree window displays a nested hierarchy of all controls used in the current project. When Glade starts, all of the windows are either empty or disabled until a project is created.

To start a new project, select *New* from the Project menu in the project window (Figure 1). When starting a new project, users must choose between Gtk and Gnome. Although Gnome projects have access to a broader selection of widgets, Gtk projects are more portable and have fewer dependencies. For this tutorial, create a Gtk project.

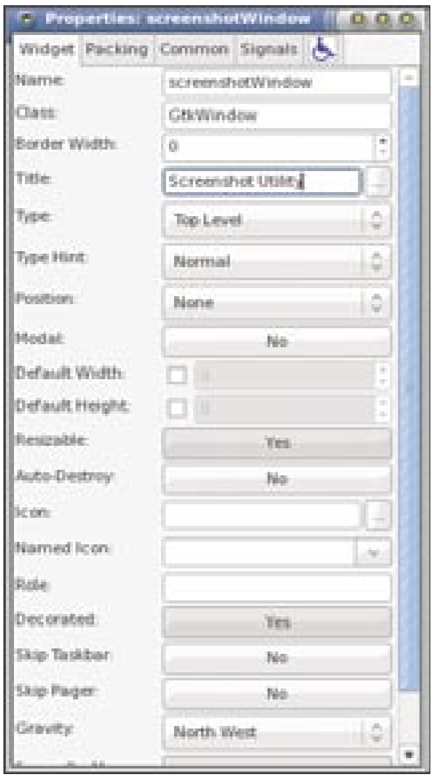
After you create a new project, the Palette window will become accessible. The Palette window (Figure 2) includes category and widget buttons. Each category contains a number of widgets that can be included in Glade programs. The user can switch between categories by clicking the category buttons. The Basic category includes a variety of widgets that are commonly used in simple applications. The Additional category contains widgets that are a bit more obscure, but still frequently used. The Deprecated category includes widgets that are no longer supported but are still occasionally used by legacy applications. To select a widget, click one of the widget icon buttons in any category.

Creating the Layout

To build our sample screenshot tool, we will start by designing the interface with Glade, and then we will use Ruby to associate actions with program events.

To create a window for the screenshot utility, select the window widget from the Basic category on the palette. The window widget button, which has an icon that looks like a window, is the first widget button in the Basic category. When you click the window widget button, a new window will appear immediately and the Properties window (Figure 3) will display the new window's attributes. The new window, which will be called Window1 by default, will be listed automatically in the project window and widget tree. When new Glade windows are created, they are drawn with a crosshatch background to indicate that they are empty.

The first item in the properties window is the widget name. Ruby programs that load Glade user interfaces can access and manipulate individual widgets within the user interface by referring to widget names. As a result, it is important to specify meaningful names for widgets that the program will need to manipulate. To change the value of the Name property, simply type a new name into the Name property text box. For the screenshot utility, set the window Name property to *screenshotWindow*. The Title



Name:	screenshotWindow
Class:	GtkWindow
Border Width:	0
Title:	Screenshot Utility
Type:	Top Level
Type Hint:	Normal
Position:	None
Modal:	No
Default Width:	☐ 0
Default Height:	☐ 0
Resizable:	Yes
Auto-Destroy:	No
Icon:	
Named Icon:	
Role:	
Decorated:	Yes
Skip Taskbar:	No
Skip Pager:	No
Gravity:	North West

Figure 3: The Properties window allows developers to customize widget attributes.

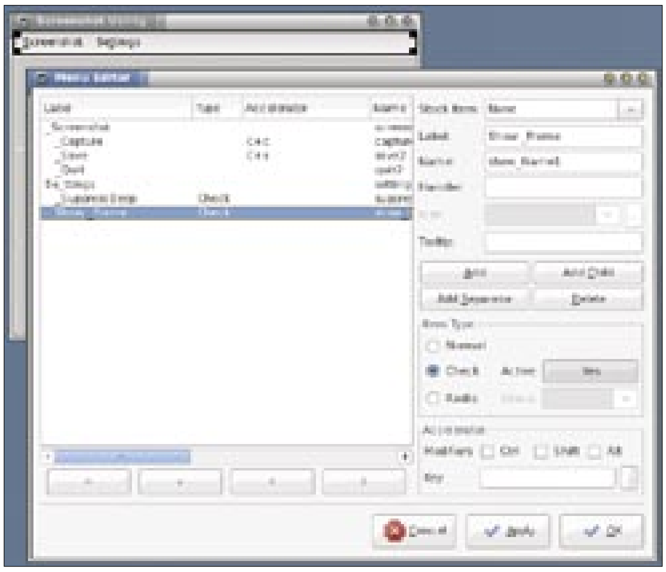


Figure 4: The menu editor allows developers to customize application menus.

property is used to specify the text that will appear in the title bar of a window. For this example, change the value of the Title property to *Screenshot Utility*. Although many other window properties are available, in this article, I will only describe the properties that are relevant for the sample application. Users can get additional information about other widget properties by referring to the Gtk documentation.

