The Racket Graphical Interface Toolkit

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`(require racket/gui/base)` package: `gui-lib`

The `racket/gui/base` library provides all of the class, interface, and procedure bindings defined in this manual, in addition to the bindings of `racket/draw` and `file/resource`.

`#lang racket/gui` package: `gui-lib`

The `racket/gui` language combines all bindings of the `racket` language and the `racket/gui/base` and `racket/draw` modules.

The `racket/gui` toolbox is roughly organized into two parts:

- The *windowing toolbox*, for implementing windows, buttons, menus, text fields, and other controls.
- The *editor toolbox*, for developing traditional text editors, editors that mix text and graphics, or free-form layout editors (such as a word processor, HTML editor, or icon-based file browser).

Both parts of the toolbox rely extensively on the `racket/draw` drawing library.

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1 Windowing

The windowing toolbox provides the basic building blocks of GUI programs, including frames (top-level windows), modal dialogs, menus, buttons, check boxes, text fields, and radio buttons—all as classes.

See §13 “Classes and Objects” for an introduction to classes and interfaces in Racket.

1.1 Creating Windows

To create a new top-level window, instantiate the `frame%` class:

```
; Make a frame by instantiating the frame% class
(define frame (new frame% [label "Example"]))

; Show the frame by calling its show method
(send frame show #t)
```

The built-in classes provide various mechanisms for handling GUI events. For example, when instantiating the `button%` class, supply an event callback procedure to be invoked when the user clicks the button. The following example program creates a frame with a text message and a button; when the user clicks the button, the message changes:

```
; Make a frame by instantiating the frame% class
(define frame (new frame% [label "Example"]))

; Make a static text message in the frame
(define msg (new message% [parent frame]
                          [label "No events so far..."]))

; Make a button in the frame
(new button% [parent frame]
             [label "Click Me"]
             ; Callback procedure for a button click:
             [callback (lambda (button event)
                         (send msg set-label "Button click"))])

; Show the frame by calling its show method
(send frame show #t)
```

Programmers never implement the GUI event loop directly. Instead, the windowing system automatically pulls each event from an internal queue and dispatches the event to an appropriate window. The dispatch invokes the window’s callback procedure or calls one of the window’s methods. In the above program, the windowing system automatically invokes the button’s callback procedure whenever the user clicks Click Me.

If a window receives multiple kinds of events, the events are dispatched to methods of the window's class instead of to a callback procedure. For example, a drawing canvas receives update events, mouse events, keyboard events, and sizing events; to handle them, derive a new class from the built-in canvas% class and override the event-handling methods. The following expression extends the frame created above with a canvas that handles mouse and keyboard events:

```
; Derive a new canvas (a drawing window) class to handle events
(define my-canvas%
  (class canvas% ; The base class is canvas%
    ; Define overriding method to handle mouse events
    (define/override (on-event event)
      (send msg set-label "Canvas mouse"))
    ; Define overriding method to handle keyboard events
    (define/override (on-char event)
      (send msg set-label "Canvas keyboard"))
    ; Call the superclass init, passing on all init args
    (super-new)))

; Make a canvas that handles events in the frame
(new my-canvas% [parent frame])
```

After running the above code, manually resize the frame to see the new canvas. Moving the cursor over the canvas calls the canvas's on-event method with an object representing a motion event. Clicking on the canvas calls on-event. While the canvas has the keyboard focus, typing on the keyboard invokes the canvas's on-char method.

The windowing system dispatches GUI events sequentially; that is, after invoking an event-handling callback or method, the windowing system waits until the handler returns before dispatching the next event. To illustrate the sequential nature of events, extend the frame again, adding a Pause button:

```
(new button% [parent frame]
             [label "Pause"]
             [callback (lambda (button event) (sleep 5))])
```

After the user clicks Pause, the entire frame becomes unresponsive for five seconds; the windowing system cannot dispatch more events until the call to sleep returns. For more information about event dispatching, see §1.6 "Event Dispatching and Eventspaces".

In addition to dispatching events, the GUI classes also handle the graphical layout of windows. Our example frame demonstrates a simple layout; the frame's elements are lined up top-to-bottom. In general, a programmer specifies the layout of a window by assigning each GUI element to a parent container. A vertical container, such as a frame, arranges its children in a column, and a horizontal container arranges its children in a row. A container can

be a child of another container; for example, to place two buttons side-by-side in our frame, create a horizontal panel for the new buttons:

```
(define panel (new horizontal-panel% [parent frame]))
(new button% [parent panel]
             [label "Left"]
             [callback (lambda (button event)
                         (send msg set-label "Left click"))])
(new button% [parent panel]
             [label "Right"]
             [callback (lambda (button event)
                         (send msg set-label "Right click"))])
```

For more information about window layout and containers, see §1.4 “Geometry Management”.

1.2 Drawing in Canvases

The content of a canvas is determined by its `on-paint` method, where the default `on-paint` calls the `paint-callback` function that is supplied when the canvas is created. The `on-paint` method receives no arguments and uses the canvas’s `get-dc` method to obtain a drawing context (DC) for drawing; the default `on-paint` method passes the canvas and this DC on to the `paint-callback` function. Drawing operations of the `racket/draw` toolbox on the DC are reflected in the content of the canvas onscreen.

For example, the following program creates a canvas that displays large, friendly letters:

```
(define frame (new frame%
                   [label "Example"]
                   [width 300]
                   [height 300]))
(new canvas% [parent frame]
             [paint-callback
              (lambda (canvas dc)
                (send dc set-scale 3 3)
                (send dc set-text-foreground "blue")
                (send dc draw-text "Don't Panic!" 0 0))])
(send frame show #t)
```

The background color of a canvas can be set through the `set-canvas-background` method. To make the canvas transparent (so that it takes on its parent’s color and texture as its initial content), supply `'transparent` in the `style` argument when creating the canvas.

See §1 “Overview” in *The Racket Drawing Toolkit* for an overview of drawing with the

racket/draw library. For more advanced information on canvas drawing, see §1.7 “Animation in Canvases”.

1.3 Core Windowing Classes

The fundamental graphical element in the windowing toolbox is an *area*. The following classes implement the different types of areas in the windowing toolbox:

- *Containers* — areas that can contain other areas:
  - frame% — a *frame* is a top-level window that the user can move and resize.
  - dialog% — a *dialog* is a modal top-level window; when a dialog is shown, other top-level windows are disabled until the dialog is dismissed.
  - panel% — a *panel* is a subcontainer within a container. The toolbox provides three subclasses of panel%: vertical-panel%, horizontal-panel%, and tab-panel%.
  - pane% — a *pane* is a lightweight panel. It has no graphical representation or event-handling capabilities. The pane% class has three subclasses: vertical-pane%, horizontal-pane%, and grow-box-spacer-pane%.
- *Containees* — areas that must be contained within other areas:
  - panel% — a panel is a containee as well as a container.
  - pane% — a pane is a containee as well as a container.
  - canvas% — a *canvas* is a subwindow for drawing on the screen.
  - editor-canvas% — an *editor canvas* is a subwindow for displaying a text editor or pasteboard editor. The editor-canvas% class is documented with the editor classes in §5 “Editors”.
  - *Controls* — containees that the user can manipulate:
    - message% — a *message* is a static text field or bitmap with no user interaction.
    - button% — a *button* is a clickable control.
    - check-box% — a *check box* is a clickable control; the user clicks the control to set or remove its check mark.
    - radio-box% — a *radio box* is a collection of mutually exclusive *radio buttons*; when the user clicks a radio button, it is selected and the radio box’s previously selected radio button is deselected.
    - choice% — a *choice item* is a pop-up menu of text choices; the user selects one item in the control.
    - list-box% — a *list box* is a scrollable lists of text choices; the user selects one or more items in the list (depending on the style of the list box).

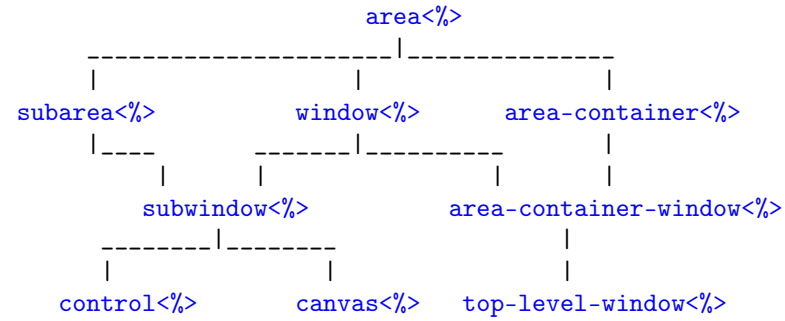
* text-field% — a *text field* is a box for simple text entry.
* combo-field% — a *combo field* combines a text field with a pop-up menu of choices.
* slider% — a *slider* is a dragable control that selects an integer value within a fixed range.
* gauge% — a *gauge* is an output-only control (the user cannot change the value) for reporting an integer value within a fixed range.

As suggested by the above listing, certain areas, called containers, manage certain other areas, called containees. Some areas, such as panels, are both containers and containees.

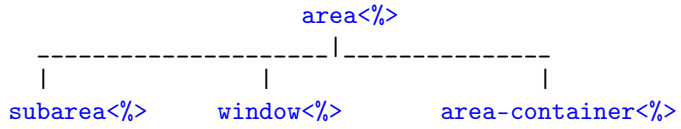
Most areas are *windows*, but some are *non-windows*. A window, such as a panel, has a graphical representation, receives keyboard and mouse events, and can be disabled or hidden. In contrast, a non-window, such as a pane, is useful only for geometry management; a non-window does not receive mouse events, and it cannot be disabled or hidden.

