
Toga Documentation

Release 0.2.9

Russell Keith-Magee

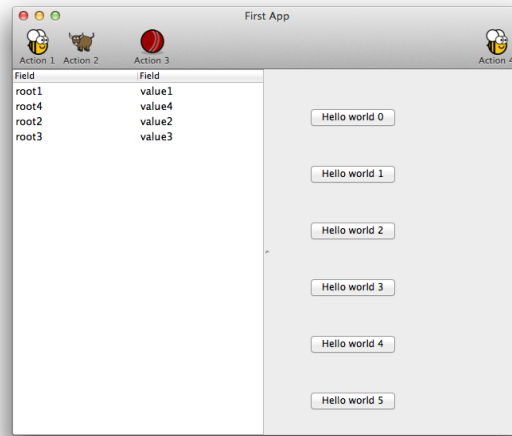
May 15, 2017

Contents

1	Quickstart	3
1.1	Getting Started	3
2	Community	5
3	Contents	7
3.1	Why Toga?	7
3.2	Tutorials	9
3.3	Widget Reference	21
3.4	Toga internals	25

Toga is a Python native, OS native, cross platform GUI toolkit. Toga consists of a library of base components with a shared interface to simplify platform-agnostic GUI development.

Toga is available on Mac OS, Windows, Linux (GTK), and mobile platforms such as Android and iOS.



CHAPTER 1

Quickstart

In your virtualenv, install Toga, and then run it:

```
$ pip install toga-demo
$ toga-demo
```

This will pop up a GUI window showing the full range of widgets available to an application using Toga.

Getting Started

To get started, you can dive into our [Tutorials](#) or check out the widget [Reference](#).

Prerequisites

Toga has some minimum requirements:

- If you're on OS X, you need to be on 10.7 (Lion) or newer.
- If you're on Linux, you need to have GTK+ 3.4 or later. This is the version that ships with Ubuntu 12.04; you'll need to have the `python3-gi` package installed. If you want to use the `WebView` widget, you'll also need to have `WebKit`, plus the GI bindings to `WebKit` (`gir1.2-webkit-3.0`) installed.

If these requirements aren't met, Toga either won't work at all, or won't have full functionality.

CHAPTER 2

Community

Toga is part of the [BeeWare suite](#). You can talk to the community through:

- [@pybeeware](#) on Twitter
- [pybee/general](#) on Gitter

Why Toga?

Toga isn't the world's first widget toolkit - there are dozens of other options. So why build a new one?

Native widgets - not themes

Toga uses native system widgets, not themes. When you see a Toga app running, it doesn't just *look* like a native app - it *is* a native app. Applying an operating system-inspired theme over the top of a generic widget set is an easy way for a developer to achieve a cross-platform goal, but it leaves the end user with the mess.

It's easy to spot apps that have been built using themed widget sets - they're the ones that don't behave quite like any other app. Widgets don't look *quite* right, or there's a menu bar on a window in an OS X app. Themes can get quite close - but there are always telltale signs.

On top of that, native widgets are always faster than a themed generic widget. After all, you're using native system capability that has been tuned and optimized, not a drawing engine that's been layered on top of a generic widget.

Abstract the broad concepts

It's not enough to just look like a native app, though - you need to *feel* like a native app as well.

A "Quit" option under a "File" menu makes sense if you're writing a Windows app - but it's completely out of place if you're on OS X - the Quit option should be under the application menu.

And besides - why did the developer have to code the location of a Quit option anyway? Every app in the world has to have a quit option, so why doesn't the widget toolkit provide a quit option pre-installed, out of the box?

Although Toga uses 100% native system widgets, that doesn't mean Toga is just a wrapper around system widgets. Wherever possible, Toga attempts to abstract the broader concepts underpinning the construction of GUI apps, and build an API for *that*. So - every Toga app has the basic set of menu options you'd expect of every app - Quit, About, and so on - all in the places you'd expect to see them in a native app.

When it comes to widgets, sometimes the abstraction is simple - after all, a button is a button, no matter what platform you're on. But other widgets may not be exposed so literally. What the Toga API aims to expose is a set of mechanisms for achieving UI goals, not a literal widget set.

Python native

Most widget toolkits start their life as a C or C++ layer, which is then wrapped by other languages. As a result, you end up with APIs that taste like C or C++.

Toga has been designed from the ground up to be a Python native widget toolkit. This means the API is able to exploit language level features like generators and context managers in a way that a wrapper around a C library wouldn't be able to (at least, not easily).

This also means supporting Python 3, and 3 only because that's where the future of Python is at.

pip install and nothing more

Toga aims to be no more than a *pip install* away from use. It doesn't require the compilation of C extensions. There's no need to install a binary support library. There's no need to change system paths and environment variables. Just install it, import it, and start writing (or running) code.

Embrace mobile

10 years ago, being a cross-platform widget toolkit meant being available for Windows, OS X and Linux. These days, mobile computing is much more important. But despite this, there aren't many good options for Python programming on mobile platforms, and cross-platform mobile coding is still elusive. Toga aims to correct this.

So... why the name Toga?

We all know the aphorism that “*When in Rome, do as the Romans do.*”

So - what does a well dressed Roman wear? A toga, of course! And what does a well dressed Python app wear? Toga!

So... why the yak mascot?

It's a reflection of the long running joke about *yak shaving* in computer programming. The story originally comes from MIT, and is related to a Ren and Stimpy episode; over the years, the story has evolved, and now goes something like this:

You want to borrow your neighbours hose so you can wash your car. But you remember that last week, you broke their rake, so you need to go to the hardware store to buy a new one. But that means driving to the hardware store, so you have to look for your keys. You eventually find your keys inside a tear in a cushion - but you can't leave the cushion torn, because the dog will destroy the cushion if they find a little tear. The cushion needs a little more stuffing before it can be repaired, but it's a special cushion filled with exotic Tibetan yak hair.

The next thing you know, you're standing on a hillside in Tibet shaving a yak. And all you wanted to do was wash your car.

An easy to use widget toolkit is the yak standing in the way of progress of a number of *PyBee* projects, and the original creator of Toga has been tinkering with various widget toolkits for over 20 years, so the metaphor seemed appropriate.

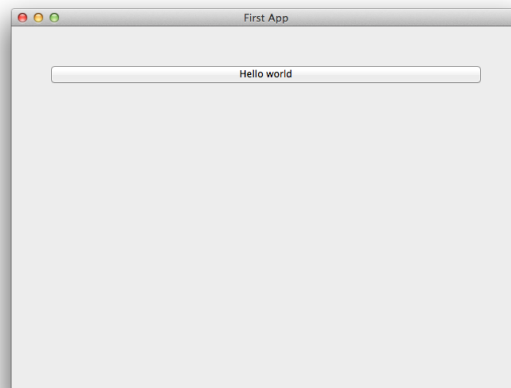
Let's get started!