In Gtk applications, widgets are stacked in nestable vertical, horizontal, and grid boxes. This approach to layout is referred to as the box model. To determine what kind of boxes should be used, one must first consider the structure of the application's user interface. The screenshot utility has a menubar, a toolbar, a file selection widget, and a preview pane. The widgets will be stacked vertically, and the preview pane will have to grow when the user resizes the window. To accommodate that layout, the screenshot utility will use a vertical box with four rows.

To add a vertical box to the window, select the vertical box widget from the Basic category of the Glade palette. The vertical box button, which has an icon with three stacked rectangles, is in the bottom half of the Basic palette. After you click the vertical box button, click anywhere inside the empty screenshot utility window. A dialog will appear to ask how many rows Glade should include in the box. Increase the number to four, since the screenshot utility will have four major widgets.

After you add the vertical box, the blank space in the screenshot utility window will be partitioned into four separate rectangles, and the widget tree window list will include the vertical box. When you add the vertical box to the window, the Properties dialog will change to show the properties of the new box widget. Vertical boxes have fewer properties than windows.

To add or remove rows from the vertical box, you can use the Size property, and to set the amount of blank space that the application should render between each row, you can use the Spacing property. To modify the properties of the window again, select the window in the widget tree. You can use the widget tree to select and manipulate any widget in the current program.

Creating the Menubar

The menubar belongs in the first row of the vertical box. Select the menubar widget from the Basic category of the Glade palette. The menubar widget button is the second one in the first row of the Basic category, right after the window widget button. Next, click inside the top row of the vertical box. A default menubar will appear, with File, Edit, View, and Help menus. You will have to modify the menus to serve the needs of the screenshot utility program, so right-click the menubar and select *Edit Menus* from the right-click context menu to open up the Menu Editor (Figure 4). The left side of the Menu Editor is dominated by the menu item tree, which lists all of the menus and menu items on the active menubar. The right side of the Menu Editor shows the properties of the selected menu item and provides buttons for adding and removing menu items.

Before you can add the proper menu items, you have to delete the current ones. Select the very first item in the menu item tree and then hold down the Delete key on the keyboard or click the *Delete* button until all the menu items are gone. Now click the *Add* button to create a new menu. When the new menu item is added, it will be selected by default and its properties will be configurable with the controls on the right side of the Menu Editor.

You can use the Label property to set the text that will be visible on the menu to the user. The first item on our menubar will be the Screenshot menu, so type *Screenshot* into the Label text box. In many programs, each menu item has one underlined letter to indicate what the user can press in conjunction with the Alt key to activate the menu item. Gtk handles that keyboard functionality automatically, and you can use an underscore in widget labels to specify which key Gtk should be associated with the menu item. Type an underscore right before the *S* in *Screenshot* to make it so that users can hold the Alt key and hit *S* to activate the Screenshot menu. Gtk always uses the letter that immediately follows the underscore for keyboard menu selection.

To bind a function to the menu selection event, you can use the Handler property of menu items. The value of the Handler property is the name of the method that the application will invoke in the source code when the user selects the menu item. Because Settings is a menu and not a menu item, the Handler property should be empty. Delete the

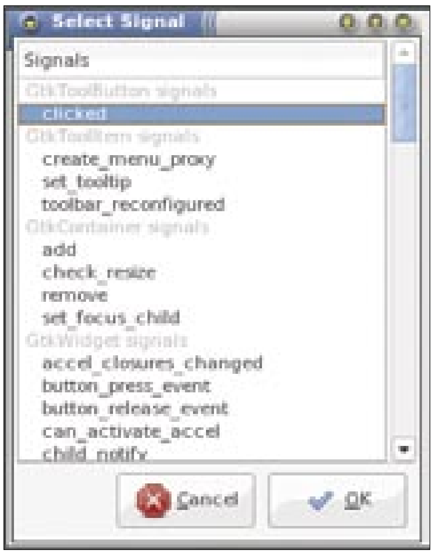


Figure 5: The signal selection dialog is used to select an event signal to bind to a handler.

text in the Handler text box for the Image menu.