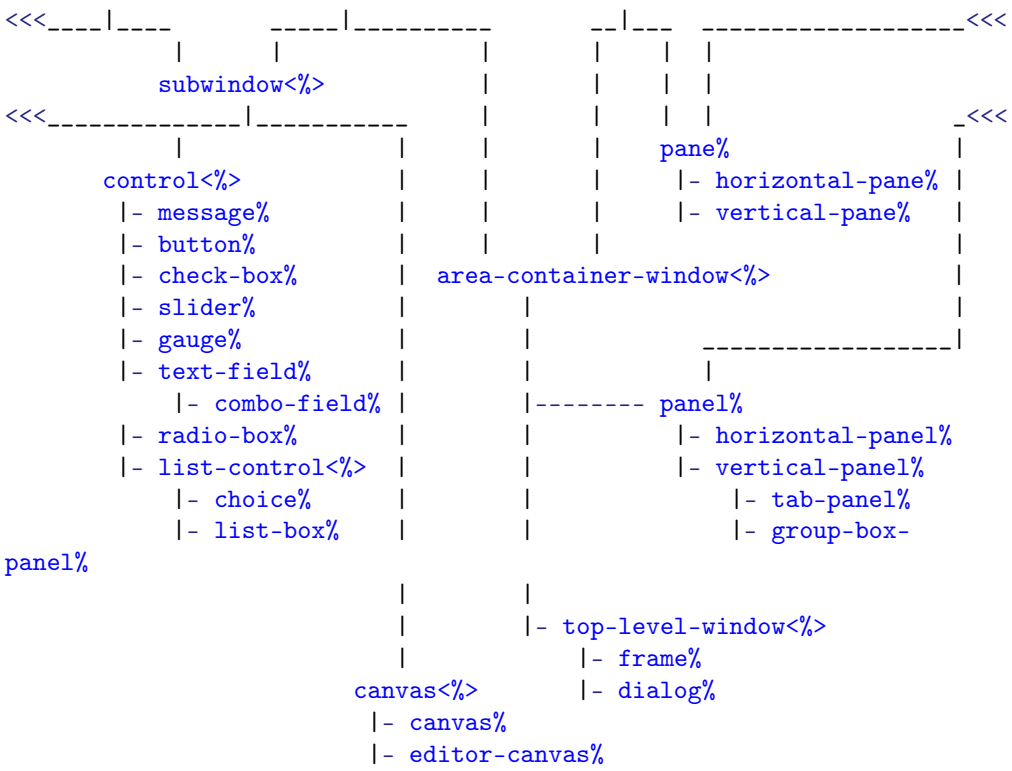
Every area is an instance of the area<%> interface. Each container is also an instance of the area-container<%> interface, whereas each containee is an instance of subarea<%>. Windows are instances of window<%>. The area-container<%>, subarea<%>, and window<%> interfaces are subinterfaces of area<%>.

The following diagram shows more of the type hierarchy under area<%>:



The diagram below extends the one above to show the complete type hierarchy under area<%>. (Some of the types are represented by interfaces, and some types are represented by classes. In principle, every area type should be represented by an interface, but whenever the windowing toolbox provides a concrete implementation, the corresponding interface is omitted from the toolbox.) To avoid intersecting lines, the hierarchy is drawn for a cylindrical surface; lines from subarea<%> and subwindow<%> wrap from the left edge of the diagram to the right edge.



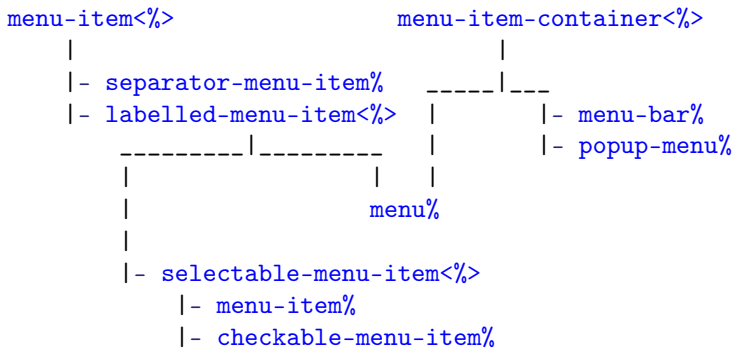


Menu bars, menus, and menu items are graphical elements, but not areas (i.e., they do not have all of the properties that are common to areas, such as an adjustable graphical size). Instead, the menu classes form a separate container–containee hierarchy:

- *Menu Item Containers*
  - `menu-bar%` — a *menu bar* is a top-level collection of menus that are associated with a frame.
  - `menu%` — a *menu* contains a set of menu items. The menu can appear in a menu bar, in a popup menu, or as a submenu in another menu.
  - `popup-menu%` — a *popup menu* is a top-level menu that is dynamically displayed in a canvas or editor canvas.
- *Menu Items*
  - `separator-menu-item%` — a *separator* is an unselectable line in a menu or popup menu.
  - `menu-item%` — a *plain menu item* is a selectable text item in a menu. When the item is selected, its callback procedure is invoked.
  - `checkable-menu-item%` — a *checkable menu item* is a text item in a menu; the user selects a checkable menu item to toggle a check mark next to the item.

– menu% — a menu is a menu item as well as a menu item container.

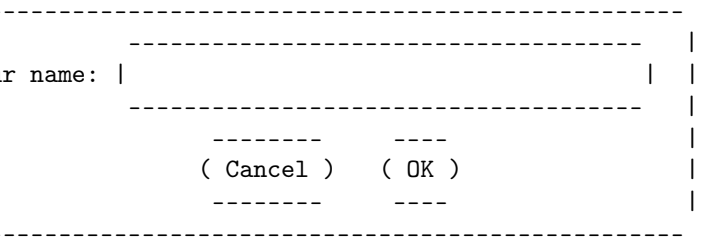
The following diagram shows the complete type hierarchy for the menu system:



1.4 Geometry Management

The windowing toolbox's geometry management makes it easy to design windows that look right on all platforms, despite different graphical representations of GUI elements. Geometry management is based on containers; each container arranges its children based on simple constraints, such as the current size of a frame and the natural size of a button.

The built-in container classes include horizontal panels (and panes), which align their children in a row, and vertical panels (and panes), which align their children in a column. By nesting horizontal and vertical containers, a programmer can achieve most any layout. For example, to construct a dialog with the shape



with the following program:

```
; Create a dialog
(define dialog (instantiate dialog% ("Example")))

; Add a text field to the dialog
(new text-field% [parent dialog] [label "Your name"])
```

```
; Add a horizontal panel to the dialog, with centering for buttons
(define panel (new horizontal-panel% [parent dialog]
                                     [alignment '(center center)]))

; Add Cancel and Ok buttons to the horizontal panel
(new button% [parent panel] [label "Cancel"])
(new button% [parent panel] [label "Ok"])
(when (system-position-ok-before-cancel?)
  (send panel change-children reverse))

; Show the dialog
(send dialog show #t)
```

Each container arranges its children using the natural size of each child, which usually depends on instantiation parameters of the child, such as the label on a button or the number of choices in a radio box. In the above example, the dialog stretches horizontally to match the minimum width of the text field, and it stretches vertically to match the total height of the field and the buttons. The dialog then stretches the horizontal panel to fill the bottom half of the dialog. Finally, the horizontal panel uses the sum of the buttons' minimum widths to center them horizontally.

As the example demonstrates, a stretchable container grows to fill its environment, and it distributes extra space among its stretchable children. By default, panels are stretchable in both directions, whereas buttons are not stretchable in either direction. The programmer can change whether an individual GUI element is stretchable.

The following subsections describe the container system in detail, first discussing the attributes of a containee in §1.4.1 "Containees", and then describing the attributes of a container in §1.4.2 "Containers". In addition to the built-in vertical and horizontal containers, programmers can define new types of containers as discussed in the final subsection, §1.4.3 "Defining New Types of Containers".

1.4.1 Containees

Each containee, or child, has the following properties:

- a *graphical minimum width* and a *graphical minimum height*;
- a *requested minimum width* and a *requested minimum height*;
- horizontal and vertical *stretchability* (on or off); and
- horizontal and vertical margins.

A container arranges its children based on these four properties of each containee. A containee's parent container is specified when the containee is created. A window containee can be hidden or deleted within its parent, and its parent can be changed by reparenting.

The *graphical minimum size* of a particular containee, as reported by `get-graphical-min-size`, depends on the platform, the label of the containee (for a control), and style attributes specified when creating the containee. For example, a button's minimum graphical size ensures that the entire text of the label is visible. The graphical minimum size of a control (such as a button) cannot be changed; it is fixed at creation time. (A control's minimum size is *not* recalculated when its label is changed.) The graphical minimum size of a panel or pane depends on the total minimum size of its children and the way that they are arranged.

To select a size for a containee, its parent container considers the containee's *requested minimum size* rather than its graphical minimum size (assuming the requested minimum is larger than the graphical minimum). Unlike the graphical minimum, the requested minimum size of a containee can be changed by a programmer at any time using the `min-width` and `min-height` methods.

Unless a containee is stretchable (in a particular direction), it always shrinks to its minimum size (in the corresponding direction). Otherwise, containees are stretched to fill all available space in a container. Each containee begins with a default stretchability. For example, buttons are not initially stretchable, whereas a one-line text field is initially stretchable in the horizontal direction. A programmer can change the stretchability of a containee at any time using the `stretchable-width` and `stretchable-height` methods.

A *margin* is space surrounding a containee. Each containee's margin is independent of its minimum size, but from the container's point of view, a margin effectively increases the minimum size of the containee. For example, if a button has a vertical margin of `2`, then the container must allocate enough room to leave two pixels of space above and below the button, in addition to the space that is allocated for the button's minimum height. A programmer can adjust a containee's margin with `horiz-margin` and `vert-margin`. The default margin is `2` for a control, and `0` for any other type of containee.

In practice, the requested minimum size and margin of a control are rarely changed, although they are often changed for a canvas. Stretchability is commonly adjusted for any type of containee, depending on the visual effect desired by the programmer.

