This tutorial will quickly get you up and running with the latest Tk from Python, Tcl, Ruby, and Perl on macOS, Windows, or Linux. It provides all the essentials about core Tk concepts, the various widgets, layout, events and more that you need for your application.

Previous: Tk Concepts | Contents | Single Page | Next: The Grid Geometry Manager

Basic Widgets

This chapter introduces the basic Tk widgets that you'll find in just about any user interface: frames, labels, buttons, checkbuttons, radiobuttons, entries, and comboboxes. By the end, you'll know how to use all the widgets you'd ever need for a typical fill-in-the-form type of user interface.

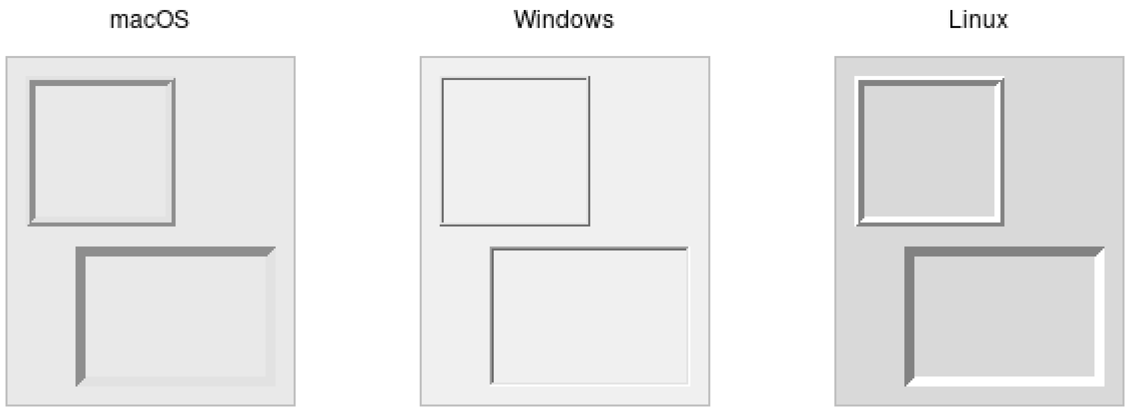
You'll find it easiest to read this chapter (and those following that discuss more widgets) in order. Because there is so much commonality between many widgets, we'll introduce certain concepts when describing one widget that will also apply to a widget we describe later. Rather than going over the same ground multiple times, we'll refer back to when the concept was first introduced.

As each widget is introduced, we'll refer to the widget roundup page for the specific widget, as well as the Tk reference manual page. As a reminder, this tutorial highlights the *most useful parts* of Tk and how to use them to build effective modern user interfaces. The reference documentation, which details *everything* that can be done in Tk, serves a very different purpose.

Frame

- Widget Roundup
- Reference Manual

A **frame** is a widget that displays as a simple rectangle. Frames help to organize your user interface, often both visually and at the coding level. Frames often act as master widgets for a geometry manager like `grid`, which manages the slave widgets contained within the frame.



Frame widgets.

Frames are created using the **`ttk.Frame`** class:

```
frame = ttk.Frame(parent)
```

Frames are created using the **`ttk::frame`** command:

```
ttk::frame .frame
```

Frames are created using the **`Tk::Tile::Frame`** class:

```
frame = Tk::Tile::Frame.new(parent)
```

Frames are created using the **`new_ttk__frame`** method, a.k.a. **`Tkx::ttk__frame()`**:

```
$frame = $parent->new_ttk__frame;
```

Frames can take several different configuration options, which can alter how they are displayed.

Requested Size

Typically, the size of a frame is determined by the size and layout of any widgets within it. In turn, this is controlled by the geometry manager that manages the contents of the frame itself.

If, for some reason, you want an empty frame that does not contain other widgets, you can instead explicitly set its size using the `width` and/or `height` configuration options (otherwise, you'll end up with a very small frame indeed).

Screen distances such as width and height are usually specified as a number of pixels. You can also specify them via one of several suffixes. For example, `350` means 350 pixels, `350c` means 350 centimeters, `350m` means 350 millimeters, `350i` means 350 inches, and `350p` means 350 printer's points (1/72 inch).

> *Remember, you can request a given size for a frame (or any widget), but the geometry manager has the final say. If things aren't showing up the way you want them, make sure to check there too.*

Padding

The `padding` configuration option is used to request extra space around the inside of the widget. If you're putting other widgets inside the frame, there will be a margin all the way around. You can specify the same padding for all sides, different horizontal and vertical padding, or padding for each side separately.

```
f['padding'] = 5           # 5 pixels on all sides
f['padding'] = (5,10)      # 5 on left and right, 10 on top and bottom
f['padding'] = (5,7,10,12) # left: 5, top: 7, right: 10, bottom: 12
```

```
.f configure -padding 5           ;# 5 pixels on all sides
.f configure -padding "5 10"      ;# 5 on left and right, 10 on top and bottom
.f configure -padding "5 7 10 12" ;# left: 5, top: 7, right: 10, bottom: 12
```

```
f['padding'] = '5'          ;# 5 pixels on all sides
f['padding'] = '5 10'       ;# 5 on left and right, 10 on top and bottom
f['padding'] = '5 7 10 12'  ;# left: 5, top: 7, right: 10, bottom: 12
```

```
$f->configure(-padding => "5");         # 5 pixels on all sides
$f->configure(-padding => "5 10");      # 5 on left and right, 10 on top and bottom
$f->configure(-padding => "5 7 10 12"); # left: 5, top: 7, right: 10, bottom: 12
```

Borders

You can display a border around a frame widget to visually separate it from its surroundings. You'll see this often used to make a part of the user interface look sunken or raised. To do this, you need to set the `borderwidth` configuration option (which defaults to 0, i.e., no border) and the `relief` option, which specifies the visual appearance of the border. This can be one of: `flat` (default), `raised`, `sunken`, `solid`, `ridge`, or `groove`.

```
frame['borderwidth'] = 2
frame['relief'] = 'sunken'
```

```
.frame configure -borderwidth 2 -relief sunken
```

```
frame['borderwidth'] = 2
frame['relief'] = 'sunken'
```

```
$frame->configure(-borderwidth => 2, -relief => "sunken");
```

Changing Styles

Frames have a `style` configuration option, which is common to all of the themed widgets. This lets you control many other aspects of their appearance or behavior. This is a bit more advanced, so we won't go into it in too much detail right now. But here's a quick example of creating a "Danger" frame with a red background and a raised border.

```
s = ttk.Style()
s.configure('Danger.TFrame', background='red', borderwidth=5, relief='raised')
ttk.Frame(root, width=200, height=200, style='Danger.TFrame').grid()
```

```
ttk::style configure Danger.TFrame -background red -borderwidth 5 -relief raised
grid [ttk::frame .f -width 200 -height 200 -style Danger.TFrame]
```

```
Tk::Tile::Style.configure('Danger.TFrame', "background" => "red", "borderwidth" => 5, "relief" => "raised")
f = Tk::Tile::Frame.new(root) {width 200; height 200; style "Danger.TFrame"}.grid()
```

```
Tkx::ttk__style_configure("Danger.TFrame", -background => "red", -borderwidth => 5, -relief => "raised");
my $f = $mw->new_ttk__frame(-width => 200, -height => 200, -style => "Danger.TFrame")->g_grid();
```

What elements of widgets can be changed by styles vary by widget and platform. On Windows and Linux, it does what you'd expect. On current macOS, the frame will have a red raised border, but the background will remain the default grey. Much more on why this is in a later chapter.