Next, we will add menu items to the Screenshot menu. Select the Screenshot item in the menu item tree and then click *Add Child* to add a new menu item. This new menu item will enable users to initiate the screenshot capture. Set the value of the Label property to *_Capture* and set the Handler to *on_capture*. When you write the source code for the screenshot utility, you will implement the *on_capture* instance method to perform the actual screenshot capture. Because users will probably use the capture feature frequently, it should have an accelerator. Accelerators are the keyboard shortcuts used to activate menu items. Select *Capture* in the menu item tree and click the *Ctrl* checkbox in the Accelerator property group in the bottom right corner of the Menu Editor. Then, type the letter *c* in the Key text box.

Now click the *Add* button to add the next menu item. This menu item will allow the user to save the captured screen image. Next, set the value of the Label property to *_Save*, the value of the Handler property to *on_save*, and the accelerator to *Ctrl + s*. To make the save icon appear on the menu item, select *gtk-save* for the Icon property value. The last item on the Screenshot menu will allow the user to quit the program. Click the *Add* button, set the label to *_Quit*, the Handler to *on_quit*, and the icon to *gtk-quit*.

The screenshot utility will also have a Settings menu. Click the *Add* button to add a new menu item. If you click the *Add* button while the Quit menu item is selected in the menu item tree, Glade will add the new item after Quit on the Screenshot menu. To make the new item a top-level menu rather than an item on the Screenshot menu, click the left arrow button below the menu item tree. Keep in mind that *Add Child* will add a new submenu to the selected item, whereas *Add* will create a new item at the current level. Now set the Label to *Se_ttings* and clear the Handler value. The items on the Settings menu will allow the user to configure the behavior of the program. Instead of using handlers, the Settings menu items will have checkboxes that the user can toggle. The state of those checkboxes will be used at run time to determine how the program operates.

To add the first Settings menu item, click the *Add Child* button. This menu item will allow the user to configure whether or not the program should beep after it successfully completes a screen capture. Set the label to *_Suppress Beep* and clear the handler.

To make this menu item a checkbox, select *Check* in the Item Type property group. To make the program suppress the beep by default, set the Active toggle property to *Yes*. Because the program will access the value of the checkbox at run time, the Suppress Beep menu item needs to have a meaningful value for the Name property. Set the Name property of the Suppress Beep menu item to *checkSuppressBeep*.

To create another menu item that will allow the user to configure whether screen captures of single windows should include window borders, click the *Add* button, set the Label to *Show _Frame*, and clear the handler. To ensure that screen captures will include window borders by default, set the Item Type to *Check* and make sure that the value of the Active property is *Yes*. Then, set the value of the Name property to *checkShowFrame*. When you finish creating the menus, click *OK*.

Creating the Toolbar

Now it is time to add a toolbar to the vertical box. Select the toolbar widget from the Basic category of the palette. It can be found to the right of the menu widget button. Now click inside of the second partition of the vertical box, right below the menu. Glade will display a dialog box that asks how many items you want to include on the toolbar. Our toolbar will have three buttons that perform the same operations as the items on the Screenshot menu, so set the value to *3* and click *OK*. When the toolbar is added, it will contain three empty boxes with the same crosshatch background as the empty portions of the vertical box. Many Gtk widgets that can be placed in a window can also be placed in a toolbar, but in this case, we will use toolbar buttons, so select the toolbar button widget from the Basic category of the Palette window. It's the first icon on the second row of the palette, right below the window widget icon. Now click the first empty slot in the toolbar to create a new toolbar button. Repeat this process two more times to fill in the rest of the empty slots.

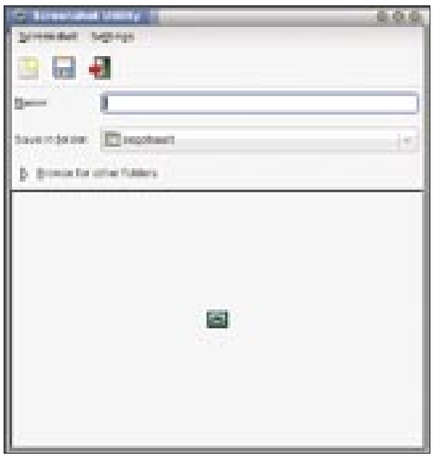


Figure 6: The completed screenshot utility interface is ready for inclusion in a Ruby program.