1.4.2 Containers

A container has the following properties:

- a list of (non-deleted) children containees;
- a requested minimum width and a requested minimum height;
- a spacing used between the children;

- a border margin used around the total set of children;
- horizontal and vertical stretchability (on or off); and
- an alignment setting for positioning leftover space.

These properties are factored into the container's calculation of its own size and the arrangement of its children. For a container that is also a containee (e.g., a panel), the container's requested minimum size and stretchability are the same as for its containee aspect.

A containee's parent container is specified when the containee is created. A containee window can be hidden or deleted within its parent container, and its parent can be changed by reparenting (but a non-window containee cannot be hidden, deleted, or reparented):

- A *hidden* child is invisible to the user, but space is still allocated for each hidden child within a container. To hide or show a child, call the child's `show` method.
- A *deleted* child is hidden *and* ignored by container as it arranges its other children, so no space is reserved in the container for a deleted child. To make a child deleted or non-deleted, call the container's `delete-child` or `add-child` method (which calls the child's `show` method).
- To *reparent* a window containee, use the `reparent` method. The window retains its hidden or deleted status within its new parent.

When a child is created, it is initially shown and non-deleted. A deleted child is subject to garbage collection when no external reference to the child exists. A list of non-deleted children (hidden or not) is available from a container through its `get-children` method.

The order of the children in a container's non-deleted list is significant. For example, a vertical panel puts the first child in its list at the top of the panel, and so on. When a new child is created, it is put at the end of its container's list of children. The order of a container's list can be changed dynamically via the `change-children` method. (The `change-children` method can also be used to activate or deactivate children.)

The graphical minimum size of a container, as reported by `get-graphical-min-size`, is calculated by combining the minimum sizes of its children (summing them or taking the maximum, as appropriate to the layout strategy of the container) along with the spacing and border margins of the container. A larger minimum may be specified by the programmer using `min-width` and `min-height` methods; when the computed minimum for a container is larger than the programmer-specified minimum, then the programmer-specified minimum is ignored.

A container's spacing determines the amount of space left between adjacent children in the container, in addition to any space required by the children's margins. A container's border margin determines the amount of space to add around the collection of children; it effectively

decreases the area within the container where children can be placed. A programmer can adjust a container's border and spacing dynamically via the `border` and `spacing` methods. The default border and spacing are `0` for all container types.

Because a panel or pane is a containee as well as a container, it has a containee margin in addition to its border margin. For a panel, these margins are not redundant because the panel can have a graphical border; the border is drawn inside the panel's containee margin, but outside the panel's border margin.

For a top-level-window container, such as a frame or dialog, the container's stretchability determines whether the user can resize the window to something larger than its minimum size. Thus, the user cannot resize a frame that is not stretchable. For other types of containers (i.e., panels and panes), the container's stretchability is its stretchability as a containee in some other container. All types of containers are initially stretchable in both directions—except instances of `grow-box-spacer-pane%`, which is intended as a lightweight spacer class rather than a useful container class—but a programmer can change the stretchability of an area at any time via the `stretchable-width` and `stretchable-height` methods.

The alignment specification for a container determines how it positions its children when the container has leftover space. (A container can only have leftover space in a particular direction when none of its children are stretchable in that direction.) For example, when the container's horizontal alignment is `'left`, the children are left-aligned in the container and leftover space is accumulated to the right. When the container's horizontal alignment is `'center`, each child is horizontally centered in the container. A container's alignment is changed with the `set-alignment` method.

1.4.3 Defining New Types of Containers

Although nested horizontal and vertical containers can express most layout patterns, a programmer can define a new type of container with an explicit layout procedure. A programmer defines a new type of container by deriving a class from `panel%` or `pane%` and overriding the `container-size` and `place-children` methods. The `container-size` method takes a list of size specifications for each child and returns two values: the minimum width and height of the container. The `place-children` method takes the container's size and a list of size specifications for each child, and returns a list of sizes and placements (in parallel to the original list).

An input size specification is a list of four values:

- the child's minimum width;
- the child's minimum height;
- the child's horizontal stretchability (`#t` means stretchable, `#f` means not stretchable); and

- the child's vertical stretchability.

For `place-children`, an output position and size specification is a list of four values:

- the child's new horizontal position (relative to the parent);
- the child's new vertical position;
- the child's new actual width;
- the child's new actual height.

The widths and heights for both the input and output include the children's margins. The returned position for each child is automatically incremented to account for the child's margin in placing the control.

1.5 Mouse and Keyboard Events

Whenever the user moves the mouse, clicks or releases a mouse button, or presses a key on the keyboard, an event is generated for some window. The window that receives the event depends on the current state of the graphic display:

- The receiving window of a mouse event is usually the window under the cursor when the mouse is moved or clicked. If the mouse is over a child window, the child window receives the event rather than its parent.

  When the user clicks in a window, the window "grabs" the mouse, so that *all* mouse events go to that window until the mouse button is released (regardless of the location of the cursor). As a result, a user can click on a scrollbar thumb and drag it without keeping the cursor strictly inside the scrollbar control.

  A mouse button-release event is normally generated for each mouse button-down event, but a button-release event might get dropped. For example, a modal dialog might appear and take over the mouse. More generally, any kind of mouse event can get dropped in principle, so avoid algorithms that depend on precise mouse-event sequences. For example, a mouse tracking handler should reset the tracking state when it receives an event other than a dragging event.

- The receiving window of a keyboard event is the window that owns the *keyboard focus* at the time of the event. Only one window owns the focus at any time, and focus ownership is typically displayed by a window in some manner. For example, a text field control shows focus ownership by displaying a blinking caret.

  Within a top-level window, only certain kinds of subwindows can have the focus, depending on the conventions of the platform. Furthermore, the subwindow that initially

owns the focus is platform-specific. A user can moves the focus in various ways, usually by clicking the target window. A program can use the `focus` method to move the focus to a subwindow or to set the initial focus.

A `'wheel-up` or `'wheel-down` event may be sent to a window other than the one with the keyboard focus, depending on how the operating system handles wheel events.

A key-press event may correspond to either an actual key press or an auto-key repeat. Multiple key-press events without intervening key-release events normally indicate an auto-key. Like any input event, however, key-release events sometimes get dropped (e.g., due to the appearance of a modal dialog).

Controls, such as buttons and list boxes, handle keyboard and mouse events automatically, eventually invoking the callback procedure that was provided when the control was created. A canvas propagates mouse and keyboard events to its `on-event` and `on-char` methods, respectively.

A mouse and keyboard event is delivered in a special way to its window. Each ancestor of the receiving window gets a chance to intercept the event through the `on-subwindow-event` and `on-subwindow-char` methods. See the method descriptions for more information.

The default `on-subwindow-char` method for a top-level window intercepts keyboard events to detect menu-shortcut events and focus-navigation events. See `on-subwindow-char` in `frame%` and `on-subwindow-char` in `dialog%` for details. Certain OS-specific key combinations are captured at a low level, and cannot be overridden. For example, on Windows and Unix, pressing and releasing Alt always moves the keyboard focus to the menu bar. Similarly, Alt-Tab switches to a different application on Windows. (Alt-Space invokes the system menu on Windows, but this shortcut is implemented by `on-system-menu-char`, which is called by `on-subwindow-char` in `frame%` and `on-subwindow-char` in `dialog%`.)

1.6 Event Dispatching and Eventspaces

A graphical user interface is an inherently multi-threaded system: one thread is the program managing windows on the screen, and the other thread is the user moving the mouse and typing at the keyboard. GUI programs typically use an *event queue* to translate this multi-threaded system into a sequential one, at least from the programmer's point of view. Each user action is handled one at a time, ignoring further user actions until the previous one is completely handled. The conversion from a multi-threaded process to a single-threaded one greatly simplifies the implementation of GUI programs.

Despite the programming convenience provided by a purely sequential event queue, certain situations require a less rigid dialog with the user:

- *Nested event handling:* In the process of handling an event, it may be necessary to obtain further information from the user. Usually, such information is obtained via

a modal dialog; in whatever fashion the input is obtained, more user events must be received and handled before the original event is completely handled. To allow the further processing of events, the handler for the original event must explicitly *yield* to the system. Yielding causes events to be handled in a nested manner, rather than in a purely sequential manner.

- *Asynchronous event handling:* An application may consist of windows that represent independent dialogs with the user. For example, a drawing program might support multiple drawing windows, and a particularly time-consuming task in one window (e.g., a special filter effect on an image) should not prevent the user from working in a different window. Such an application needs sequential event handling for each individual window, but asynchronous (potentially parallel) event handling across windows. In other words, the application needs a separate event queue for each window, and a separate event-handling thread for each event queue.

An *eventspace* is a context for processing GUI events. Each eventspace maintains its own queue of events, and events in a single eventspace are dispatched sequentially by a designated *handler thread*. An event-handling procedure running in this handler thread can yield to the system by calling `yield`, in which case other event-handling procedures may be called in a nested (but single-threaded) manner within the same handler thread. Events from different eventspaces are dispatched asynchronously by separate handler threads.

When a frame or dialog is created without a parent, it is associated with the current eventspace as described in §1.6.3 "Creating and Setting the Eventspace". Events for a top-level window and its descendants are always dispatched in the window's eventspace. Every dialog is modal; a dialog's `show` method implicitly calls `yield` to handle events while the dialog is shown. (See also §1.6.2 "Eventspaces and Threads" for information about threads and modal dialogs.) Furthermore, when a modal dialog is shown, the system disables key and mouse press/release events to other top-level windows in the dialog's eventspace, but windows in other eventspaces are unaffected by the modal dialog. (Mouse motion, enter, and leave events are still delivered to all windows when a modal dialog is shown.)

1.6.1 Event Types and Priorities

In addition to events corresponding to user and windowing actions, such as button clicks, key presses, and updates, the system dispatches two kinds of internal events: timer events and explicitly queued events.