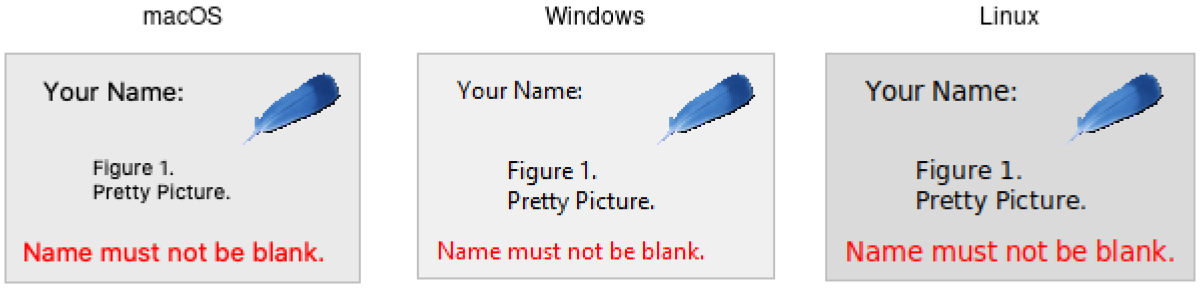
Styles mark a sharp departure from how most aspects of a widget's visual appearance were changed in the "classic" Tk widgets. In classic Tk, you could provide a wide range of options to finely control every aspect of an individual widget's behavior, e.g., foreground color, background color, font, highlight thickness, selected foreground color, and padding. When using the new themed widgets, these changes are made by modifying styles, not adding options to each widget.

As such, many options you may be familiar with in certain classic widgets are not present in their themed version. However, overuse of such options was a key factor undermining the appearance of Tk applications, especially when used across different platforms. Transitioning from classic to themed widgets provides an opportune time to review and refine how (and if!) such appearance changes are made.

Label

- Widget Roundup
- Reference Manual

A **label** is a widget that displays text or images, typically that users will just view but not otherwise interact with. Labels are used to identify controls or other parts of the user interface, provide textual feedback or results, etc.



Your Name:

Figure 1.
Pretty Picture.

Name must not be blank.

Label widgets.

Labels are created using the **`ttk.Label`** class. Often, the text or image the label will display are specified via configuration options at the same time:

```
label = ttk.Label(parent, text='Full name:')
```

Labels are created using the **`ttk::label`** command. Often, the text or image the label will display are specified via configuration options at the same time:

```
ttk::label .label -text {Full name:}
```

Labels are created using the **`Tk::Tile::Label`** class. Often, the text or image the label will display are specified via configuration options at the same time:

```
label = Tk::Tile::Label.new(parent) {text 'Full name:'}
```

Labels are created using the **`new_ttk__label`** method, a.k.a. **`Tkx::ttk__label()`**. Often, the text or image the label will display are specified via configuration options at the same time:

```
$label = $parent->new_ttk__label(-text => "Full name:");
```

Like frames, labels can take several different configuration options, which can alter how they are displayed.

Displaying Text

The `text` configuration option (shown above when creating the label) is the most commonly used, particularly when the label is purely decorative or explanatory. You can change what text is displayed by modifying this configuration option. This can be done at any time, not only when first creating the label.

You can also have the widget monitor a variable in your script. Anytime the variable changes, the label will display the new value of the variable. This is done with the `textvariable` option:

```
resultsContents = StringVar()
label['textvariable'] = resultsContents
resultsContents.set('New value to display')
```

Tkinter only allows you to attach widgets to an instance of the `StringVar` class but not arbitrary Python variables. This class contains all the logic to watch for changes and communicate them back and forth between the variable and Tk. Use the `get` and `set` methods to read or write the current value of the variable.

```
.label configure -textvariable resultContents
set resultContents "New value to display"
```

Variables must be global, or the fully qualified name given for those within a namespace.

```
$resultsVar = TkVariable.new
label['textvariable'] = $resultsVar
$resultsVar.value = 'New value to display'
```

Ruby's Tk binding only allows you to attach to an instance of the `TkVariable` class, which contains all the logic to watch for changes, communicate them back and forth between the variable and Tk, and so on. You need to read or write the current value using the `value` accessor, as shown.

```
$label->configure(-textvariable => \$resultContents);
$resultContents = "New value to display";
```

Displaying Images

Labels can also display an image instead of text. If you just want an image displayed in your user interface, this is normally the way to do it. We'll go into images in more detail in a later chapter, but for now, let's assume you want to display a GIF stored in a file on disk. This is a two-step process. First, you will create an image "object." Then, you can tell the label to use that object via its `image` configuration option:

```
image = PhotoImage(file='myimage.gif')
label['image'] = image
```

```
image create photo imgobj -file "myimage.gif"
.label configure -image imgobj
```

```
image = TkPhotoImage.new(:file => "myimage.gif")
label['image'] = image
```

```
Tkx::image_create_photo( "imgobj", -file => "myimage.gif");
$label->configure(-image => "imgobj");
```

Labels can also display both an image and text at the same time. You'll often see this in toolbar buttons. To do so, use the `compound` configuration option. The default value is `none`, meaning display only the image if present; if there is no image, display the text specified by the `text` or `textvariable` options. Other possible values for the `compound` option are `text` (text only), `image` (image only), `center` (text in the center of image), `top` (image above text), `left`, `bottom`, and `right`.

Fonts, Colors, and More

Like with frames, you normally don't want to change things like fonts and colors directly. If you need to change them (e.g., to create a special type of label), the preferred method would be to create a new style, which is then used by the widget with the `style` option.

Unlike most themed widgets, the label widget also provides explicit widget-specific configuration options as an alternative. Again, you should use these only in special one-off cases when using a style doesn't necessarily make sense.

You can specify the font used to display the label's text using the `font` configuration option. While we'll go into fonts in more detail in a later chapter, here are the names of some predefined fonts you can use:

`TkDefaultFont`
Default for all GUI items not otherwise specified.