Next we have to set the proper attributes for the new toolbar buttons. Click the first toolbar button in the screenshot utility window and then select the *Widget* tab of the Properties window. This button will perform the capture function. Set the value of the Label property to *Capture* and then select an icon for the Icon property. I used the gtk-new icon because I couldn't find one that seemed more relevant. Now you have to associate that button with the capture method. With the first toolbar button selected in the screenshot utility window, select the *Signals* tab.

In Gtk, signals are messages that are emitted when an event transpires. In this case, we want the program to call the *on_capture* method when the user clicks the toolbar button, so we have to hook the button's click event. To open up the signal selection dialog, click the small button to the right of the Signal text box (Figure 5). The signal selection dialog lists all of the signals that can be emitted by the selected widget, including signals inherited from other widgets. Select the *clicked* signal and click the *OK* button. The signal name now appears in the Signal property text box. Because the *Capture* button will do the same thing as the Capture menu item, they should both trigger the same handler: the *on_capture* method. Set the Handler property value to *on_capture* and then click the *Add* button in the Properties window.

Select the second toolbar button in the screenshot utility window. Because this button is associated with the save function, which is commonly used, you can use Gtk's stock button feature instead of manually setting the label and icon.

Select *Save* from the Stock Button property combo box in the Properties dialog. Now click the *Signal* tab and associate the on_save handler with the clicked signal. To enable the last button to allow users to quit the program, set its *Stock Button* property value to *Quit* and then associate the on_quit handler with its *clicked* signal.

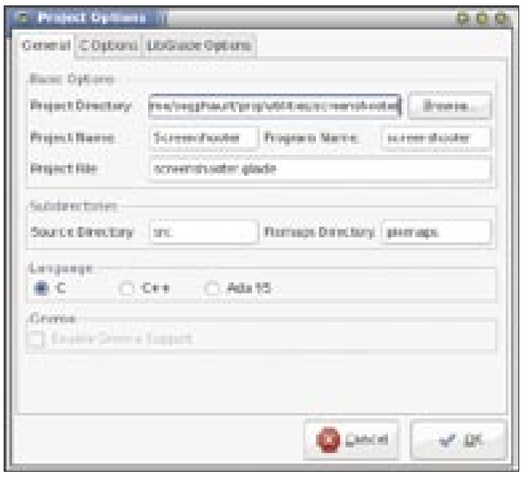
Adding the File Chooser

The menubar and toolbar are now finished and the user interface for the screenshot utility is almost complete. The user needs a way to specify what file name to use when a screenshot is saved. The program could use a conventional save dialog, but I think it's more convenient to integrate the save feature directly into the application window in this case. Select the file chooser widget from the Additional category of the Palette window. The file chooser widget icon is a folder inside of a white box, and it is positioned at the far left of the third row from the bottom of the Additional category. After you select the file chooser widget, click the first of the two remaining empty spaces in the screenshot utility window. The file chooser's target file will have to be accessed in the *on_save* method, so the file chooser widget will need a name that you can remember. Set its name to *fileChooser*. By default, the new file chooser widget behaves like the Gtk dialog used to open a file. To make it behave like a Save dialog, change the value of the Action property to *Save*.

The Local Only property indicates whether or not the file chooser widget will be able to access remote locations. I frequently use screenshots to show Linux programs to my friends, so I want to be able to save my screenshots directly to my web server using the ftp protocol. To make this possible, the screenshot utility will have to leverage Gnome's virtual filesystem layer, which is capable of reading and writing remote files with several protocols, including ftp, SSH, and SMB. Set the value of the file chooser widget's Local Only property to *No* for the ability to navigate to remote locations.

The one thing that annoys me the most about Gnome's built-in screenshot utility is the small preview size. When I preview a screenshot, I want to see more than just a thumbnail, so this custom screenshot utility will include support for full-size previews with scrolling. Some Gtk widgets already include support for scrollbars, but for other widgets, scrollbars have to be added separately with a Gtk viewport widget. In this case, a viewport is required.

To select the viewport widget from the Additional category of the Palette window, click on the first icon on the last line of the Additional category. Now



Basic Options

Project Directory: [illegible]

Project Name: Screenshooter

Program Name: screenshooter

Project File: screenshooter.glade

Subdirectories

Source Directory: src

Pixmaps Directory: pixmaps

Language

[✓ C] C++ Ada 95

Gnome

Enable Gnome Support

Figure 7: The Project Options dialog allows users to choose a target directory and file name for Glade projects.