Timer events are created by instances of `timer%`. When a timer is started and then expires, the timer queues an event to call the timer's `notify` method. Like a top-level window, each timer is associated with a particular eventspace (the current eventspace as described in §1.6.3 "Creating and Setting the Eventspace") when it is created, and the timer queues the event in its eventspace.

Explicitly queued events are created with `queue-callback`, which accepts a callback pro-

cedure to handle the event. The event is enqueued in the current eventspace at the time of the call to `queue-callback`, with either a high or low priority as specified by the (optional) second argument to `queue-callback`.

An eventspace's event queue is actually a priority queue with events sorted according to their kind, from highest-priority (dispatched first) to lowest-priority (dispatched last):

- High-priority events installed with `queue-callback` have the highest priority.
- Timer events via `timer%` have the second-highest priority.
- Window-refresh events have the third-highest priority.
- Input events, such as mouse clicks or key presses, have the second-lowest priority.
- Low-priority events installed with `queue-callback` have the lowest priority.

Although a programmer has no direct control over the order in which events are dispatched, a programmer can control the timing of dispatches by setting the *event dispatch handler* via the `event-dispatch-handler` parameter. This parameter and other eventspace procedures are described in more detail in §4.2 "Eventspaces".

1.6.2 Eventspaces and Threads

When a new eventspace is created, a corresponding handler thread is created for the eventspace. The initial eventspace does not create a new handler thread, but instead uses the thread where `racket/gui/base` is instantiated as the initial eventspace's handler thread; see also §12 "Startup Actions".

When the system dispatches an event for an eventspace, it always does so in the eventspace's handler thread. A handler procedure can create new threads that run indefinitely, but as long as the handler thread is running a handler procedure, no new events can be dispatched for the corresponding eventspace.

When a handler thread shows a dialog, the dialog's `show` method implicitly calls `yield` for as long as the dialog is shown. When a non-handler thread shows a dialog, the non-handler thread simply blocks until the dialog is dismissed. Calling `yield` with no arguments from a non-handler thread has no effect. Calling `yield` with a semaphore from a non-handler thread is equivalent to calling `semaphore-wait`.

Windowing functions and methods from `racket/gui/base` can be called in any thread, but beware of creating race conditions among the threads or with the handler thread:

- Although graphical objects are thread-safe, callbacks or other event handlers might see changing object states if graphical elements are manipulated in multiple threads.

- Editor classes have specific threading constraints. See §5.10 “Editors and Threads”.

Because it’s easy to create confusing race conditions by manipulating GUI elements in a non-handler thread (while callbacks might run in the handler thread), it’s best to instead perform all GUI setup and manipulations in the handler thread. The `queue-callback` function can be helpful to schedule work in the handler thread from any other thread. When already running in the handler thread, use `yield` to wait on non-GUI events while allowing GUI events to proceed.

1.6.3 Creating and Setting the Eventspace

Whenever a frame, dialog, or timer is created, it is associated with the *current eventspace* as determined by the `current-eventspace` parameter (see §11.3.2 “Parameters”).

The `make-eventspace` procedure creates a new eventspace. The following example creates a new eventspace and a new frame in the eventspace (the `parameterize` syntactic form temporary sets a parameter value):

```
(let ([new-es (make-eventspace)])
  (parameterize ([current-eventspace new-es])
    (new frame% [label "Example"])))
```

When an eventspace is created, it is placed under the management of the current custodian. When a custodian shuts down an eventspace, all frames and dialogs associated with the eventspace are destroyed (without calling `can-close?` or `on-close` in `top-level-window<%>`), all timers in the eventspace are stopped, and all enqueued callbacks are removed. Attempting to create a new window, timer, or explicitly queued event in a shut-down eventspace raises the `exn:fail` exception.

An eventspace is a synchronizable event (not to be confused with a GUI event), so it can be used with `sync`. As a synchronizable event, an eventspace is in a blocking state when a frame is visible, a timer is active, a callback is queued, or a `menu-bar%` is created with a `'root` parent. Note that the blocking state of an eventspace is unrelated to whether an event is ready for dispatching. Note also that an eventspace is not necessarily in a blocking state while an event is being handled, timer is firing, or callback is being run, and an eventspace may be left in a block state if its handler thread has terminated.

1.6.4 Continuations and Event Dispatch

Whenever the system dispatches an event, the call to the handler is wrapped with a *continuation prompt* (see `call-with-continuation-prompt`) that delimits continuation aborts (such as when an exception is raised) and continuations captured by the handler. The de-

limited continuation prompt is installed outside the call to the event dispatch handler, so any captured continuation includes the invocation of the event dispatch handler.

For example, if a button callback raises an exception, then the abort performed by the default exception handler returns to the event-dispatch point, rather than terminating the program or escaping past an enclosing `(yield)`. If `with-handlers` wraps a `(yield)` that leads to an exception raised by a button callback, however, the exception can be captured by the `with-handlers`.

Along similar lines, if a button callback captures a continuation (using the default continuation prompt tag), then applying the continuation re-installs only the work to be done by the handler up until the point that it returns; the dispatch machinery to invoke the button callback is not included in the continuation. A continuation captured during a button callback is therefore potentially useful outside of the same callback.

1.6.5 Logging

The GUI system logs the timing of when events are handled and how long they take to be handled. Each event that involves a callback into Racket code has two events logged, both of which use the `gui-event` struct:

```
(struct gui-event (start end name) #:prefab)
```

The *`start`* field is the result of `(current-inexact-milliseconds)` when the event handling starts. The *`end`* field is `#f` for the log message when the event handling starts, and the result of `(current-inexact-milliseconds)` when it finishes for the log message when an event finishes. The *`name`* field is the name of the function that handled the event; in the case of a `queue-callback`-based event, it is the name of the thunk passed to `queue-callback`.

1.7 Animation in Canvases

The content of a canvas is buffered, so if a canvas must be redrawn, the `on-paint` method or `paint-callback` function usually does not need to be called again. To further reduce flicker, while the `on-paint` method or `paint-callback` function is called, the windowing system avoids flushing the canvas-content buffer to the screen.

Canvas content can be updated at any time by drawing with the result of the canvas's `get-dc` method, and drawing is thread-safe. Changes to the canvas's content are flushed to the screen periodically (not necessarily on an event-handling boundary), but the `flush` method immediately flushes to the screen—as long as flushing has not been suspended. The `suspend-flush` and `resume-flush` methods suspend and resume both automatic and explicit flushes, although on some platforms, automatic flushes are forced in rare cases.

For most animation purposes, `suspend-flush`, `resume-flush`, and `flush` can be used to avoid flicker and the need for an additional drawing buffer for animations. During an animation, bracket the construction of each animation frame with `suspend-flush` and `resume-flush` to ensure that partially drawn frames are not flushed to the screen. Use `flush` to ensure that canvas content is flushed when it is ready if a `suspend-flush` will soon follow, because the process of flushing to the screen can be starved if flushing is frequently suspended. The method `refresh-now` in `canvas%` conveniently encapsulates this sequence.

1.8 Screen Resolution and Text Scaling

On Mac OS, screen sizes are described to users in terms of drawing units. A Retina display provides two pixels per drawing unit, while drawing units are used consistently for window sizes, child window positions, and canvas drawing. A "point" for font sizing is equivalent to a drawing unit.

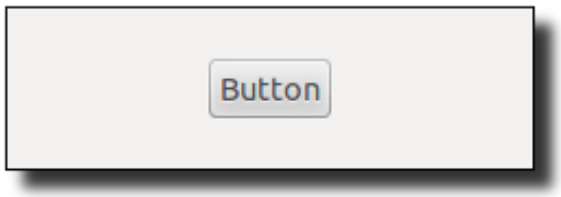
On Windows and Unix, screen sizes are described to users in terms of pixels, while a scale can be selected independently by the user to apply to text and other items. Typical text scales are 125%, 150%, and 200%. The `racket/gui` library uses this scale for all GUI elements, including the screen, windows, buttons, and canvas drawing. For example, if the scale is 200%, then the screen size reported by `get-display-size` will be half of the number of pixels in each dimension. Beware that round-off effects can cause the reported size of a window to be different than a size to which a window has just been set. A "point" for font sizing is equivalent to `(/ 96 72)` drawing units.

On Unix, if the `PLT_DISPLAY_BACKING_SCALE` environment variable is set to a positive real number, then it overrides certain system settings for `racket/gui` scaling. With GTK+ 3 (see §14 "Platform Dependencies"), the environment variable overrides system-wide text scaling; with GTK+ 2, the environment variable overrides both text and control scaling. Menus, control labels using the default label font, and non-label control parts will not use a scale specified through `PLT_DISPLAY_BACKING_SCALE`, however.

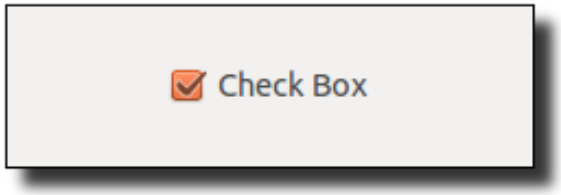
Changed in version 1.14 of package `gui-lib`: Added support for scaling on Unix.