`TkTextFont`
Used for entry widgets, listboxes, etc.

`TkFixedFont`
A standard fixed-width font.

`TkMenuFont`
The font used for menu items.

`TkHeadingFont`
A font for column headings in lists and tables.

`TkCaptionFont`
A font for window and dialog caption bars.

`TkSmallCaptionFont`
Smaller captions for subwindows or tool dialogs.

`TkIconFont`
A font for icon captions.

`TkTooltipFont`
A font for tooltips.

> *Because font choices are platform-specific, be careful of hardcoding specifics (font families, sizes, etc.). This is something else you'll see in many older Tk programs that can make them look ugly.*

```
label['font'] = "TkDefaultFont"
```

```
.label configure -font TkDefaultFont
```

```
label['font'] = "TkDefaultFont"
```

```
$label->configure(-font => "TkDefaultFont");
```

The foreground (text) and background color of the label can also be changed via the `foreground` and `background` configuration options. Colors are covered in detail later, but you can specify them as either color names (e.g., `red`) or hex RGB codes (e.g., `#ff340a`).

Labels also accept the `relief` configuration option discussed for frames to make them appear sunken or raised.

Layout

The geometry manager determines the overall layout of the label (i.e., where it is positioned within the user interface and how large it is). Yet, several options can help you control how the label is displayed within the rectangle the geometry manager gives it.

If the box given to the label is larger than the label requires for its contents, you can use the `anchor` option to specify what edge or corner the label should be attached to, which would leave any empty space in the opposite edge or corner. Possible values are specified as compass directions: `n` (north, or top edge), `ne`, (north-east, or top right corner), `e`, `se`, `s`, `sw`, `w`, `nw` or `center`.

> *Things not appearing where you think they should? The position and size of the overall label widget may not be what you think it is. They can be affected by various widget and geometry manager options. For example, if you're using `grid`, you may need to adjust the `sticky` options. Options on one widget can affect the placement of another, as the geometry manager juggles space to fit all the widgets together. When debugging, it can help to change the background color of each widget so you know exactly where each is positioned. This is a good example of those "one-off" cases we just mentioned where you might use configuration options rather than styles to modify appearance.*

Multi-line Labels

Labels can display more than one line of text. To do so, embed carriage returns (`\n`) in the `text` (or `textvariable`) string. Labels can also automatically wrap your text into multiple lines via the `wraplength` option, which specifies the maximum length of a line (in pixels, centimeters, etc.).

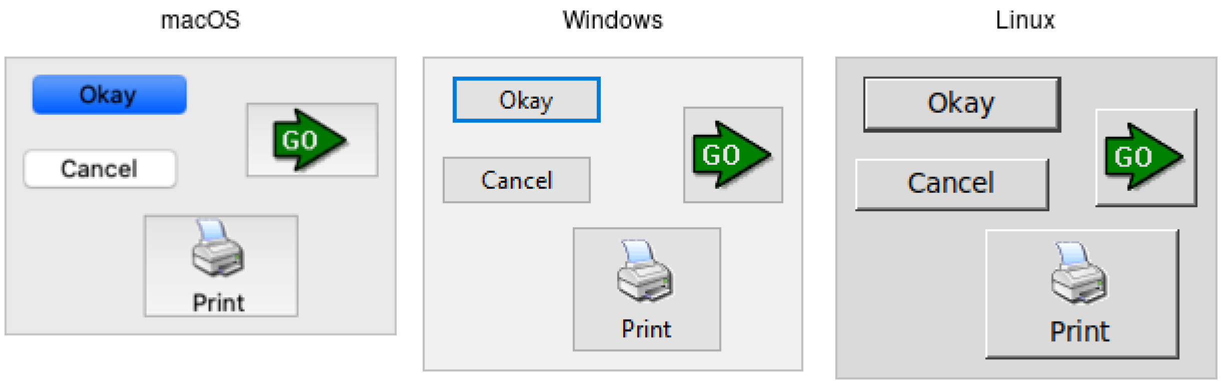
> *Multi-line labels are a replacement for the older `message` widgets in classic Tk.*

You can also control how the text is justified via the `justify` option. It can have the values `left`, `center`, or `right`. If you have only a single line of text, you probably want the `anchor` option instead.

Button

- Widget Roundup
- Reference Manual

A **button**, unlike a frame or label, is very much there to interact with. Users press a button to perform an action. Like labels, they can display text or images but accept additional options to change their behavior.



Button widgets.

Buttons are created using the `ttk.Button` class:

```
button = ttk.Button(parent, text='Okay', command=submitForm)
```

Buttons are created using the `ttk::button` command:

```
ttk::button .button -text "Okay" -command "submitForm"
```

Buttons are created using the `Tk::Tile::Button` class:

```
button = Tk::Tile::Button.new(parent) {text 'Okay'; command 'submitForm'}
```

Buttons are created using the `new_ttk__button` method, a.k.a. `Tkx::ttk__button()`:

```
$button = $parent->new_ttk__button(-text => "Okay", -command => sub {submitForm();});
```

Typically, their contents and command callback are specified at the same time the button is created. As with other widgets, buttons accept several configuration options to alter their appearance and behavior, including the standard `style` option.

Text or Image

Buttons take the same `text`, `textvariable` (rarely used), `image`, and `compound` configuration options as labels. These control whether the button displays text and/or an image.

Buttons have a `default` configuration option. If specified as `active`, this tells Tk that the button is the default button in the user interface; otherwise, it is `normal`. Default buttons are invoked if users hit the Return or Enter key. Some platforms and styles will draw this default button with a different border or highlight. Note that setting this option doesn't create an event binding that will make the Return or Enter key activate the button; you have to do that yourself.

The Command Callback

The `command` option connects the button's action and your application. When a user presses the button, the script provided by the option is evaluated by the interpreter.

You can also ask the button to invoke the command callback from your application. That way, you don't need to repeat the command to be invoked several times in your program. If you change the command attached to the button, you don't need to change it elsewhere too. Sounds like a useful way to add that event binding on our default button, doesn't it?

```
action = ttk.Button(root, text="Action", default="active", command=myaction)
root.bind('<Return>', lambda e: action.invoke())
```

```
ttk::button .action -text "Action" -default active -command myaction
bind . <Return> ".action invoke"
```

```
action = Tk::Tile::Button.new(root) {text "Action"; default "active"; command {myaction}}
root.bind("Return", proc{action.invoke()})
```

```
$action = $mw->new_ttk__button(-text => "Action", -default => "active", -command => sub {myaction();});
Tkx::bind(".", "<Return>", sub{$action->invoke();});
```

Standard behavior for dialog boxes and many other windows on most platforms is to set up a binding on the window for the Return key (`<Return>` or `<Key-Return>`) to invoke the active button if it exists, as we've done here. If there is a "Close" or "Cancel" button, create a binding to the Escape key (`<Key-Escape>`). On macOS, you should additionally bind the Enter key on the keyboard (`<KP_Enter>`) to the *active button and Command-period (`<Command-.>`) to the close or cancel button.*

Button State

Buttons and many other widgets start off in a normal state. A button will respond to mouse movements, can be pressed, and will invoke its command callback. Buttons can also be put into a disabled state, where the button is greyed out, does not respond to mouse movements, and cannot be pressed. Your program would disable the button when its command is not applicable at a given point in time.