Listing 1: screenshooter.rb

```
#!/usr/bin/env ruby

# Load the required libraries
require "RMagick"
require "libglade2"
require "gnomevfs"

# Initialize the Gtk toolkit
Gtk.init
# Specify the location of temporary capture
$capture_file = File.join(ENV["HOME"], ".screen_capture.png")
# Specify the location of the glade interface file
$glade_file = File.join(File.dirname(__FILE__), "screenshooter.glade")

def on_quit
  # Quit the program
  Gtk.main_quit
end

def on_capture
  # Capture a screenshot and save it to disk at the location specified by $capture_file
  Magick::Image.capture($glade["checkBeep"].active?, $glade["checkFrame"].active?).write($capture_file)
  # Load the captured screenshot into the image preview pane
  $glade["imagePreview"].file = $capture_file
end

def on_save
  # open the file non-exclusively, in write mode
  f = GnomeVFS::File.new($glade["fileChooser"].uri, 2, false)
  # write the contents of the temporary capture file to target
  f.write(File.open($capture_file).read)
  # close the target file
  f.close
end

# Load the Glade file
$glade = GladeXML.new($glade_file) {|h| method(h)}

# Start the main loop
Gtk.main
```

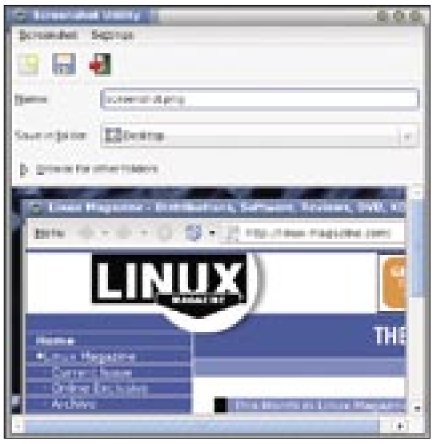


Figure 8: The fully operational screenshot utility is useful despite its simplicity.

click inside of the last empty space at the bottom of the screenshot utility window. Scrollbars will appear on the bottom and right edges of the empty space. By default, scrollbars are always shown. To make it so that the scrollbars only appear when they are needed, set the viewport widget's H Policy and V Policy properties to *Automatic*. Now you have to add the image widget to the viewport by selecting the image widget icon, a small house with green grass and blue sky, from the Basic category of the Palette window. Now click inside of the remaining empty space to place the image widget. The contents of the image widget will be manipulated in the program's source code, so it needs a meaningful name. Set the value of its Name property to *imagePreview*.

To make sure that the program terminates when the user closes the window, you have to associate a handler with the window's destroy event. To do this, select the *screenshotWindow* item in the widget tree, navigate to the Signals tab, and click the button with three dots to the right of the Signal text box. Then, select the *destroy signal* in the Select Signal dialog window, and click the *OK* button. Next, type *on_quit* in the Handler text box and click the *Add* button. Now the program will invoke the *on_quit* method when the user closes the window.

Saving the Glade project

Before you can use the interface in a Ruby script, you must save the Glade project. To save the project, select *Save* from the Project menu of the Glade project window. In the Project Options dialog window (Figure 7), select the directory in which you will store your Glade project and then enter *Screenshooter* into the Project Name text box. Because most of the rest of the options in the Project Options dialog window relate to deprecated code generation features, you can safely ignore them and click the *OK* button to save your project. Glade will generate a *.glade* file, which contains the XML data for the user interface. Glade will also generate a *.gladep* file, which stores other project information.

From Interface to App

To transform the Glade interface file into a fully functional Ruby application, you must create a simple Ruby script that loads the Glade file, displays the window, and associates various interface events with application functionality.

Start by creating a file called *screenshooter.rb* in your favorite text editor (Listing 1). Save the file in the same directory as the *screenshooter.glade* file. The script starts with a shebang (#!)

Advertisement

line, which specifies which interpreter the system should use to run the program. After the shebang line, the script uses the require keyword to load the Ruby libraries employed by the script. In this case, we will use the RMagick library to capture the screenshot, the libglade2 library to handle the Glade user interface file, and the gnomevfs library to provide support for network transparent file access. After loading libglade2, the script has to initialize the underlying Gtk infrastructure, which is done with the *Gtk.init*.