2 Widget Gallery

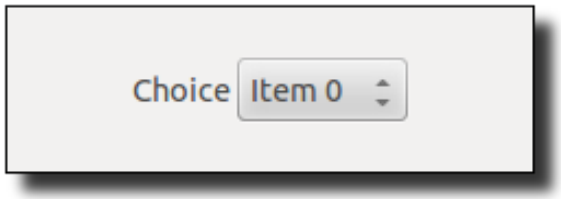
This section shows the main widgets available in the Racket Graphical User Interface Toolkit. Each image is a link to the documentation of the relevant widget.




```
(define button (new button%
                    (parent panel)
                    (label "Button")))
```

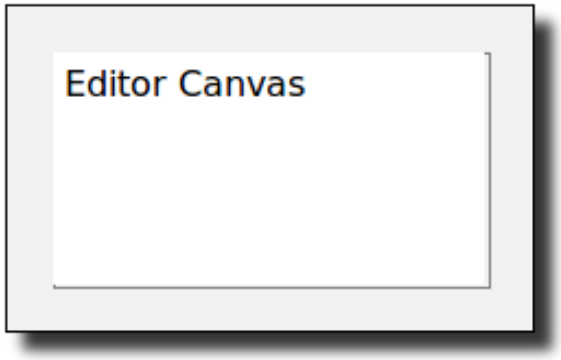



```
(define check-box (new check-box%
                       (parent panel)
                       (label "Check Box")
                       (value #t)))
```

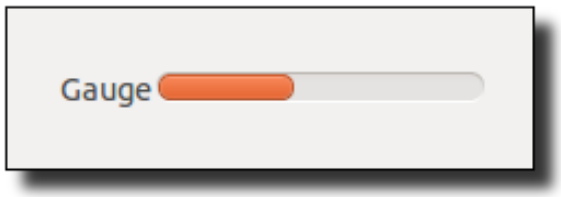



```
(define choice (new choice%
                    (label "Choice")
                    (parent panel)
                    (choices (list "Item 0"))))
```

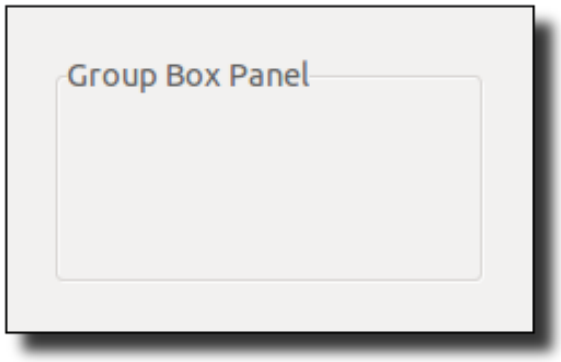
```
(define combo-field (new combo-field%
                         (label "Combo")
                         (parent panel)
                         (choices (list "Field"))
                         (init-value "Field")))
```



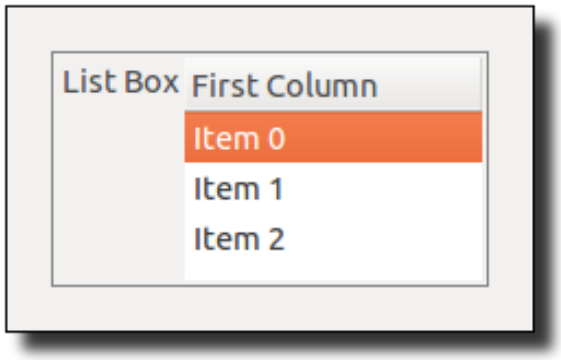

```
(define editor-canvas (new editor-canvas%
                           (parent panel)
                           (label "Editor Canvas")))
(define text (new text%))
(send text insert "Editor Canvas")
(send editor-canvas set-editor text)
```



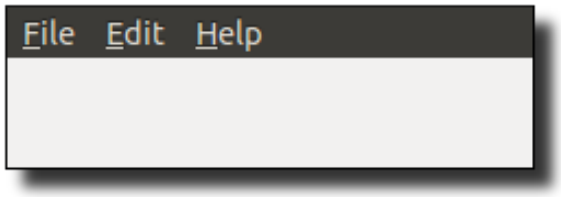

```
(define gauge (new gauge%
                   (label "Gauge")
                   (parent panel)
                   (range 100)))
(send gauge set-value 42)
```



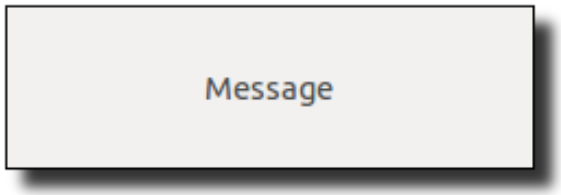

```
(define group-box-panel (new group-box-panel%
                             (parent panel)
                             (label "Group Box Panel")))
```



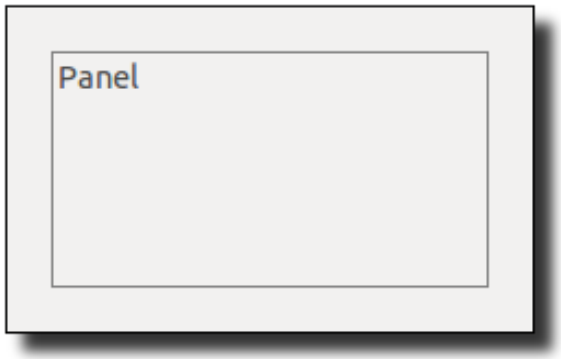

```
(define list-box (new list-box%
                      (label "List Box")
                      (parent (new horizontal-panel%
                                   (parent panel)
                                   (style (list 'border))))
                      (choices (list "Item 0"
                                     "Item 1"
                                     "Item 2"))
                      (style (list 'single
                                   'column-headers))
                      (columns (list "First Column"))))
```




```
(define menu-bar (new menu-bar%
                      (parent frame)))
(new menu%
     (label "&File")
     (parent menu-bar))
(new menu%
     (label "&Edit")
     (parent menu-bar))
(new menu%
     (label "&Help")
     (parent menu-bar))
```

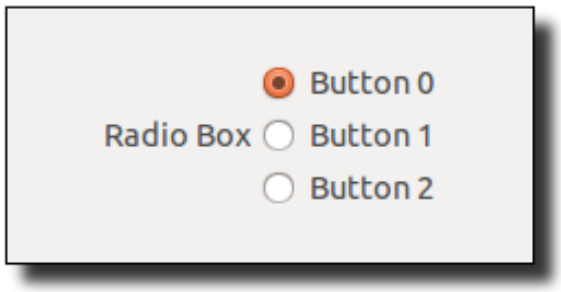



```
(define message (new message%
                     (parent panel)
                     (label "Message")))
```

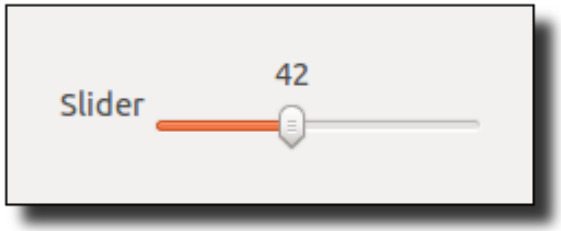



```
(define a-panel (new panel%
```

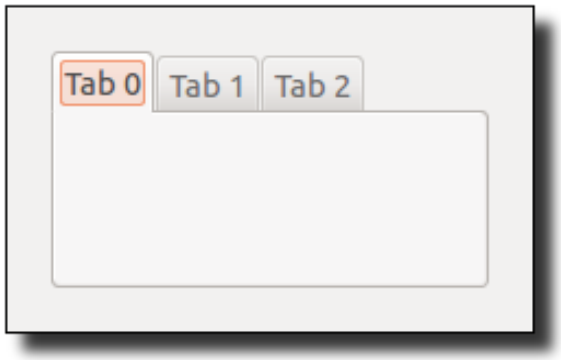
```
                    (parent panel)
                    (style (list 'border))))
(new message%
     (parent a-panel)
     (label "Panel"))
```



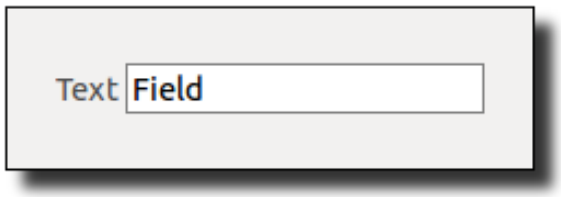

```
(define radio-box (new radio-box%
                       (label "Radio Box")
                       (parent panel)
                       (choices (list "Button 0"
                                      "Button 1"
                                      "Button 2"))))
```




```
(define slider (new slider%
                    (label "Slider")
                    (parent panel)
                    (min-value 0)
                    (max-value 100)
                    (init-value 42)))
```



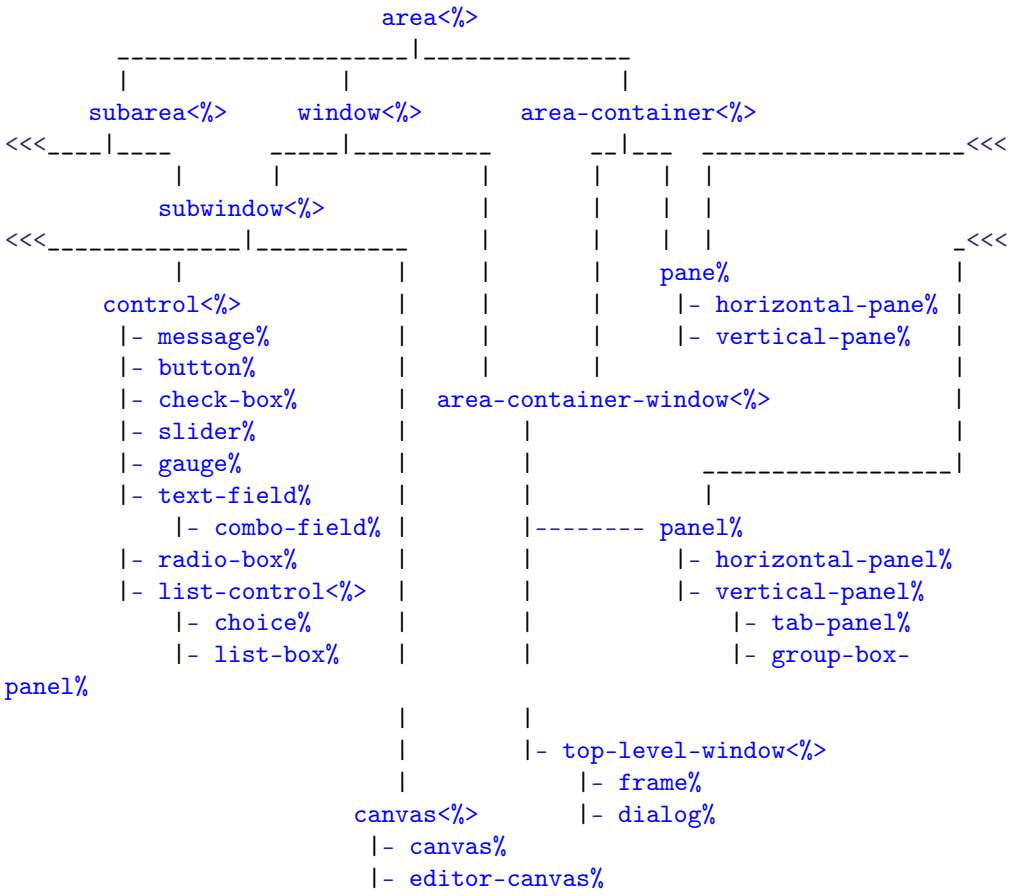

```
(define tab-panel (new tab-panel%
                       (parent panel)
                       (choices (list "Tab 0"
                                      "Tab 1"
                                      "Tab 2"))))
```