Enough theory (and bad puns...) - let's get started with your first Toga app!

Tutorials

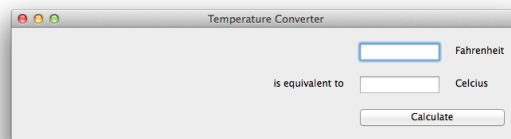
Tutorial 0

In *Your first Toga app*, you will discover how to create a basic app and have a simple `toga.interface.widgets.button.Button` widget to click.



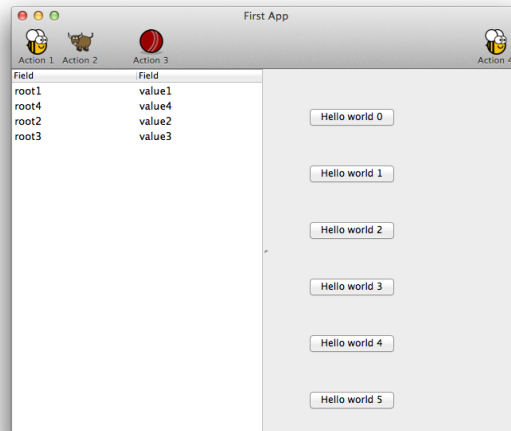
Tutorial 1

In *A slightly less toy example*, you will discover how to capture basic user input using the `toga.interface.widgets.textinput.TextInput` widget and control layout.



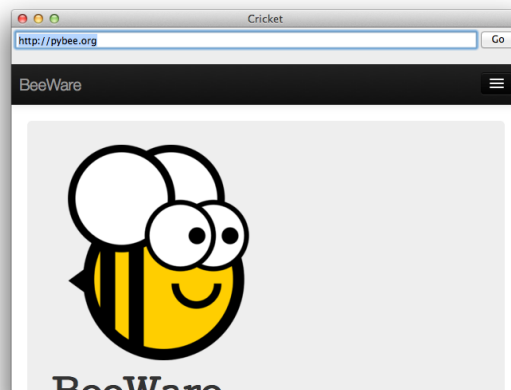
Tutorial 2

In *You put the box inside another box...*, you will discover how to use the `toga.interface.widgets.splitcontainer.SplitContainer` widget to display some components, a toolbar and a table.



Tutorial 3

In *Let's build a browser!*, you will discover how to use the `toga.interface.widgets.webview.WebView` widget to display a simple browser.



Index

Your first Toga app

In this example, we're going to build a desktop app with a single button, that prints to the console when you press the button.

Here's a complete code listing for our "Hello world" app:

```
import toga

def button_handler(widget):
    print("hello")
```

```
def build(app):
    box = toga.Box()

    button = toga.Button('Hello world', on_press=button_handler)
    button.style.set(margin=50)
    box.add(button)

    return box

if __name__ == '__main__':
    app = toga.App('First App', 'org.pybee.helloworld', startup=build)
    app.main_loop()
```

Lets walk through this one line at a time.

The code starts with imports. First, we import toga:

```
import toga
```

Then, we set up a handler - a wrapper around behavior that we want to activate when the button is pressed. A handler is just a function. The function takes the widget that was activated as the first argument; depending on the type of event that is being handled, other arguments may also be provided. In the case of a simple button press, however, there are no extra arguments:

```
def button_handler(widget):
    print("hello")
```

By creating an app, we're declaring that we want to have a main window, with a main menu. However, Toga doesn't know what content we want in that main window. The next step is to define a method that describes the UI that we want our app to have. This method is a callable that accepts an app instance:

```
def build(app):
```

We want to put a button in the window. However, unless we want the button to fill the entire app window, we can't just put the button into the app window. Instead, we need create a box, and put the button in the box.

A box is an object that can be used to hold multiple widgets, and to define padding around widgets. So, we define a box:

```
box = toga.Box()
```

We can then define a button. When we create the button, we can set the button text, and we also set the behavior that we want to invoke when the button is pressed, referencing the handler that we defined earlier:

```
button = toga.Button('Hello world', on_press=button_handler)
```

Now we have to define how the button will appear in the window. Toga uses a CSS-based layout scheme, so we can apply CSS styles to each widget:

```
button.style.set(margin=50)
```

Each widget is a “block” in CSS terms, what we've done here is say that the button with have a margin of 50 pixels on each side. If we wanted to define a margin of 20 pixels on top of the button, we could have defined `margin_top=20`, or we could have specified the `margin=(20, 50, 50, 50)`.

The next step is to add the button to the box:

```
box.add(button)
```

The button will, by default, stretch to the size of the box it is placed in. The outer box is also a block, which will stretch to the size of box it is placed in - which, in our case, is the window itself. The button has a default height, defined by the way that the underlying platform draws buttons). As a result, this means we'll see a single button in the app window that stretches to the width of the screen, but has a 50 pixel margin surrounding it.

Now we've set up the box, we return the outer box that holds all the UI content. This box will be the content of the app's main window:

```
return box
```

Lastly, we get into the main body of the program, where we create the app itself. The app is a high level container representing the executable. The app has a name, and a unique identifier. The identifier is used when registering any app-specific system resources. By convention, the identifier is a "reversed domain name". The app also accepts our callable defining the main window contents:

```
if __name__ == '__main__':  
    app = toga.App('First App', 'org.pybee.helloworld', startup=build)
```

Having created the app, we can start the main app loop. This is a blocking call; it won't return until you quit the main app:

```
app.main_loop()
```

And that's it! Save this script as `helloworld.py`, and you're ready to go.

Running the app

Before you run the app, you'll need to install toga. Although you *can* install toga by just running:

```
$ pip install toga
```

We strongly suggest that you **don't** do this. We'd suggest creating a [virtual environment](#) first, and installing toga in that virtual environment.

Note: Minimum versions

Toga has some minimum requirements:

- If you're on OS X, you need to be on 10.7 (Lion) or newer.
- If you're on Linux, you need to have GTK+ 3.4 or later. This is the version that ships starting with Ubuntu 12.04 and Fedora 17.
- If you want to use the WebView widget, you'll also need to have WebKit, plus the GI bindings to WebKit installed.
 - For Ubuntu that's provided by the `libwebkitgtk-3.0-0` and `gir1.2-webkit-3.0` packages.
 - For Fedora it's all provided in the `webkitgtk3` package.

If these requirements aren't met, Toga either won't work at all, or won't have full functionality.

Note: Problems under Linux

Unfortunately, GTK+3 doesn't provide a pip-installable version of its Python bindings, so if you're using a virtual environment with `--no-site-packages` installed (which is the default), GTK+ won't be in your `PYTHONPATH` inside a virtual environment.