All themed widgets maintain an internal state, represented as a series of binary flags. Each flag can either be set (on) or cleared (off). You can set or clear these different flags, and check the current setting using the `state` and `instate` methods. Buttons make use of the `disabled` flag to control whether or not users can press the button. For example:

```
b.state(['disabled'])          # set the disabled flag
b.state(['!disabled'])         # clear the disabled flag
b.instate(['disabled'])        # true if disabled, else false
b.instate(['!disabled'])       # true if not disabled, else false
b.instate(['!disabled'], cmd)  # execute 'cmd' if not disabled
```

*Note that these commands accept an **array** of state flags as their argument.*

```
.b state disabled            ;# set the disabled flag
.b state !disabled           ;# clear the disabled flag
.b instate disabled          ;# 1 if disabled, else 0
.b instate !disabled         ;# 1 if not disabled, else 0
.b instate !disabled {mycmd} ;# execute 'mycmd' if not disabled
```

```
b.state('disabled')            ;# set the disabled flag
b.state('!disabled')           ;# clear the disabled flag
b.instate('disabled')          ;# true if disabled, else false
b.instate('!disabled')         ;# true if not disabled, else false
b.instate('!disabled', 'cmd')  ;# execute 'cmd' if not disabled
```

```
$b->state("disabled");                  # set the disabled flag
$b->state("!disabled");                 # clear the disabled flag
$b->instate("disabled");                # 1 if disabled, else 0
$b->instate("!disabled");               # 1 if not disabled, else 0
$b->instate("!disabled", sub {mycmd});  # execute 'mycmd' if not disabled
```

The full list of state flags available to themed widgets is: `active`, `disabled`, `focus`, `pressed`, `selected`, `background`, `readonly`, `alternate`, and `invalid`. These are described in the themed widget reference. While all widgets have the same set of state flags, not all states are meaningful for all widgets. It's also possible to get fancy in the `state` and `instate` methods and specify multiple state flags at the same time.

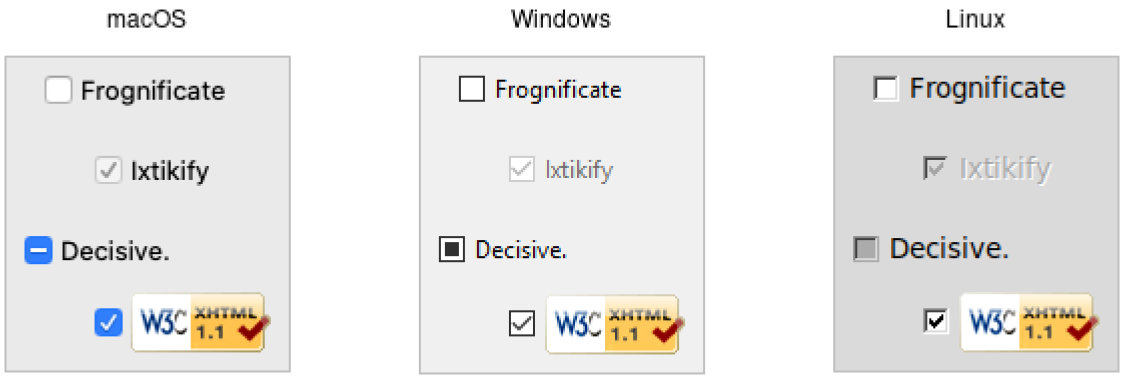
The `state` and `instate` methods replace the older `state` configuration option (which took the values `normal` or `disabled`).

That configuration option is actually still available for themed widgets in Tk 8.5, but "write-only," which means that changing the option calls the appropriate `state` command. It's mainly intended as a convenience, so you can specify a widget should be disabled when you first create it. However, any changes made using the new `state` command do not update the configuration option. To avoid confusion, update your code to use the state flags for all themed widgets.

Checkbutton

- Widget Roundup
- Reference Manual

A **checkbutton** widget is like a regular button that also holds a binary value of some kind (i.e., a toggle). When pressed, a checkbutton flips the toggle and then invokes its callback. Checkbutton widgets are frequently used to allow users to turn an option on or off.



Checkbutton widgets.

Checkbuttons are created using the `ttk.Checkbutton` class. Typically, their contents and behavior are specified at the same time:

```
measureSystem = StringVar()
check = ttk.Checkbutton(parent, text='Use Metric',
            command=metricChanged, variable=measureSystem,
            onvalue='metric', offvalue='imperial')
```

Checkbuttons are created using the `ttk::checkbutton` command. Typically, their contents and behavior are specified at the same time:

```
ttk::checkbutton .check -text "Use Metric" -command "metricChanged"
            -variable measuresystem -onvalue metric -offvalue imperial
```

Checkbuttons are created using the `Tk::Tile::CheckButton` class. Typically, their contents and behavior are specified at the same time:

```
$measureSystem = TkVariable.new
check = Tk::Tile::CheckButton.new(parent) {text 'Use Metric';
            command 'metricChanged'; variable $measureSystem;
            onvalue 'metric'; offvalue 'imperial'}
```

Checkbuttons are created using the `new_ttk__checkbutton` method, a.k.a. `Tkx::ttk__checkbutton`. Typically, their contents and behavior are specified at the same time:

```
$check = $parent->new_ttk__checkbutton(-text => "Use Metric", -command => sub {metricChanged},
            -variable => \$measuresystem, -onvalue => "metric", -offvalue => "imperial");
```

Checkbuttons use many of the same options as regular buttons but add a few more. The `text`, `textvariable`, `image`, and `compound` configuration options control the display of the label (next to the checkbox itself). Similarly, the `command` option lets you specify a command to be called every time a user toggles the checkbutton; and the `invoke` method will also execute the same command. The `state` and `instate` methods allow you to manipulate the `disabled` state flag to enable or disable the checkbutton.

Widget Value

Unlike regular buttons, checkbuttons also hold a value. We've seen how the `textvariable` option links the label of a widget to a variable. The `variable` option for checkbuttons behaves similarly, except it links a variable to the widget's current value. The variable is updated whenever the widget is toggled. By default, checkbuttons use a value of `1` when checked and `0` when not checked. These can be changed to something else using the `onvalue` and `offvalue` options.