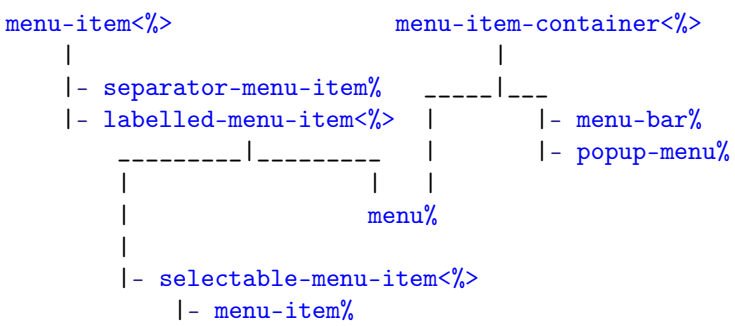

```
(define text-field (new text-field%
                        (label "Text")
                        (parent panel)
                        (init-value "Field")))
```

3 Windowing Classes

Windows and controls:



Menus:



```
                |- checkable-menu-item%
```

Events and other:

```
event%                                  timer%
 |- key-event%                         cursor%
 |- mouse-event%
 |- scroll-event%                      clipboard<%>
 |- control-event%                     clipboard-client%
```

Alphabetical:

3.1 area<%>

```
area<%> : interface?
```

An area<%> object is either a window or a windowless container for managing the position and size of other areas. An area<%> can be a container, a containee, or both. The only areas without a parent are top-level windows.

All area<%> classes accept the following named instantiation arguments:

- min-width — default is the initial graphical minimum width; passed to min-width
- min-height — default is the initial graphical minimum height; passed to min-height
- stretchable-width — default is class-specific; passed to stretchable-width
- stretchable-height — default is class-specific; passed to stretchable-height

```
(send an-area get-graphical-min-size)
 → dimension-integer? dimension-integer?
```

Returns the area's graphical minimum size as two values: the minimum width and the minimum height (in pixels).

See §1.4 "Geometry Management" for more information. Note that the return value *does not* depend on the area's min-width and min-height settings.

```
(send an-area get-parent)
 → (or/c (is-a?/c area-container<%>) #f)
```

Returns the area's parent. A top-level window may have no parent (in which case #f is returned), or it may have another top-level window as its parent.

```
(send an-area get-top-level-window)
 → (or/c (is-a?/c frame%) (is-a?/c dialog%))
```

Returns the area's closest frame or dialog ancestor. For a frame or dialog area, the frame or dialog itself is returned.

```
(send an-area min-width) → dimension-integer?
(send an-area min-width w) → void?
  w : dimension-integer?
```

Gets or sets the area's minimum width (in pixels) for geometry management.

The minimum width is ignored when it is smaller than the area's graphical minimum width, or when it is smaller than the width reported by container-size if the area is a container. See §1.4 "Geometry Management" for more information.

An area's initial minimum width is its graphical minimum width. See also get-graphical-min-size .

When setting the minimum width, if w is smaller than the internal hard minimum, an exn:fail:contract exception is raised.

```
(send an-area min-height) → dimension-integer?
(send an-area min-height h) → void?
  h : dimension-integer?
```

Gets or sets the area's minimum height for geometry management.

The minimum height is ignored when it is smaller than the area's graphical minimum height, or when it is smaller than the height reported by container-size if the area is a container. See §1.4 "Geometry Management" for more information.

An area's initial minimum height is its graphical minimum height. See also get-graphical-min-size .

When setting the minimum height (in pixels); if h is smaller than the internal hard minimum, an exn:fail:contract exception is raised.

```
(send an-area stretchable-height) → boolean?
(send an-area stretchable-height stretch?) → void?
  stretch? : any/c
```

Gets or sets the area's vertical stretchability for geometry management. See §1.4 "Geometry Management" for more information.

```
(send an-area stretchable-width) → boolean?
(send an-area stretchable-width stretch?) → void?
  stretch? : any/c
```

Gets or sets the area's horizontal stretchability for geometry management. See §1.4 "Geometry Management" for more information.

3.2 area-container<%>

```
area-container<%> : interface?
  implements: area<%>
```

An area-container<%> is a container area<%>.

All area-container<%> classes accept the following named instantiation arguments:

- border — default is 0; passed to border
- spacing — default is 0; passed to spacing
- alignment — default is class-specific, such as '(center top) for vertical-panel%; the list elements are passed to set-alignment

```
(send an-area-container add-child child) → void?
  child : (is-a?/c subwindow<%>)
```

Add the given subwindow to the set of non-deleted children. See also change-children.

```
(send an-area-container after-new-child child) → void?
  child : (is-a?/c subarea<%>)
```

Specification: This method is called after a new containee area is created with this area as its container. The new child is provided as an argument to the method.

Default implementation: Does nothing.

```
(send an-area-container begin-container-sequence) → void?
```

Suspends geometry management in the container's top-level window until end-container-sequence is called. The begin-container-sequence and end-container-sequence methods are used to bracket a set of container modifications so that the resulting geometry is computed only once. A container sequence also delays show and hide actions by change-children, as well as the on-screen part of showing via show until the sequence is complete. Sequence begin and end commands may be nested arbitrarily deeply.

```
(send an-area-container border) → spacing-integer?
(send an-area-container border margin) → void?
  margin : spacing-integer?
```

Gets or sets the border margin for the container in pixels. This margin is used as an inset into the panel's client area before the locations and sizes of the subareas are computed.

```
(send an-area-container change-children filter) → void?
  filter : ((listof (is-a?/c subarea<%>))
            . -> . (listof (is-a?/c subarea<%>)))
```

Takes a filter procedure and changes the container's list of non-deleted children. The filter procedure takes a list of children areas and returns a new list of children areas. The new list must consist of children that were created as subareas of this area (i.e., change-children cannot be used to change the parent of a subarea).

After the set of non-deleted children is changed, the container computes the sets of newly deleted and newly non-deleted children. Newly deleted windows are hidden. Newly non-deleted windows are shown.

Since non-window areas cannot be hidden, non-window areas cannot be deleted. If the filter procedure removes non-window subareas, an exception is raised and the set of non-deleted children is not changed.

```
(send an-area-container container-flow-modified) → void?
```

Call this method when the result changes for an overridden flow-defining method, such as place-children. The call notifies the geometry manager that the placement of the container's children needs to be recomputed.

The reflow-containermethod only recomputes child positions when the geometry manager thinks that the placement has changed since the last computation.

```
(send an-area-container container-size info)
 → dimension-integer? dimension-integer?
```

```
  info : (listof (list/c dimension-integer?
                         dimension-integer?
                         any/c
                         any/c))
```

Called to determine the minimum size of a container. See §1.4 “Geometry Management” for more information.

```
(send an-area-container delete-child child) → void?
  child : (is-a?/c subwindow<%>)
```

Removes the given subwindow from the list of non-deleted children. See also change-children.

```
(send an-area-container end-container-sequence) → void?
```

See begin-container-sequence.

```
(send an-area-container get-alignment)
 → (symbols 'right 'center 'left)
   (symbols 'bottom 'center 'top)
```

Returns the container’s current alignment specification. See set-alignment for more information.

```
(send an-area-container get-children)
 → (listof (is-a?/c subarea<%>))
```

Returns a list of the container’s non-deleted children. (The non-deleted children are the ones currently managed by the container; deleted children are generally hidden.) The order of the children in the list is significant. For example, in a vertical panel, the first child in the list is placed at the top of the panel.

```
(send an-area-container place-children info
                                        width
                                        height)
 → (listof (list/c dimension-integer?
                   dimension-integer?
                   dimension-integer?
                   dimension-integer?))
```

```
  info : (listof (list/c dimension-integer?
                         dimension-integer?
                         any/c
                         any/c))
  width : dimension-integer?
  height : dimension-integer?
```

Called to place the children of a container. See §1.4 “Geometry Management” for more information.

```
(send an-area-container reflow-container) → void?
```

When a container window is not shown, changes to the container’s set of children do not necessarily trigger the immediate re-computation of the container’s size and its children’s sizes and positions. Instead, the recalculation is delayed until the container is shown, which avoids redundant computations between a series of changes. The `reflow-container` method forces the immediate recalculation of the container’s and its children’s sizes and locations.

Immediately after calling the `reflow-container` method, `get-size`, `get-client-size`, `get-width`, `get-height`, `get-x`, and `get-y` report the manager-applied sizes and locations for the container and its children, even when the container is hidden. A container implementation can call functions such as `get-size` at any time to obtain the current state of a window (because the functions do not trigger geometry management).