To make the system GTK+ bindings available to your virtualenv, symlink the `gi` module from the system `dist-packages` directory into your virtualenv's `site-packages`.

For a Ubuntu 32bit system (assuming Python 3.5):

```
$ cd $VIRTUAL_ENV/lib/python3.5/site-packages
$ ln -si /usr/lib/python3.5/dist-packages/gi
```

For a Fedora 64bit system (assuming Python 3.5):

```
$ cd $VIRTUAL_ENV/lib/python3.5/site-packages
$ ln -si /usr/lib64/python3.5/site-packages/gi/
```

Once you've got toga installed, you can run your script:

```
$ python -m helloworld
```

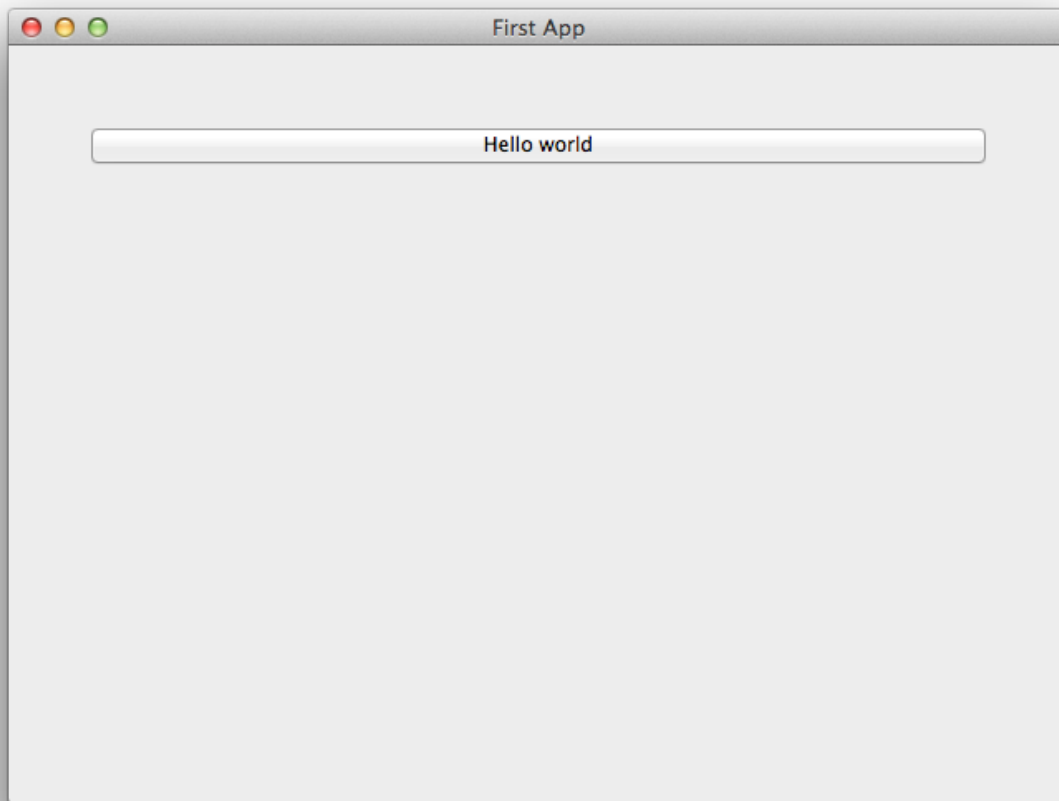
Note: `python -m helloworld` vs `python helloworld.py`

Note the `-m` flag and absence of the `.py` extension in this command line. If you run `python helloworld.py`, you may see some errors like:

```
NotImplementedError: Application does not define open_document()
```

Toga apps must be executed as modules - hence the `-m` flag.

This should pop up a window with a button:



If you click on the button, you should see messages appear in the console. Even though we didn't define anything about menus, the app will have default menu entries to quit the app, and an About page. The keyboard bindings to quit the app, plus the “close” button on the window will also work as expected. The app will have a default Toga icon (a picture of Tiberius the yak).

A slightly less toy example

Most applications require a little more than a button on a page. Lets build a slightly more complex example - a Fahrenheit to Celsius converter:



Here's the source code:

```
import toga

def build(app):
    c_box = toga.Box()
    f_box = toga.Box()
    box = toga.Box()

    c_input = toga.TextInput(readonly=True)
    f_input = toga.TextInput()

    c_label = toga.Label('Celsius', alignment=toga.LEFT_ALIGNED)
    f_label = toga.Label('Fahrenheit', alignment=toga.LEFT_ALIGNED)
    join_label = toga.Label('is equivalent to', alignment=toga.RIGHT_ALIGNED)

    def calculate(widget):
        try:
            c_input.value = (float(f_input.value) - 32.0) * 5.0 / 9.0
        except:
            c_input.value = '???'

    button = toga.Button('Calculate', on_press=calculate)

    f_box.add(f_input)
    f_box.add(f_label)

    c_box.add(join_label)
    c_box.add(c_input)
    c_box.add(c_label)

    box.add(f_box)
    box.add(c_box)
    box.add(button)

    box.style.set(flex_direction='column', padding_top=10)
    f_box.style.set(flex_direction='row', margin=5)
    c_box.style.set(flex_direction='row', margin=5)

    c_input.style.set(flex=1)
    f_input.style.set(flex=1, margin_left=160)
    c_label.style.set(width=100, margin_left=10)
```

```
f_label.style.set(width=100, margin_left=10)
join_label.style.set(width=150, margin_right=10)

button.style.set(margin=15)

return box

def main():
    return toga.App('Temperature Converter', 'org.pybee.f_to_c', startup=build)

if __name__ == '__main__':
    main().main_loop()
```

This example shows off the use of Flexbox in Toga’s CSS styling. Flexbox is a new layout scheme that is part of the CSS3 specification that corrects the problems with the older box layout scheme in CSS2. Flexbox is not yet universally available in all web browsers, but that doesn’t matter for Toga - Toga provides an implementation of the Flexbox layout scheme. [CSS-tricks provides a good tutorial on Flexbox](#) if you’ve never come across it before.

In this example app, we’ve set up an outer box that stacks vertically; inside that box, we’ve put 2 horizontal boxes and a button.