A checkbutton doesn't automatically set (or create) the linked variable. Therefore, your program needs to initialize it to the appropriate starting value.

What happens when the linked variable contains neither the `onvalue` or the `offvalue` (or even doesn't exist)? In that case, the checkbutton is put into a special "tristate" or indeterminate mode. The checkbox might display a single dash in this mode instead of being empty or holding a checkmark. Internally, the state flag `alternate` is set, which you can inspect via the `instate` method:

```
check.instate(['alternate'])
```

```
.check instate alternate
```

```
check.instate('alternate')
```

```
$check->instate("alternate")
```

While we've been using an instance of the `StringVar` class, Tkinter provides other variable classes that can hold booleans, integers, or floating-point numbers. You can always use a `StringVar` (because the Tcl API that Tkinter uses is string-based) but can choose one of the others if the data stored in it fits the type. All are subclasses of the base class `Variable`.

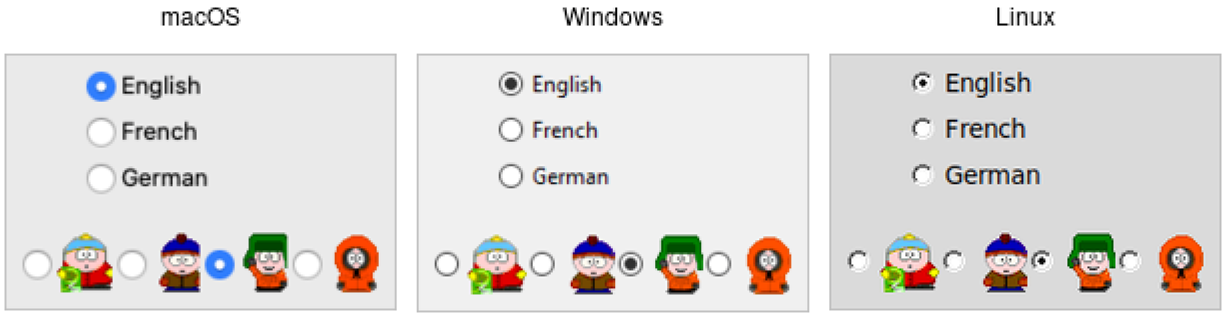
In the feet to meters example, we saw that you can call the `get` method of a `Variable` to retrieve its value or the `set` method to provide a new value. You can also supply an initial value when you instantiate it.

```
s = StringVar(value="abc")   # default value is ''
b = BooleanVar(value=True)   # default is False
i = IntVar(value=10)         # default is 0
d = DoubleVar(value=10.5)    # default is 0.0
```

Radiobutton

- Widget Roundup
- Reference Manual

A **radiobutton** widget lets you choose between one of several mutually exclusive choices. Unlike a checkbutton, they are not limited to just two options. Radiobuttons are always used together in a set, where multiple radiobutton widgets are tied to a single choice or preference. They are appropriate to use when the number of options is relatively small, e.g., 3-5.



Radiobutton widgets.

Radiobuttons are created using the **`ttk.Radiobutton`** class. Typically, you'll create and initialize several of them at once:

```
phone = StringVar()
home = ttk.Radiobutton(parent, text='Home', variable=phone, value='home')
office = ttk.Radiobutton(parent, text='Office', variable=phone, value='office')
cell = ttk.Radiobutton(parent, text='Mobile', variable=phone, value='cell')
```

Radiobuttons are created using the **`ttk::radiobutton`** command. Typically, you'll create and initialize several of them at once:

```
ttk::radiobutton .home -text "Home" -variable phone -value home
ttk::radiobutton .office -text "Office" -variable phone -value office
ttk::radiobutton .cell -text "Mobile" -variable phone -value cell
```

Radiobuttons are created using the **`Tk::Tile::RadioButton`** class. Typically, you'll create and initialize several of them at once:

```
$phone = TkVariable.new
home = Tk::Tile::RadioButton.new(parent) {text 'Home'; variable $phone; value 'home'}
office = Tk::Tile::RadioButton.new(parent) {text 'Office'; variable $phone; value 'office'}
cell = Tk::Tile::RadioButton.new(parent) {text 'Mobile'; variable $phone; value 'cell'}
```

Radiobuttons are created using the **`new_ttk__radiobutton`** method, a.k.a. **`Tkx::ttk__radiobutton`**. Typically, you'll create and initialize several of them at once:

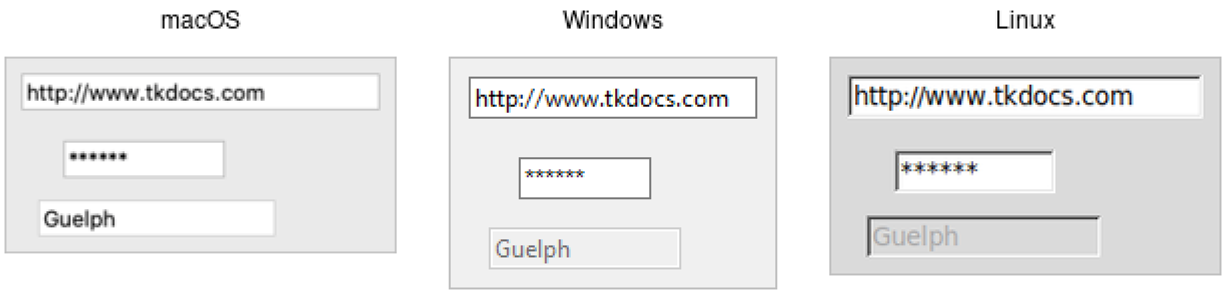
```
$home = $parent->new_ttk__radiobutton(-text => "Home", -variable => \$phone, -value => "home");
$office = $parent->new_ttk__radiobutton(-text => "Office", -variable => \$phone, -value => "office");
$cell = $parent->new_ttk__radiobutton(-text => "Mobile", -variable => \$phone, -value => "cell");
```

Radiobuttons share most of the same configuration options as checkbuttons. One exception is that the `onvalue` and `offvalue` options are replaced with a single `value` option. Each radiobutton in the set will have the same linked variable but a different value. When the variable holds the matching value, that radiobutton will visually indicate it is selected. If it doesn't match, the radiobutton will be unselected. If the linked variable doesn't exist, or you don't specify one with the `variable` option, radiobuttons also display as "tristate" or indeterminate. This can be checked via the `alternate` state flag.

Entry

- Widget Roundup
- Reference Manual

An **entry** widget presents users with a single-line text field where they can type in a string value. These can be just about anything: a name, a city, a password, social security number, etc.



http://www.tkdocs.com

******

Guelph

Entry widgets.