See also `container-flow-modified`.

```
(send an-area-container set-alignment horiz-align
                                      vert-align) → void?
  horiz-align : (symbols 'right 'center 'left)
  vert-align : (symbols 'bottom 'center 'top)
```

Sets the alignment specification for a container, which determines how it positions its children when the container has leftover space (when a child was not stretchable in a particular dimension).

When the container’s horizontal alignment is `'left`, the children are left-aligned in the container and whitespace is inserted to the right. When the container’s horizontal alignment is `'center`, each child is horizontally centered in the container. When the container’s horizontal alignment is `'right`, leftover whitespace is inserted to the left.

Similarly, a container’s vertical alignment can be `'top`, `'center`, or `'bottom`.

```
(send an-area-container spacing) → spacing-integer?
(send an-area-container spacing spacing) → void?
  spacing : spacing-integer?
```

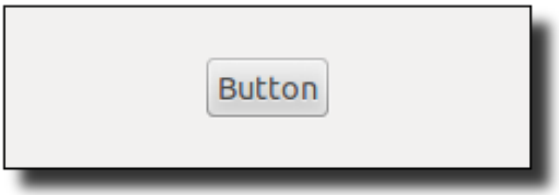
Gets or sets the spacing, in pixels, used between subareas in the container. For example, a vertical panel inserts this spacing between each pair of vertically aligned subareas (with no extra space at the top or bottom).

3.3 area-container-window<%>

```
area-container-window<%> : interface?
  implements: area-container<%>
              window<%>
```

Combines two interfaces.

3.4 button%




```
button% : class?
  superclass: object%
  extends: control<%>
```

Whenever a button is clicked by the user, the button's callback procedure is invoked. A callback procedure is provided as an initialization argument when each button is created.

```
(new button%
     [label label]
     [parent parent]
    [[callback callback]
     [style style]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
```

```
→ (is-a?/c button%)
 label : (or/c label-string?
               (is-a?/c bitmap%)
               (list/c (is-a?/c bitmap%)
                       label-string?
                       (or/c 'left 'top 'right 'bottom)))
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 callback : ((is-a?/c button%) (is-a?/c control-event%) . -> . any)
          = (lambda (b e) (void))
 style : (listof (or/c 'border 'multi-line 'deleted)) = null
 font : (is-a?/c font%) = normal-control-font
 enabled : any/c = #t
 vert-margin : spacing-integer? = 2
 horiz-margin : spacing-integer? = 2
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #f
 stretchable-height : any/c = #f
```

Creates a button with a string label, bitmap label, or both. If *label* is a bitmap, and if the bitmap has a mask (see get-loaded-mask in bitmap%) that is the same size as the bitmap, then the mask is used for the label. Modifying a bitmap while it is used as a label has an unspecified effect on the displayed label. If *label* is a list, then the button has both a bitmap and string label, and the symbol 'left, 'top, 'right, or 'bottom specifies the location of the image relative to the text on the button.

If & occurs in *label* (when *label* includes a string), it is specially parsed; on Windows and Unix, the character following & is underlined in the displayed control to indicate a keyboard mnemonic. (On Mac OS, mnemonic underlines are not shown.) The underlined mnemonic character must be a letter or a digit. The user can effectively click the button by typing the mnemonic when the control's top-level-window contains the keyboard focus. The user must also hold down the Meta or Alt key if the keyboard focus is currently in a control that handles normal alphanumeric input. The & itself is removed from *label* before it is displayed for the control; a && in *label* is converted to & (with no mnemonic underlining). On Mac OS, a parenthesized mnemonic character is removed (along with any surrounding space) before the label is displayed, since a parenthesized mnemonic is often used for non-Roman languages. Finally, for historical reasons, any text after a tab character is removed on all platforms. All of these rules are consistent with label handling in menu items (see set-label). Mnemonic keyboard events are handled by on-traverse-char (but not on Mac OS).

The *callback* procedure is called (with the event type 'button) whenever the user clicks the button.

If *style* includes 'border, the button is drawn with a special border that indicates to the user that it is the default action button (see on-traverse-char). If *style* includes

'multi-line, the button is drawn in a way that can stretch vertically and accommodate multiple lines in a text label; currently, this style makes a difference only on Mac OS, and it is selected automatically when *label* is a string that contains #\newline or #\return. If *style* includes 'deleted, then the button is created as hidden, and it does not affect its parent's geometry; the button can be made active later by calling *parent*'s add-child method.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

Changed in version 1.47 of package gui-lib: Added the 'multi-line style, and made it selected when *label* contains #\return.

```
(send a-button set-label label) → void?
  label : (or/c label-string?
                (is-a?/c bitmap%))
```

Overrides set-label in window<%>.

The same as set-label in window<%> when *label* is a string.

Otherwise, sets the bitmap label for a bitmap button. Since *label* is a bitmap, if the bitmap has a mask (see get-loaded-mask in bitmap%) that is the same size as the bitmap, then the mask is used for the label. Modifying a bitmap while it is used as a label has an unspecified effect on the displayed label. The bitmap label is installed only if the control was originally created with a bitmap label.

If the button has both a string and a bitmap label, then either can be set using set-label.

3.5 canvas<%>

```
canvas<%> : interface?
  implements: subwindow<%>
```

A canvas is a subwindow onto which graphics and text can be drawn. Canvases also receive mouse and keyboard events.

The canvas<%> interface is implemented by two classes:

- canvas% — a canvas for arbitrary drawing and event handling; and
- editor-canvas% — a canvas for displaying editor<%> objects.

To draw onto a canvas, get its device context via get-dc. There are two basic approaches to updating a canvas:

- Drawing normally occurs during the canvas's on-paint callback. The canvas% class supports a paint-callback initialization argument to be called from the default on-paint method.

  A canvas's on-paint method is called automatically as an event when the windowing system determines that the canvas must be updated, such as when the canvas is first shown or when it is resized. Use the refresh method to explicitly trigger an on-paint call from the windowing system. (Multiple refresh requests before on-paint can be called are coaleced into a single on-paint call.)

  Before the windowing system calls on-paint, it may erase the canvas's background (see erase), depending on the style of the canvas (e.g., as determined by the style initialization argument for canvas%). Even when the canvas's style suppresses explicit clearing of the canvas, a canvas may be erased by the windowing system due to window-moving and -resizing operations. For a transparent canvas, "erased" means that the canvas's parent window shows through.

- Drawing can also occur at any time outside an on-paint call from the windowing system, including from threads other than the handler thread of the canvas's eventspace. Drawing outside an on-paint callback from the system is transient in the sense that windowing activity can erase the canvas, but the drawing is persistent as long as no windowing refresh is needed.

  Calling an on-paint method directly is the same as drawing outside an on-paint callback from the windowing system. For a canvas%, use refresh-now to force an immediate update of the canvas's content that is otherwise analogous to queueing an update with refresh.

Drawing to a canvas's drawing context actually renders into an offscreen buffer. The buffer is automatically flushed to the screen asynchronously, explicitly via the flush method, or explicitly via flush-display—unless flushing has been disabled for the canvas. The suspend-flush method suspends flushing for a canvas until a matching resume-flush calls; calls to suspend-flush and resume-flush can be nested, in which case flushing is suspended until the outermost suspend-flush is balanced by a resume-flush. An on-paint call from the windowing system is implicitly wrapped with suspend-flush and resume-flush calls, as is a call to a paint procedure by refresh-now.

In the case of a transparent canvas, line and text smoothing can depend on the window that serves as the canvas's background. For example, smoothing may color pixels differently depending on whether the target context is white or gray. Background-sensitive smoothing is supported only if a relatively small number of drawing commands are recorded in the canvas's offscreen buffer, however.

```
(send a-canvas accept-tab-focus) → boolean?
(send a-canvas accept-tab-focus on?) → void?
  on? : any/c
```

Gets or sets whether tab-focus is enabled for the canvas (assuming that the canvas is not created with the 'no-focus style for canvas%). When tab-focus is enabled, the canvas can receive the keyboard focus when the user navigates among a frame or dialog's controls with the Tab and arrow keys. By default, tab-focus is disabled.

When tab-focus is enabled for a canvas% object, Tab, arrow, Enter, and Escape keyboard events are consumed by a frame's default on-traverse-char method. (In addition, a dialog's default method consumes Escape key events.) Otherwise, on-traverse-char allows the keyboard events to be propagated to the canvas.

For an editor-canvas% object, handling of Tab, arrow, Enter, and Escape keyboard events is determined by the allow-tab-exit method.

```
(send a-canvas flush) → void?
```

Like flush-display, but constrained if possible to the canvas.

```
(send a-canvas get-canvas-background)
 → (or/c (is-a?/c color%) #f)
```

Returns the color currently used to "erase" the canvas content before on-paint is called. See also set-canvas-background.

The result is #f if the canvas was created with the 'transparent style, otherwise it is always a color% object.

```
(send a-canvas get-dc) → (is-a?/c dc<%>)
```

Gets the canvas's device context. See dc<%> for more information about drawing.

```
(send a-canvas get-scaled-client-size)
 → dimension-integer? dimension-integer?
```

Returns the canvas's drawing-area dimensions in unscaled pixels—that is, without scaling (see §1.8 "Screen Resolution and Text Scaling") that is implicitly applied to the canvas size and content.

For example, when a canvas on Mac OS resides on a Retina display, it has a backing scale of 2, and so the results from get-scaled-client-size will be twice as large as results from get-client-size. If the same canvas's frame is dragged to a non-Retina screen, its backing scale can change to 1, in which case get-scaled-client-size and get-client-size will produce the same value. Whether a canvas's backing scale can change depends on the platform.

The size reported by `get-scaled-client-size` may match a viewport size for OpenGL drawing in `canvas%` instance with the `'gl` style. On Mac OS, however, the viewport will match the scaled size unless the canvas is created with a `gl-config%` specification that is adjusted to high-resolution mode via `set-hires-mode`. See also `get-gl-client-size` in `canvas%`.