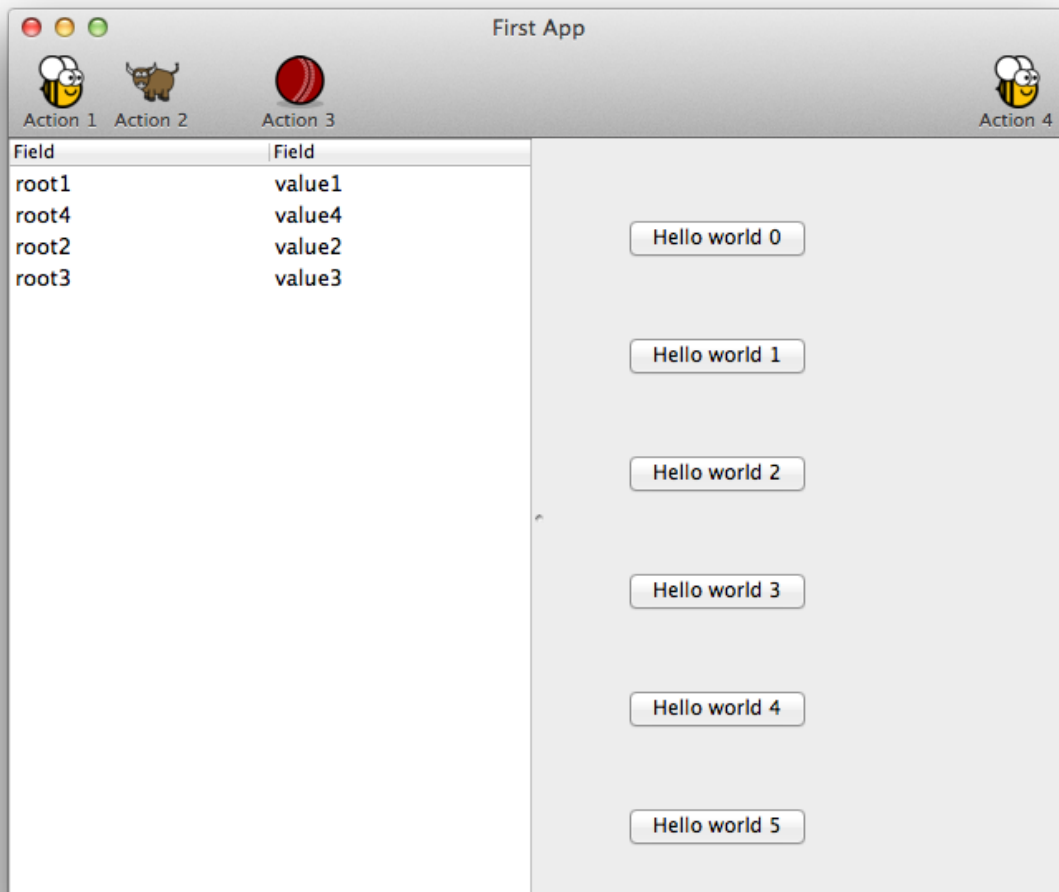
Since there’s no width styling on the horizontal boxes, they’ll try to fit the widgets the contain into the available space. The `TextInput` widgets have a style of `flex=1`, but the `Label` widgets have a fixed width; as a result, the `TextInput` widgets will be stretched to fit the available horizontal space. The margin and padding terms then ensure that the widgets will be aligned vertically and horizontally.

You put the box inside another box...

If you’ve done any GUI programming before, you will know that one of the biggest problems that any widget toolkit solves is how to put widgets on the screen in the right place. Different widget toolkits use different approaches - constraints, packing models, and grid-based models are all common. Toga uses an approach that is new for widget toolkits, but well proven in computing: Cascading Style Sheets, (CSS).

If you’ve done any design for the web, you will have come across CSS before as the mechanism that you use to lay out HTML on a web page. Although this is the reason CSS was developed, CSS itself is a general set of rules for laying out any “boxes” that are structured in a tree-like heirarchy. GUI widgets are an example of one such structure.

To see how this works in practice, lets look at a more complex example, involving layouts, scrollers, and containers inside other containers.:



Here's the source code

```
import toga
from colosseum import CSS

def button_handler(widget):
    print('button handler')
    for i in range(0, 10):
        print("hello", i)
        yield 1
    print("done", i)

def action1(widget):
    print("action 1")

def action2(widget):
    print("action 2")
```

```
def action3(widget):
    print("action 3")

if __name__ == '__main__':

    def build(app):
        left_container = toga.Table(['Hello', 'World'])

        left_container.insert(None, 'root1', 'value1')
        left_container.insert(None, 'root2', 'value2')
        left_container.insert(None, 'root3', 'value3')
        left_container.insert(1, 'root4', 'value4')

        for i in range(0, 100):
            left_container.insert(None, 'root%s' % (i+5), 'value%s' % (i+5))

        right_content = toga.Box(
            style=CSS(flex_direction='column', padding_top=50)
        )

        for b in range(0, 10):
            right_content.add(
                toga.Button(
                    'Hello world %s' % b,
                    on_press=button_handler,
                    style=CSS(width=200, margin=20)
                )
            )

        right_container = toga.ScrollContainer(horizontal=False)

        right_container.content = right_content

        split = toga.SplitContainer()

        split.content = [left_container, right_container]

        cmd1 = toga.Command(
            action1, 'Action 1',
            tooltip='Perform action 1',
            icon='icons/brutus.icns'
        )
        cmd2 = toga.Command(
            action2, 'Action 2',
            tooltip='Perform action 2',
            icon=toga.TIBERIUS_ICON
        )
        cmd3 = toga.Command(
            action3, 'Action 3',
            tooltip='Perform action 3',
            icon='icons/cricket-72.png'
        )

        def action4(widget):
            print("CALLING Action 4")
            cmd3.enabled = not cmd3.enabled
```

```
cmd4 = toga.Command(
    action4, 'Action 4',
    tooltip='Perform action 4',
    icon='icons/brutus.icns'
)

app.main_window.toolbar = [
    cmd1, toga.SEPARATOR, cmd2, toga.SPACER, cmd3,
    toga.EXPANDING_SPACER,
    cmd4
]

return split

app = toga.App('First App', 'org.pybee.helloworld', startup=build)

app.main_loop()
```