Entries are created using the `ttk.Entry` class:

```
username = StringVar()
name = ttk.Entry(parent, textvariable=username)
```

Entries are created using the `ttk::entry` command:

```
ttk::entry .name -textvariable username
```

Entries are created using the `Tk::Tile::Entry` class:

```
$username = TkVariable.new
name = Tk::Tile::Entry.new(parent) { textvariable $username }
```

Entries are created using the `new_ttk__entry` method, a.k.a. `Tkx::ttk__entry`:

```
$name = $parent->new_ttk__entry(-textvariable => \$username);
```

A `width` configuration option may be specified to provide the number of characters wide the entry should be. This allows you, for example, to display a shorter entry for a zip or postal code.

Entry Contents

We've seen how checkbutton and radiobutton widgets have a value associated with them. Entries do as well, and that value is usually accessed through a linked variable specified by the `textvariable` configuration option.

> *Unlike the various buttons, entries don't have a text or image beside them to identify them. Use a separate label widget for that.*

You can also get or change the value of the entry widget without going through the linked variable. The `get` method returns the current value, and the `delete` and `insert` methods let you change the contents, e.g.

```
print('current value is %s' % name.get())
name.delete(0,'end')          # delete between two indices, 0-based
name.insert(0, 'your name')   # insert new text at a given index
```

```
puts "current value is [.name get]"
.name delete 0 end           ; # delete between two indices, 0-based
.name insert 0 "your name"   ; # insert new text at a given index
```

```
puts ("current value is #{name.get}")
name.delete(0, end)          ; # delete between two indices, 0-based
name.insert(0, 'your name')  ; # insert new text at a given index
```

```
print "current value is " . $name->get;
$name->delete(0, "end");       # delete between two indices, 0-based
$name->insert(0, "your name"); # insert new text at a given index
```

Watching for Changes

Entry widgets don't have a `command` option to invoke a callback whenever the entry is changed. To watch for changes, you should watch for changes to the linked variable. See also "Validation" below.

```
def it_has_been_written(*args):
    ...
username.trace_add("write", it_has_been_written)
```

```
proc it_has_been_written {args} {...}
trace add variable username write it_has_been_written
```

```
def it_has_been_written()
  ...
end
$username.trace("write", proc{it_has_been_written})
```

```
sub it_has_been_written {...}
Tkx::trace("add", "variable", \$username, "write", sub{it_has_been_written});
```

You'll be fine if you stick with simple uses of `trace_add` like that shown above. You might want to know that this is a small part of a much more complex system for observing variables and invoking callbacks when they are read, written, or deleted. You can trigger multiple callbacks, add or delete them (`trace_remove`), and introspect them (`trace_info`).

UPGRADE *These methods also replace a now-deprecated set of older methods (`trace`, `trace_variable`, `trace_vdelete`, and `trace_vinfo`) that should not be used.*

Tkinter allows you to watch for changes on a `StringVar` (or any subclass of `Variable`). Both the older and newer tracing tools are a very thin (and not terribly Pythonic) front end to Tcl's `trace` command.

Passwords

Entries can be used for passwords, where the actual contents are displayed as a bullet or other symbol. To do this, set the `show` configuration option to the character you'd like to display.

```
passwd = ttk.Entry(parent, textvariable=password, show="*")
```

```
ttk::entry .passwd -textvariable password -show "*"
```

```
passwd = Tk::Tile::Entry.new(parent) { textvariable $password; show "*"}
```

```
$passwd = $parent->new_ttk__entry(-textvariable => \$password, show => "*");
```

Widget States

Like the various buttons, entries can also be put into a disabled state via the `state` command (and queried with `instate`). Entries can also use the state flag `readonly`; if set, users cannot change the entry, though they can still select the text in it (and copy it to the clipboard). There is also an `invalid` state, set if the entry widget fails validation, which leads us to...

Validation

Users can type any text they like into an entry widget. However, if you'd like to restrict what they can type into the entry, you can do so with *validation*. For example, an entry might only accept an integer or a valid zip or postal code.

Your program can specify what makes an entry valid or invalid, as well as when to check its validity. As we'll see soon, the two are related. We'll start with a simple example, an entry that can only hold an integer up to five digits long.

The validation criteria are specified via an entry's `validatecommand` configuration option. You supply a piece of code whose job is to validate the entry. It functions like a widget callback or event binding, except that it returns a value (whether or not the entry is valid). We'll validate the entry on every keystroke; this is specified by providing a value of `key` to the `validate` configuration option.

```
import re
def check_num(newval):
    return re.match('^[0-9]*$', newval) is not None and len(newval) <= 5
check_num_wrapper = (root.register(check_num), '%P')

num = StringVar()
e = ttk.Entry(root, textvariable=num, validate='key', validatecommand=check_num_wrapper)
e.grid(column=0, row=0, sticky='we')
```

```
proc check_num {newval} {
   return [expr {[regexp {^[0-9]*$} $newval] && [string length $newval]<=5}]
}
ttk::entry .e -textvariable num -validate key -validatecommand "check_num %P"
grid .e -column 0 -row 0 -sticky we
```

```
def check_num(newval)
  return /^[0-9]*$/.match(newval) && newval.length <= 5
end

num = TkVariable.new
e = Tk::Tile::Entry.new(root) {textvariable num; validate 'key'; validatecommand [proc{|v| check_num(v)}, '%P']}
e.grid :column => 0, :row => 0, :sticky => 'we'
```

```
sub check_num {
   my ($newval) = @_;
   return $newval =~ /^[0-9]*$/ && length($newval) <= 5 ? 1 : 0;
}

$e = $mw->new_ttk__entry(-textvariable => \$num, -validate => 'key', -validatecommand => [\&check_num, Tkx::Ev('%P')]);
$e->g_grid(-column => 0, -row => 0, -sticky => 'we');
```

A few things are worth noting. First, as with event bindings, we can access more information about the conditions that triggered the validation via *percent substitutions*. We used one of these here: `%P` is the new value of the entry *if* the validation passes. We'll use a simple regular expression and a length check to determine if the change is valid. To reject the change, our validation command can return a false value, leaving the entry unchanged.

> Taking advantage of these percent substitutions requires some gymnastics. You'll recall that Tkinter abstracts away percent substitutions in event binding callbacks. All event parameters are wrapped into an event object that is passed to the callback. There's no equivalent abstraction for validation callbacks. Instead, we have to choose which percent substitutions we're interested in. The `register` method (which can be called on any widget, not just `root`) creates a Tcl procedure which will call our Python function. The percent substitutions we've chosen will be passed to it as parameters.