When the program captures a screenshot, it will have to store the image file in a temporary location. For the sake of convenience, I save the file in the user's home directory as *.screen_capture.png*. After initializing Gtk, the script assigns the path of the temporary storage location to the *$capture_file* variable, done with the *File.join* method and the *HOME* environment variable. The *File.join* method uses the proper directory separator ("/" on a Linux system) to combine file and directory paths. *ENV["HOME"]* provides the full path of the user's home directory. When I run the program on my computer, the value of the *$capture_file* variable is */home/segphault/.screen_capture.png*.

After assigning the proper value to the *$capture_file* variable, the program has to specify the location of the Glade user interface file. The *File.join* method is used again, this time with the *File.dirname* method and the name of the Glade file (*screenshooter.glade*).

Methods

Now we have to implement the *on_quit*, *on_capture*, and *on_save* methods. These methods must be defined before the *GladeXML.new* invocation, which binds those methods to signals.

The *on_quit* method contains only one method call, *Gtk.main_quit*, which terminates Gtk's main loop and ends the program. If we wanted to make the program pop up a dialog box to request clarification before exiting, we could do so here. This method is called when the program's window is closed, when the *Quit* toolbar button is pressed, or when *Quit* is selected from the utility's Screenshot menu.

The *on_capture* method is a bit more complex. The first line of the method uses the *Magick::Image.capture* method to capture the screenshot and then uses the *write* method to save the screenshot to the temporary file described in the *$capture_file* variable.

The second line loads the captured screenshot into the utility's image preview pane. The *Image.capture* method of the Magick module receives two parameters, which specify whether or not the program should beep after taking the picture and whether or not the frame of a selected window should be included in a screenshot.

To determine whether the checkboxes on the Settings menu are checked, we have to retrieve those widgets from the Glade object stored in the *$glade* variable and then use the *active?* method to determine the state of the checkbox.

To retrieve a widget from a Glade object, you can use square brackets. For example, to retrieve the checkFrame checkbox, you would use *$glade ["checkFrame"]*. In the *on_capture* method, I also call the *active?* method on the checkFrame widget after I retrieve it from the Glade object: *$glade ["checkFrame"].active?*. I do this for both the *checkFrame* setting and the *checkBeep* setting and provide the returned values, booleans, to the *Image.capture* method as parameters.

The last line of the *on_capture* method retrieves the imagePreview widget from the Glade object stored in *$glade* and then associates its file property with the file name stored in the *$capture_file* variable.

The *on_save* method saves the captured image to a location specified by the user with the integrated file chooser widget. It also uses the Gnome virtual filesystem layer to provide support for network transparent file access, which enables users to save files to remote locations with several protocols, including ftp and SMB.

The *GnomeVFS::File.new* method opens a file at the specified location for reading or writing. The first parameter sent to the *GnomeVFS::File.new* method is the full path of the file to open, which is taken from the fileChooser widget's URI property. The second parameter determines whether the file is opened in read mode or write mode. In this case, we use *2*, which indicates write mode.

The third parameter of the *GnomeVFS::File.new* invocation specifies whether or not the program is permitted to overwrite existing files. In this program, I use *false* as the value for the third parameter to indicate that existing files can be overwritten.

The second line in the *on_save* method opens and reads the file described in the *$capture_file* variable and writes it to the new file created by the *GnomeVFS::File.new* invocation. The final line in the *on_save* method closes the new file.

Because we used GnomeVFS rather than Ruby's built-in file methods for saving the image file to the target location, users can save the files to remote servers or other computers on the local network. To take advantage of this functionality, a Gnome user must first connect to a remote location by selecting *Connect to Server* from Gnome's Places menu. If the user mounts a remote location with the *Connect to Server* dialog, it will be accessible in the file chooser component in the screenshot utility.

Listing 2: Running the Utility

```
$ chmod +x screenshooter.rb
$ ./screenshooter.rb
```

Running the Utility

Now that the screenshot utility is complete, it is time to put it to the test. To run the utility, change the permissions of the Ruby script so that it is executable and then run it like a regular shell script (Listing 2). The entire utility, which is only about 20 lines of code, has more functionality than Gnome's built-in screenshot feature. With Ruby and Glade, developers can produce effective applications and utilities with less effort and greater efficiency. Best of all, developing with Ruby and Glade completely obviates the need for compilation. The program can be executed immediately after modification and no other intermediate step is necessary.

Glade comes with several additional widgets that I did not discuss in this article. You can experiment with different tools on the Glade palette to learn more about the capabilities of Glade. You can also refer to the Gnome development documentation to learn more about specific widgets. ■