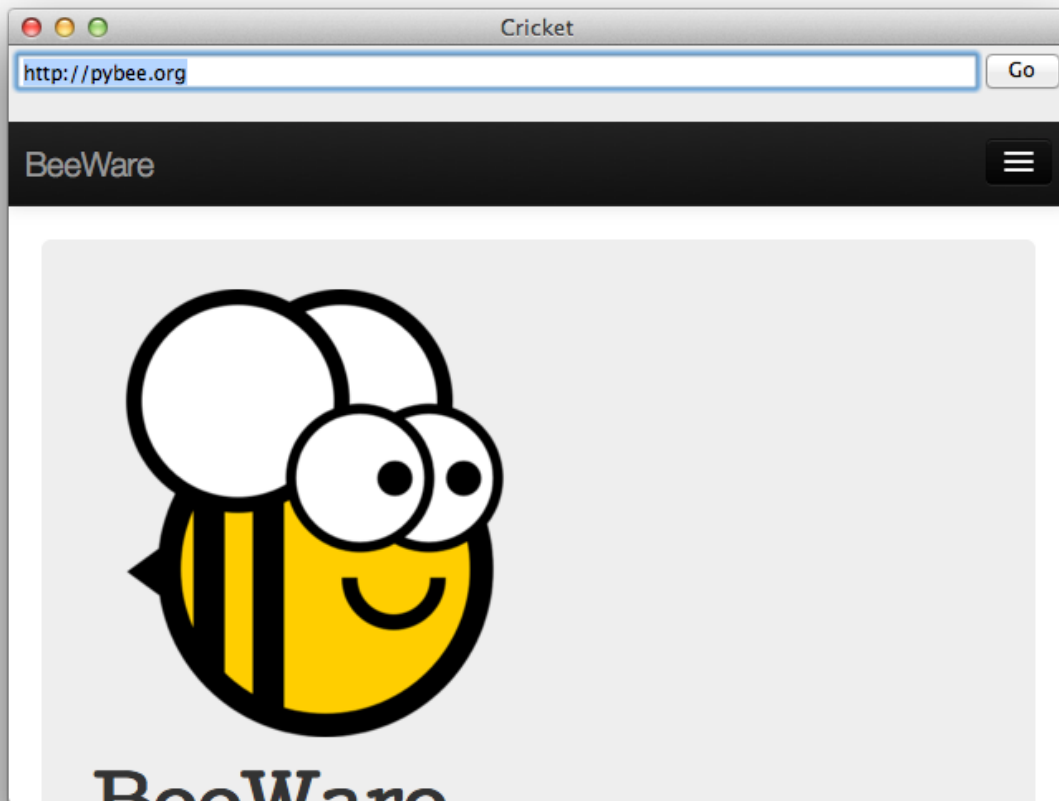
Here are the Icons

In this example, we see a couple of new Toga widgets - Table, SplitContainer, and ScrollContainer. You can also see that CSS styles can be added in the widget constructor. Lastly, you can see that windows can have toolbars.

Let's build a browser!

Although it's possible to build complex GUI layouts, you can get a lot of functionality with very little code, utilizing the rich components that are native on modern platforms.

So - lets build a tool that lets our pet yak graze the web - a primitive web browser, in less than 40 lines of code!



Here's the source code:

```
#!/usr/bin/env python

import toga
from colosseum import CSS

class Graze(toga.App):
    def startup(self):
        self.main_window = toga.MainWindow(self.name)
        self.main_window.app = self

        self.webview = toga.WebView(style=CSS(flex=1))
        self.url_input = toga.TextInput(
            initial='https://github.com/',
            style=CSS(flex=1, margin=5)
        )

        box = toga.Box(
            children = [
                toga.Box(
                    children = [
                        self.url_input,
```



```

        toga.Button('Go', on_press=self.load_page,
↪ style=CSS(width=50)),
    ],
    style=CSS(
        flex_direction='row'
    )
),
self.webview,
],
style=CSS(
    flex_direction='column'
)
)

self.main_window.content = box
self.webview.url = self.url_input.value

# Show the main window
self.main_window.show()

def load_page(self, widget):
    self.webview.url = self.url_input.value

if __name__ == '__main__':
    app = Graze('Graze', 'org.pybee.graze')

    app.main_loop()

```

In this example, you can see an application being developed as a class, rather than as a build method. You can also see boxes defined in a declarative manner - if you don't need to retain a reference to a particular widget, you can define a widget inline, and pass it as an argument to a box, and it will become a child of that box.

Widget Reference

Core Widgets

Toga includes a set of core widgets, that can be placed with a Box Container.

Component	Usage	Purpose	Class
Application	Documentation	Primary host for UI components	<code>toga.interface.app.App</code>
Box	Documentation	Container for components	<code>toga.interface.widgets.box.Box</code>
Font	Documentation	Fonts	<code>toga.interface.font.Font</code>
Widget	Documentation	Base class for widgets	<code>toga.interface.widgets.base.Widget</code>
Window	Documentation	Window object	<code>toga.interface.window.Window</code>

General widgets

Component	Usage	Purpose	Class
Button	Documen- tation	Basic clickable button	<code>toga.interface.widgets.button.Button</code>
Image View	Documen- tation	Image Viewer	<code>toga.interface.widgets.imageview. ImageView</code>
Label	Documen- tation	Text label	<code>toga.interface.widgets.label.Label</code>
Multiline Text Input	Documen- tation	Multi-line Text Input field	<code>toga.interface.widgets. multilinetextinput.MultilineTextInput</code>
Number Input	Documen- tation	Number Input field	<code>toga.interface.widgets.numberinput. NumberInput</code>
Option Container	Documen- tation	Option Container	<code>toga.interface.widgets.optioncontainer. OptionContainer</code>
Progress Bar	Documen- tation	Progress Bar	<code>toga.interface.widgets.progressbar. ProgressBar</code>
Selection	Documen- tation	Selection	<code>toga.interface.widgets.selection. Selection</code>
Text Input	Documen- tation	Text Input field	<code>toga.interface.widgets.textinput. TextInput</code>
Table	Documen- tation	Table of data	<code>toga.interface.widgets.table.Table</code>
Tree	Documen- tation	Tree of data	<code>toga.interface.widgets.tree.Tree</code>

Layout widgets

Component	Usage	Purpose	Class
Scroll Container	Documen- tation	Scrollable Container	<code>toga.interface.widgets.scrollcontainer. ScrollContainer</code>
Split Container	Documen- tation	Split Container	<code>toga.interface.widgets.splitcontainer. SplitContainer</code>
Web View	Documen- tation	Web View	<code>toga.interface.widgets.webview.WebView</code>

Supported Platforms

Component	iOS	win32	web	django	co-coa	gtk	an-droid
<code>toga.interface.widgets.optioncontainer.OptionContainer</code>					✓	✓	
<code>toga.interface.widgets.numberinput.NumberInput</code>		✓			✓	✓	
<code>toga.interface.widgets.textinput.TextInput</code>	✓	✓		✓	✓	✓	
<code>toga.interface.widgets.progressbar.ProgressBar</code>					✓		
<code>toga.interface.font.Font</code>	✓				✓	✓	
<code>toga.interface.widgets.box.Box</code>					✓	✓	
Image					✓		
EXPANDING_SPACER					✓	✓	
<code>toga.interface.widgets.passwordinput.PasswordInput</code>		✓			✓		
<code>toga.interface.widgets.scrollcontainer.ScrollContainer</code>					✓	✓	
<code>toga.interface.widgets.splitcontainer.SplitContainer</code>					✓	✓	
<code>toga.interface.widgets.imageview.ImageView</code>					✓		
<code>toga.interface.widgets.webview.WebView</code>	✓			✓	✓	✓	
<code>toga.interface.widgets.multilinetextinput.MultilineTextInput</code>		✓			✓		
TIBERIUS_ICON					✓	✓	
Command					✓	✓	
<code>toga.interface.widgets.box.Box</code>	✓	✓		✓	✓	✓	✓
<code>toga.interface.widgets.selection.Selection</code>					✓	✓	
<code>toga.interface.widgets.table.Table</code>					✓	✓	
	✓			✓	✓	✓	✓

Toga internals

Contributing to Toga

If you experience problems with Toga, [log them on GitHub](#). If you want to contribute code, please [fork the code](#) and [submit a pull request](#).