Let's extend our example so that the entry will accept a US zip code, formatted as "#####" or "#####-####" ("#" can be any digit). We'll still do some validation on each keystroke (only allowing entry of numbers or a hyphen). However, We can no longer fully validate the entry on every keystroke; if they've just typed the first digit, it's not valid yet. So full validation will only happen when the entry loses focus (e.g., a user tabs away from it). Tk refers to this as *revalidation*, in contrast with *prevalidation* (accepting changes on each keystroke).

How should we respond to errors? Let's add a message reminding users of the format. It will appear if they type a wrong key or tab away from the entry when it's not holding a valid zip code. We'll remove the message when they return to the entry or type a valid key. We'll also add a (dummy) button to "process" the zip code, which will be disabled unless the zip entry is valid. Finally, we'll also add a "name" entry so you can tab away from the zip entry.

```
import re
errmsg = StringVar()
formatmsg = "Zip should be ##### or #####-####"

def check_zip(newval, op):
    errmsg.set('')
    valid = re.match('^[0-9]{5}(\-[0-9]{4})?$', newval) is not None
    btn.state(['!disabled'] if valid else ['disabled'])
    if op=='key':
        ok_so_far = re.match('^[0-9\-]*$', newval) is not None and len(newval) <= 10
        if not ok_so_far:
            errmsg.set(formatmsg)
        return ok_so_far
    elif op=='focusout':
        if not valid:
            errmsg.set(formatmsg)
    return valid
check_zip_wrapper = (root.register(check_zip), '%P', '%V')

zip = StringVar()
f = ttk.Frame(root)
f.grid(column=0, row=0)
ttk.Label(f, text='Name:').grid(column=0, row=0, padx=5, pady=5)
ttk.Entry(f).grid(column=1, row=0, padx=5, pady=5)
ttk.Label(f, text='Zip:').grid(column=0, row=1, padx=5, pady=5)
e = ttk.Entry(f, textvariable=zip, validate='all', validatecommand=check_zip_wrapper)
e.grid(column=1, row=1, padx=5, pady=5)
btn = ttk.Button(f, text="Process")
btn.grid(column=2, row=1, padx=5, pady=5)
btn.state(['disabled'])
msg = ttk.Label(f, font='TkSmallCaptionFont', foreground='red', textvariable=errmsg)
msg.grid(column=1, row=2, padx=5, pady=5, sticky='w')
```

```
set ::formatmsg "Zip should be ##### or #####-####"
proc check_zip {newval op} {
    set ::errmsg ""
    set valid [expr {[regexp {^[0-9]{5}(\-[0-9]{4})?$} $newval]}]
    .f.btn state [expr {$valid ? "!disabled" : "disabled"}]
    if {$op=="key"} {
        set ok_so_far [expr {[regexp {^[0-9\-]*$} $newval] && [string length $newval]<=10}]
        if {!$ok_so_far} {set ::errmsg $::formatmsg }
        return $ok_so_far
    } elseif {$op=="focusout"} {
        if {!$valid} {set ::errmsg $::formatmsg}
    }
    return $valid
}

grid [ttk::frame .f] -column 0 -row 0
grid [ttk::label .f.l1 -text "Name:"] -column 0 -row 0 -padx 5 -pady 5
grid [ttk::entry .f.e1] -column 1 -row 0 -padx 5 -pady 5
grid [ttk::label .f.l -text "Zip:"] -column 0 -row 1 -padx 5 -pady 5
ttk::entry .f.e -textvariable zip -validate all -validatecommand "check_zip %P %V"
grid .f.e -column 1 -row 1 -padx 5 -pady 5
grid [ttk::button .f.btn -text Process] -column 2 -row 1 -padx 5 -pady 5
.f.btn state disabled
ttk::label .f.msg -font TkSmallCaptionFont -foreground red -textvariable errmsg
grid .f.msg -column 1 -row 2 -padx 5 -pady 5 -sticky w
```

```
$errmsg = TkVariable.new
$formatmsg = "Zip should be ##### or #####-####"
def check_zip(newval, op)
  $errmsg.value = ''
  valid = /^[0-9]{5}(\-[0-9]{4})?$/.match(newval)
  $btn.state(valid ? '!disabled' : 'disabled')
  if op=='key'
    ok_so_far = /^[0-9\-]*$/.match(newval) && newval.length <= 10
    $errmsg.value = $formatmsg if not ok_so_far
    return ok_so_far
  elsif op=='focusout'
    $errmsg.value = $formatmsg if not valid
  end
  return valid
end

zip = TkVariable.new
f = Tk::Tile::Frame.new(root)
f.grid :column => 0, :row =>0
Tk::Tile::Label.new(f) {text 'Name:'}.grid :column => 0, :row => 0, :padx => 5, :pady => 5
Tk::Tile::Entry.new(f).grid :column => 1, :row => 0, :padx => 5, :pady => 5
Tk::Tile::Label.new(f) {text 'Zip:'}.grid :column => 0, :row => 1, :padx => 5, :pady => 5
e = Tk::Tile::Entry.new(f) {textvariable zip; validate 'all'; validatecommand [proc{|v,o| check_zip(v,o)}, '%P', '%V']}
e.grid :column => 1, :row => 1, :padx => 5, :pady => 5
$btn = Tk::Tile::Button.new(f) {text 'Process'}
$btn.grid :column => 2, :row => 1, :padx => 5, :pady => 5
$btn.state 'disabled'
msg = Tk::Tile::Label.new(f) {font 'TkSmallCaptionFont'; foreground 'red'; textvariable $errmsg}
msg.grid :column => 1, :row => 2, :padx => 5, :pady => 5, :sticky => 'w'
```

```perl
our $errmsg = "";
our $formatmsg = "Zip should be ##### or #####-####";

sub check_zip {
   my ($newval,$op) = @_;
   $errmsg = "";
   $valid = $newval =~ /^[0-9]{5}(\-[0-9]{4})?$/;
   $btn->state($valid ? "!disabled" : "disabled");
   if ($op eq "key") {
      $ok_so_far = $newval =~ /^[0-9\-]*$/ && length($newval) <= 10;
      $errmsg = $formatmsg if not $ok_so_far;
      return $ok_so_far ? 1 : 0;
   } elsif ($op eq "focusout") {
      $errmsg = $formatmsg if not $valid;
   }
   return $valid ? 1 : 0;
}

$f = $mw->new_ttk__frame();
$f->g_grid(-column => 0, -row => 0);
$f->new_ttk__label(-text => 'Name:')->g_grid(-column => 0, -row => 0, -padx => 5, -pady => 5);
$f->new_ttk__entry()->g_grid(-column => 1, -row => 0, -padx => 5, -pady => 5);
$f->new_ttk__label(-text => 'Zip:')->g_grid(-column => 0, -row => 1, -padx => 5, -pady => 5);
$e = $f->new_ttk__entry(-textvariable => \$zip, -validate => 'all', -validatecommand => [\&check_zip, Tkx::Ev('%P', '%V')]);
$e->g_grid(-column => 1, -row => 1);
our $btn = $f->new_ttk__button(-text => 'Process:');
$btn->g_grid(-column => 2, -row => 1, -padx => 5, -pady => 5);
$btn->state('disabled');
$msg = $f->new_ttk__label(-font => 'TkSmallCaptionFont', -foreground => 'red', -textvariable => \$errmsg);
$msg->g_grid(-column => 1, -row => 2, -padx => 5, -pady => 5, -sticky => 'w');
```

Notice that the `validate` configuration option has been changed from `key` to `all`. That arranges for the `validatecommand` callback to be invoked on not only keystrokes but other triggers. The trigger is passed to the callback using the `%V` percent substitution. The callback differentiated between `key` and `focusout` triggers (you can also check for `focusin`).