Setting up your development environment

The recommended way of setting up your development environment for Toga is to install a virtual environment, install the required dependencies and start coding. Assuming that you are using `virtualenvwrapper`, you only have to run:

```
$ git clone git@github.com:pybee/toga.git
$ cd toga
$ mkvirtualenv toga
```

Note: Toga doesn't have a test suite yet. The high level plan is to add two types of tests to the project:

1. Tests verifying that the core of Toga (contained in `src/core/` – the abstract widgets – actually do what they are supposed to do.
2. Tests for each backend.

To get started, run the following commands within your virtual environment (ensure that you're using Python 3.4 or better):

```
$ pip install -e src/core -e .
```

The somewhat odd command is required because the main Toga package is a sort of “metapackage” which pulls other parts in; if you just do:

```
$ pip install -e . # Don't do this on its own
```

it will install the dependencies – like `toga_core` – from released versions into your site packages, instead of using the sources.

Now you are ready to start hacking on the core of toga!

Of course, if you want to work on any specific platform, you need to do the same for it:

```
$ pip install -e src/core -e src/gtk -e .
```

Have fun!

Release History

0.2 - In development

- Migrated to CSS-based layout, rather than Cassowary/constraint layout.

0.1.2

- Further improvements to multiple-repository packaging strategy.
- Ensure Ctrl-C is honored by apps.
- **Cocoa:** Added runtime warnings when minimum OS X version is not met.

0.1.1

- Refactored code into multiple repositories, so that users of one backend don't have to carry the overhead of other installed platforms
- Corrected a range of bugs, mostly related to problems under Python 3.

0.1.0

Initial public release. Includes:

- A Cocoa (OS X) backend
- A GTK+ backend
- A proof-of-concept Win32 backend
- A proof-of-concept iOS backend

Toga Roadmap

Toga is a new project - we have lots of things that we'd like to do. If you'd like to contribute, providing a patch for one of these features.

Widgets

The core of Toga is it's widget set. Modern GUI apps have lots of native controls that need to be represented. The following widgets have no representation at present, and need to be added.

There's also the task of porting widgets available on one platform to another platform.

Input

Inputs are mechanisms for displaying and editing input provided by the user.

- **ComboBox - A free entry TextField that provides options (e.g., text with past choices)** - Cocoa: NSComboBox - GTK+: Gtk.ComboBox.new_with_model_and_entry - iOS: ?
- **Switch - A native control for enabled/disabled**
 - Cocoa: NSButton with checkbox style
 - GTK+: Gtk.CheckButton (maybe Gtk.Switch?)
 - iOS: UISwitch
- **DateInput - A widget for selecting a date**
 - Cocoa: NSDatePicker, constrained to DMY

- GTK+: Gtk.Calendar?
 - iOS: UIDatePicker
- **TimeInput - A widget for selecting a time**
 - Cocoa: NSDatePicker, Constrained to Time
 - GTK+: ?
 - iOS: UIDatePicker
- **DateTimeInput - A widget for selecting a date and a time.**
 - Cocoa: NSDatePicker
 - GTK+: Gtk.Calendar + ?
 - iOS: UIDatePicker
- **MultilineTextInput - A widget for displaying multiline text, optionally** editable. - Cocoa: NSTextView inside an NSScrollView - GTK+: Gtk.TextView? (is there a simpler version than a full text editor?) - iOS: UITextView
- **Selection - A button that allows the user to choose from one of a fixed** number of options - Cocoa: NSPop-upButton, with NSMenu for options. - GTK+: Gtk.ComboBox.new_with_model - iOS: UIPickerView
- **ColorInput - A widget for selecting a color**
 - Cocoa: NSColorWell
 - GTK+: Gtk.ColorButton
 - iOS: ?
- **SliderInput (H & V) - A widget for selecting a value from a range.**
 - Cocoa: NSSlider
 - GTK+: Gtk.Scale
 - iOS: UISlider
- **NumberInput - A widget to allow entry of a numerical value, possibly with** helper buttons to make it easy to increase/decrease the value. - Cocoa: NSTextField with NSStepper - GTK+: GTKSpinButton - iOS: UITextField with UIStepper
- **Table: A scrollable display of columns of tabular data**
 - Cocoa: Done
 - GTK+: Gtk.TreeView with a Gtk.ListStore
 - iOS: UITableView
- **Tree: A scrollable display of heirarchical data**
 - Cocoa: Done
 - GTK+: Gtk.TreeView with a Gtk.TreeStore
 - iOS: UITableView with navigation
- **DetailedList: A scrollable list of a single column of detailed data**
 - Cocoa: NSTableView with custom view?
 - iOS: UITableView with navigation
- **SearchInput - A variant of TextField that is decorated as a search box.**

- Cocoa: NSSearchBar
- GTK+: ?
- iOS: UISearchBar?

Views

Views are mechanisms for displaying rich content, usually in a readonly manner.

- **Separator - a visual separator; usually a faint line.**
 - Cocoa: NSSeparator
 - GTK+:
 - iOS:
- **ProgressBar - A horizontal bar that displays progress, either progress** against a known value, or indeterminate - Cocoa: NSProgressIndicator, Bar style - GTK+: Gtk.ProgressBar - iOS: UIProgressView
- **ActivityIndicator - A spinner widget showing that something is happening**
 - Cocoa: NSProgressIndicator, Spinning style
 - GTK+: Gtk.Spinner
 - iOS: UIActivityIndicatorView
- **ImageView - Display an graphical image**
 - Cocoa: UIImageView
 - GTK+: Gtk.Image
 - iOS: UIImageView
- **VideoView - Display a video**
 - Cocoa: AVPlayerView
 - GTK+: Custom Integrate with GStreamer
 - iOS: MPMoviePlayerController
- **WebView - Display a web page. Just the web page; no URL chrome, etc.**
 - Cocoa: WebView
 - GTK+: Webkit.WebView (via WebkitGtk)
 - iOS: UIWebView
- **PDFView - Display a PDF document**
 - Cocoa: PDFView
 - GTK+: ?
 - iOS: ? Integration with QuickLook?
- **MapView - Display a map**
 - Cocoa: MKMapView
 - GTK+: Probably a Webkit.WebView pointing at Google Maps/OpenStreetMap.org
 - iOS: MKMapView

Container widgets

Containers are widgets that can contain other widgets.

- **Box** - A box drawn around a collection of widgets; often has a label
 - Cocoa: NSBox
 - GTK+:
 - iOS:
- **ButtonContainer** - A layout for a group of radio/checkbox options
 - Cocoa: NSMatrix, or NSView with pre-set constraints.
 - GTK+: ListBox?
 - iOS:
- **ScrollContainer** - A container whose internal content can be scrolled.
 - Cocoa: Done
 - GTK+:
 - iOS: UIScrollView?
- **SplitContainer** - An adjustable separator bar between 2+ visible panes of content
 - Cocoa: Done
 - GTK+:
 - iOS:
- **FormContainer** - A layout for a “key/value” or “label/widget” form
 - Cocoa: NSForm, or NSView with pre-set constraints.
 - GTK+:
 - iOS:
- **OptionContainer** - (suggestions for better name welcome) A container view that holds a small, fixed number of subviews, only one of which is visible at any given time. Generally rendered as something with “lozenge” style buttons over a box. Examples of use: OS X System preference panes that contain multiple options (e.g., Keyboard settings have an option layout for “Keyboard”, “Text”, “Shortcuts” and “Input sources”) - Cocoa: NSTabView - GTK+: GtkNotebook (Maybe GtkStack on 3.10+?) - iOS: ?
- **SectionContainer** - (suggestions for better name welcome) A container view that holds a small number of subviews, only one of which is visible at any given time. Each “section” has a name and icon. Examples of use: top level navigation in Safari’s preferences panel. - Cocoa: NSTabView - GTK+: ? - iOS: ?
- **TabContainer** - A container view for holding an unknown number of subviews, each of which is of the same type - e.g., web browser tabs. - Cocoa: ? - GTK+: GtkNotebook - iOS: ?
- **NavigationContainer** - A container view that holds a navigable tree of subviews; essentially a view that has a “back” button to return to the previous view in a heirarchy. Example of use: Top level navigation in the OS X System Preferences panel. - Cocoa: No native control - GTK+: No native control; Gtk.HeaderBar in 3.10+ - iOS: UINavigationController + UINavigationController

Dialogs and windows

GUIs aren't all about widgets - sometimes you need to pop up a dialog to query the user.

- **Info - a modal dialog providing an “OK” option**
 - Cocoa: `NSAlert`
 - GTK+: `Gtk.MessageDialog`, type `Gtk.MessageType.INFO`, buttons `Gtk.ButtonsType.OK`
 - iOS:
- **Error - a modal dialog showing an error, and a continue option.**
 - Cocoa: `NSAlert`
 - GTK+: `Gtk.MessageDialog`, type `Gtk.MessageType.ERROR`, buttons `Gtk.ButtonsType.CANCEL`
 - iOS:
- **Question - a modal dialog that asks a Yes/No question**
 - Cocoa: `NSAlert` with pre-canned buttons
 - GTK+: `Gtk.MessageDialog`, type `Gtk.MessageType.QUESTION`, buttons `Gtk.ButtonsType.YES_NO`
 - iOS:
- **Confirm - a modal dialog confirming “OK” or “cancel”**
 - Cocoa: `NSAlert` with pre-canned buttons, “proceed” name
 - GTK+: `Gtk.MessageDialog`, type `Gtk.MessageType.WARNING`, buttons `Gtk.ButtonsType.OK_CANCEL`
 - iOS:
- **StackTrace - a modal dialog for displaying a long stack trace.**
 - Cocoa: Custom `NSWindow`
 - GTK+: Custom `Gtk.Dialog`
 - iOS:
- **File Open - a mechanism for finding and specifying a file on disk.**
 - Cocoa:
 - GTK+: `Gtk.FileChooserDialog`
 - iOS:
- **File Save - a mechanism for finding and specifying a filename to save to.**
 - Cocoa:
 - GTK+:
 - iOS:

Miscellaneous

One of the aims of Toga is to provide a rich, feature-driven approach to app development. This requires the development of APIs to support rich features.

- Long running tasks - GUI toolkits have a common pattern of needing to periodically update a GUI based on some long running background task. They usually accomplish this with some sort of timer-based API to ensure that the main event loop keeps running. Python has a “yield” keyword that can be repurposed for this.
- Toolbar - support for adding a toolbar to an app definition. Interpretation in mobile will be difficult; maybe some sort of top level action menu available via a slideout tray (e.g., GMail account selection tray)
- Preferences - support for saving app preferences, and visualizing them in a platform native way.
- Easy handling of long running tasks - possibly using generators to yield control back to the event loop.
- Notification when updates are available
- Easy Licensing/registration of apps. Monetization is not a bad thing, and shouldn't be mutually exclusive with open source.

Platforms

Toga currently has good support for Cocoa on OS X, GTK+, and iOS. Proof-of-concept support exists for Windows Win32. Support for a more modern Windows API would be desirable.

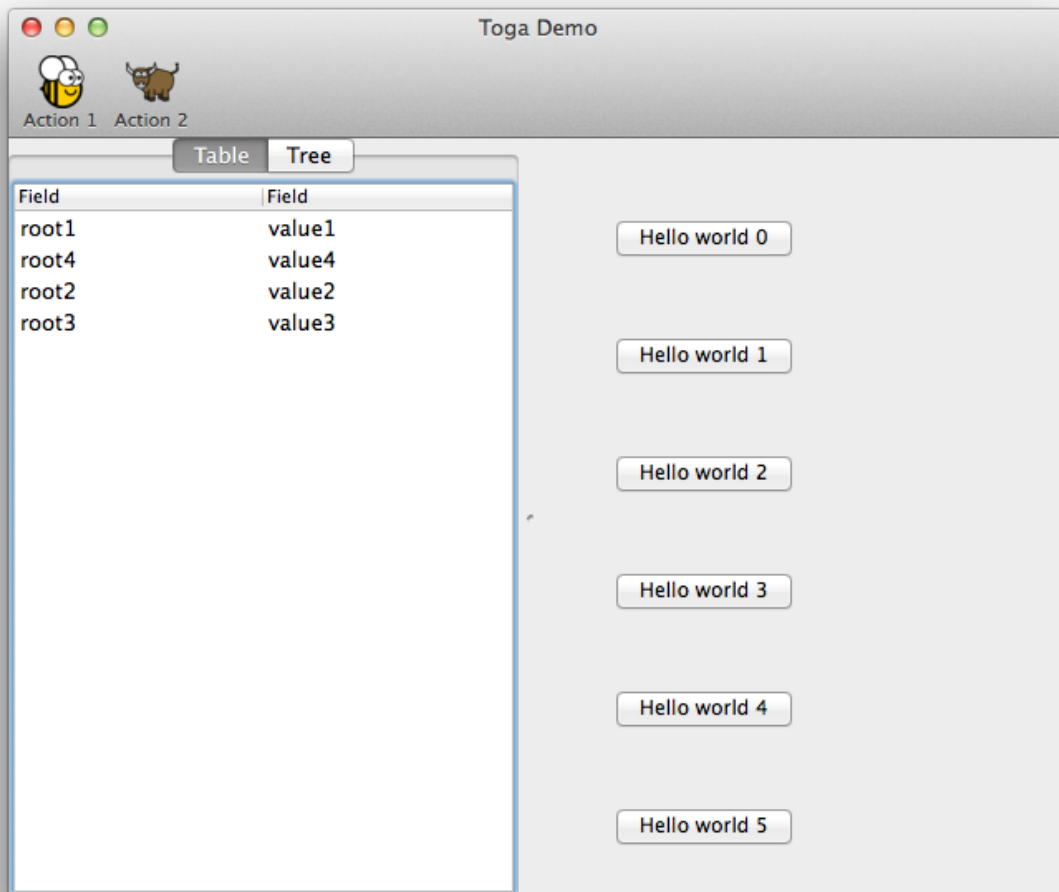
In the mobile space, it would be great if Toga supported Android, Windows Phone, or any other phone platform.