There are a few more things to know about validation. First, if your `validatecommand` ever generates an error (or doesn't return a boolean), validation will be disabled for that widget. Your callback can modify the entry, e.g., change its textvariable. You can ask the widget to validate at any time by calling its `validate` method, which returns true if validation passes (the `%V` substitution is set to `forced`).

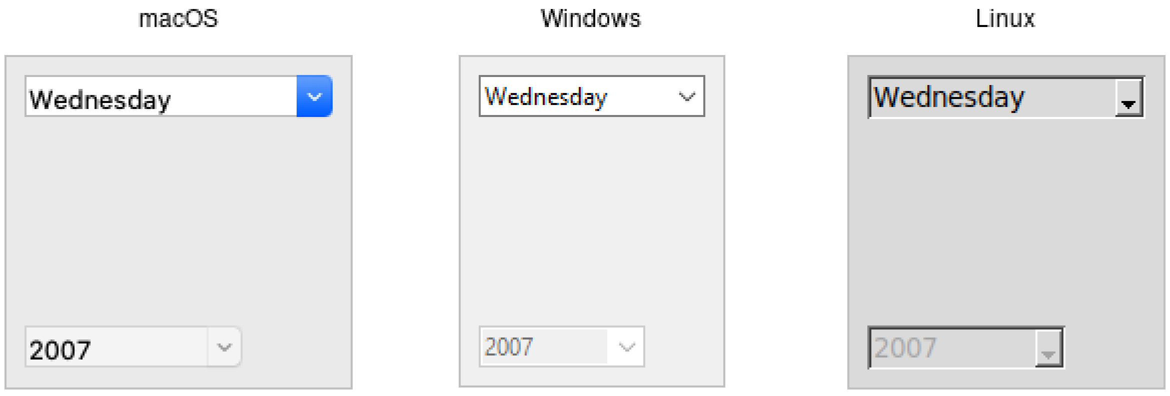
There is an `invalidcommand` configuration option (which works like `validatecommand`) that is called whenever validation fails. You can use it to accomplish nasty things like forcing the focus back on the widget that didn't validate. In practice, it's rarely used. As mentioned earlier, the entry's `invalid` state flag (which can be checked via the `instate invalid` method) is automatically updated as validation succeeds or fails.

Other percent substitutions allow you to get the entry's contents prior to editing (`%s`), differentiate between insert and delete (`%d`), where an insert or delete occurs (`%i`), what is being inserted or deleted (`%S`), the current setting of the `validate` option (`%v`) and the name of the widget (`%W`).

Combobox

- Widget Roundup
- Reference Manual

A **combobox** widget combines an entry with a list of choices. This lets users either choose from a set of values you've provided (e.g., typical settings), but also put in their own value (e.g., for less common cases).



Combobox widgets.

Comboboxes are created using the `ttk.Combobox` class:

```
countryvar = StringVar()
country = ttk.Combobox(parent, textvariable=countryvar)
```

Comboboxes are created using the **`ttk::combobox`** command:

```
ttk::combobox .country -textvariable country
```

Comboboxes are created using the **`Tk::Tile::Combobox`** class:

```
$countryvar = TkVariable.new
country = Tk::Tile::Combobox.new(parent) { textvariable $countryvar }
```

Comboboxes are created using the **`new_ttk__combobox`** method, a.k.a. **`Tkx::ttk__combobox`**:

```
$country = $parent->new_ttk__combobox(-textvariable => \$countryvar);
```

Like entries, the `textvariable` option links a variable in your program to the current value of the combobox. As with other widgets, you should initialize the linked variable in your own code.

A combobox will generate a `<<ComboboxSelected>>` virtual event that you can bind to whenever its value changes. (You could also trace changes on the `textvariable`, as we've seen in the previous few widgets we covered. Binding to the event is more straightforward, and so tends to be our preferred choice.)

```
country.bind('<<ComboboxSelected>>', function)
```

```
bind .country <<ComboboxSelected>> { script }
```

```
country.bind("<ComboboxSelected>") { script }
```

```
$country->g_bind("<<ComboboxSelected>>", sub { script });
```

Predefined Values

You can provide a list of values that users can choose from using the `values` configuration option:

```
country['values'] = ('USA', 'Canada', 'Australia')
```

```
.country configure -values [list USA Canada Australia]
```

```
country['values'] = [ 'USA', 'Canada', 'Australia']
```

```
$country->configure(-values => "USA Canada Australia");
```

If set, the `readonly` state flag will restrict users to making choices only from the list of predefined values but not be able to enter their own (though if the current value of the combobox is not in the list, it won't be changed).

```
country.state(["readonly"])
```

```
.country state readonly
```

```
country.state('readonly')
```

```
$country->state("readonly");
```

> *If you're using the combobox in `readonly` mode, I'd recommend that when the value changes (i.e., on a `<<ComboboxSelected>>` event), that you call the `selection_clear` method. It looks a bit odd visually without doing that.*

You can also get the current value using the `get` method and change the current value using the `set` method (which takes a single argument, the new value).

To complement the `get` and `set` methods, you can also use the `current` method to determine which item in the predefined values list is selected. Call `current` with no arguments; it will return a 0-based index into the list or -1 if the current value is not in the list. You can select an item in the list by calling `current` with a single 0-based index argument.

Want to associate some other value with each item in the list so that your program can use one value internally, but it gets displayed in the combobox as something else? You'll want to have a look at the section entitled "Keeping Extra Item Data" when we get to the discussion of listboxes in a couple of chapters from now.

Previous: Tk Concepts | Contents | Single Page | Next: The Grid Geometry Manager

Spotted a mistake? Couldn't find what you were looking for? Suggestions? Let me know!

If you've found this tutorial useful, please check out Modern Tkinter.

Essentials: Tutorial Installing Book Backgrounder Reference