Toga supported platforms

Official platform support

Desktop platforms

OS X

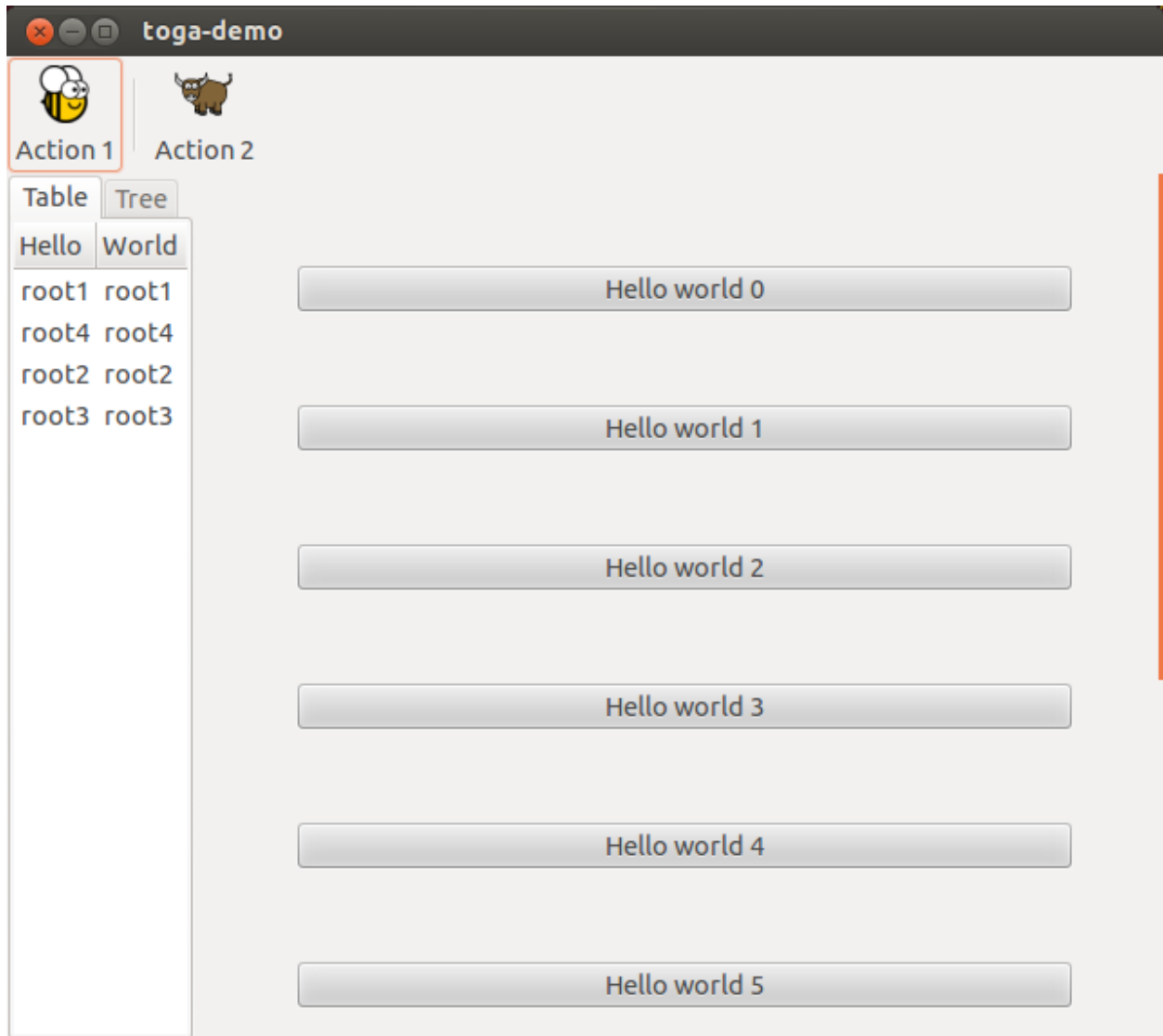


The backend for OS X is named `toga-cocoa`. It supports OS X 10.7 (Lion) and later. It is installed automatically on OS X machines (machines that report `sys.platform == 'darwin'`), or can be manually installed by invoking:

```
$ pip install toga[cocoa]
```

The OS X backend has seen the most development to date.

Linux



The backend for Linux platforms is named `toga-gtk`. It supports GTK+ 3.4 and later. It is installed automatically on Linux machines (machines that report `sys.platform == 'linux'`), or can be manually installed by invoking:

```
$ pip install toga[gtk]
```

The GTK+ backend is reasonably well developed, but currently has some known issues with widget layout.

Win32

The backend for Windows is named `toga-win32`. It supports Windows XP or later. It is installed automatically on Windows machines (machines that report `sys.platform == 'win32'`), or can be manually installed by invoking:

```
$ pip install toga[win32]
```

The Windows backend is currently proof-of-concept only. Most widgets have not been implemented.

Mobile platforms

iOS

The backend for iOS is named `toga-iOS`. It supports iOS 6 or later. It must be manually installed into an iOS Python project (such as one that has been developed using the `Python-iOS-template cookiecutter`). It can be manually installed by invoking:

```
$ pip install toga[iOS]
```

The iOS backend is currently proof-of-concept only. Most widgets have not been implemented.

Planned platform support

There are plans to provide support for the following platforms:

- Web (using `Batavia` to run Python on the browser)
- Android
- WinRT (Native Windows 8 and Windows mobile)
- Qt (for KDE based desktops)

If you are interested in these platforms and would like to contribute, please get in touch on [Twitter](#) or [Gitter](#).

Unofficial platform support

At present, there are no known unofficial platform backends.