Added in version 1.13 of package `gui-lib`.

```
(send a-canvas min-client-height) → dimension-integer?
(send a-canvas min-client-height h) → void?
  h : dimension-integer?
```

Gets or sets the canvas's minimum height for geometry management, based on the client size rather than the full size. The client height is obtained or changed via `min-height` in `area<%>`, adding or subtracting border and scrollbar sizes as appropriate.

The minimum height is ignored when it is smaller than the canvas's graphical minimum height. See §1.4 "Geometry Management" for more information.

```
(send a-canvas min-client-width) → dimension-integer?
(send a-canvas min-client-width w) → void?
  w : dimension-integer?
```

Gets or sets the canvas's minimum width for geometry management, based on the canvas's client size rather than its full size. The client width is obtained or changed via `min-width` in `area<%>`, adding or subtracting border and scrollbar sizes as appropriate.

The minimum width is ignored when it is smaller than the canvas's graphical minimum width. See §1.4 "Geometry Management" for more information.

```
(send a-canvas on-char ch) → void?
  ch : (is-a?/c key-event%)
```

Specification: Called when the canvas receives a keyboard event. See also §1.5 "Mouse and Keyboard Events".

Default implementation: Does nothing.

```
(send a-canvas on-event event) → void?
  event : (is-a?/c mouse-event%)
```

Specification: Called when the canvas receives a mouse event. See also §1.5 "Mouse and Keyboard Events", noting in particular that certain mouse events can get dropped.

Default implementation: Does nothing.

```
(send a-canvas on-paint) → void?
```

Specification: Called when the canvas is exposed or resized so that the image in the canvas can be repainted.

When `on-paint` is called in response to a system expose event and only a portion of the canvas is newly exposed, any drawing operations performed by `on-paint` are clipped to the newly-exposed region; however, the clipping region as reported by `get-clipping-region` does not change.

Default implementation: Does nothing.

```
(send a-canvas on-tab-in) → void?
```

Specification: Called when the keyboard focus enters the canvas via keyboard navigation events. The `on-focus` method is also called, as usual for a focus change. When the keyboard focus leaves a canvas due to a navigation event, only `on-focus` is called.

See also `accept-tab-focus` and `on-traverse-char` in `top-level-window<%>` .

Default implementation: Does nothing.

```
(send a-canvas resume-flush) → void?
```

See `canvas<%>` for information on canvas flushing.

```
(send a-canvas set-canvas-background color) → void?
  color : (is-a?/c color%)
```

Sets the color used to “erase” the canvas content before `on-paint` is called. (This color is typically associated with the canvas at a low level, so that it is used even when a complete refresh of the canvas is delayed by other activity.)

If the canvas was created with the `'transparent` style, an `exn:fail:contract` exception is raised.

```
(send a-canvas set-resize-corner on?) → void?
  on? : any/c
```

On Mac OS, enables or disables space for a resize tab at the canvas’s lower-right corner when only one scrollbar is visible. This method has no effect on Windows or Unix, and it

has no effect when both or no scrollbars are visible. The resize corner is disabled by default, but it can be enabled when a canvas is created with the 'resize-corner style.

```
(send a-canvas suspend-flush) → void?
```

See canvas<%> for information on canvas flushing.

Beware that suspending flushing for a canvas can discourage refreshes for other windows in the same frame on some platforms.

3.6 canvas%

```
canvas% : class?
  superclass: object%
  extends: canvas<%>
```

A canvas% object is a general-purpose window for drawing and handling events. See canvas<%> for information about drawing onto a canvas.

```
(new canvas%
     [parent parent]
    [[style style]
     [paint-callback paint-callback]
     [label label]
     [gl-config gl-config]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c canvas%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 style : (listof (or/c 'border 'control-border 'combo   = null
                       'vscroll 'hscroll 'resize-corner
                       'gl 'no-autoclear 'transparent
                       'no-focus 'deleted))
 paint-callback : ((is-a?/c canvas%) (is-a?/c dc<%>) . -> . any)
                = void
 label : (or/c label-string? #f) = #f
 gl-config : (or/c (is-a?/c gl-config%) #f) = #f
```

```
enabled : any/c = #t
vert-margin : spacing-integer? = 0
horiz-margin : spacing-integer? = 0
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #t
stretchable-height : any/c = #t
```

The *style* argument indicates one or more of the following styles:

- 'border — gives the canvas a thin border
- 'control-border — gives the canvas a border that is like a text-field% control
- 'combo — gives the canvas a combo button that is like a combo-field% control; this style is intended for use with 'control-border and not with 'hscroll or 'vscroll
- 'hscroll — enables horizontal scrolling (initially visible but inactive)
- 'vscroll — enables vertical scrolling (initially visible but inactive)
- 'resize-corner — leaves room for a resize control at the canvas's bottom right when only one scrollbar is visible
- 'gl — creates a canvas for OpenGL drawing instead of normal dc<%> drawing; call the get-gl-context method on the result of get-dc; this style is usually combined with 'no-autoclear
- 'no-autoclear — prevents automatic erasing of the canvas by the windowing system; see canvas<%> for information on canvas refresh
- 'transparent — the canvas is "erased" by the windowing system by letting its parent show through; see canvas<%> for information on window refresh and on the interaction of 'transparent and offscreen buffering; the result is undefined if this flag is combined with 'no-autoclear
- 'no-focus — prevents the canvas from accepting the keyboard focus when the canvas is clicked or when the focus method is called
- 'deleted — creates the canvas as initially hidden and without affecting *parent*'s geometry; the canvas can be made active later by calling *parent*'s add-child method

The 'hscroll and 'vscroll styles create a canvas with an initially inactive scrollbar. The scrollbars are activated with either init-manual-scrollbars or init-auto-scrollbars, and they can be hidden and re-shown with show-scrollbars.

The *paint-callback* argument is called by the default on-paint method, using the canvas and the DC returned by get-dc as the argument.

The *label* argument names the canvas for get-label, but it is not displayed with the canvas.

The *gl-config* argument determines properties of an OpenGL context for this canvas, as obtained through the canvas's drawing context. See also get-dc and get-gl-context in dc<%>.

For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

```
(send a-canvas get-gl-client-size)
 → dimension-integer? dimension-integer?
```

Returns the canvas's drawing-area dimensions in OpenGL units for a canvas% instance with the 'gl style.

The result is the same as get-scaled-client-size in a canvas without the 'gl style or on Windows and Unix. On Mac OS, the result can be the same as get-client-size if the gl-config% specification provided on creation does not specify high-resolution mode.

Added in version 1.16 of package gui-lib.

```
(send a-canvas get-scroll-page which)
 → positive-dimension-integer?
  which : (or/c 'horizontal 'vertical)
```

Get the current page step size of a manual scrollbar. The result is 0 if the scrollbar is not active or it is automatic.

The *which* argument is either 'horizontal or 'vertical, indicating whether to get the page step size of the horizontal or vertical scrollbar, respectively.

See also init-manual-scrollbars.

```
(send a-canvas get-scroll-pos which) → dimension-integer?
  which : (or/c 'horizontal 'vertical)
```

Gets the current value of a manual scrollbar. The result is always 0 if the scrollbar is not active or it is automatic.

The *which* argument is either 'horizontal or 'vertical, indicating that the value of the horizontal or vertical scrollbar should be returned, respectively.

See also init-manual-scrollbars.

```
(send a-canvas get-scroll-range which) → dimension-integer?
  which : (or/c 'horizontal 'vertical)
```

Gets the current maximum value of a manual scrollbar. The result is always `0` if the scrollbar is not active or it is automatic.

The *which* argument is either `'horizontal` or `'vertical`, indicating whether to get the maximum value of the horizontal or vertical scrollbar, respectively.

See also `init-manual-scrollbars`.

```
(send a-canvas get-view-start)
 → dimension-integer? dimension-integer?
```

Get the location at which the visible portion of the canvas starts, based on the current values of the horizontal and vertical scrollbars if they are initialized as automatic (see `init-auto-scrollbars`). Combined with `get-client-size`, an application can efficiently redraw only the visible portion of the canvas. The values are in pixels.

If the scrollbars are disabled or initialized as manual (see `init-manual-scrollbars`), the result is `(values 0 0)`.

```
(send a-canvas get-virtual-size)
 → (value dimension-integer? dimension-integer?)
```

Gets the size in device units of the scrollable canvas area (as opposed to the client size, which is the area of the canvas currently visible). This is the same size as the client size (as returned by `get-client-size`) unless scrollbars are initialized as automatic (see `init-auto-scrollbars`).

```
(send a-canvas init-auto-scrollbars horiz-pixels
                                    vert-pixels
                                    h-value
                                    v-value)     → void?
  horiz-pixels : (or/c positive-dimension-integer? #f)
  vert-pixels : (or/c positive-dimension-integer? #f)
  h-value : (real-in 0.0 1.0)
  v-value : (real-in 0.0 1.0)
```

Enables and initializes automatic scrollbars for the canvas. A horizontal or vertical scrollbar can be activated only in a canvas that was created with the `'hscroll` or `'vscroll` style flag, respectively.

With automatic scrollbars, the programmer specifies the desired virtual size of the canvas, and the scrollbars are automatically handled to allow the user to scroll around the virtual area. The scrollbars are not automatically hidden if they are unneeded; see `show-scrollbars`.

The coordinates for mouse events (passed to `on-event`) are not adjusted to account for the position of the scrollbar; use the `get-view-start` method to find suitable offsets.

See also `init-manual-scrollbars` for information about manual scrollbars. The horizontal and vertical scrollbars are always either both manual or both automatic, but they are independently enabled. Automatic scrollbars can be re-initialized as manual, and vice versa.

If either *horiz-pixels* or *vert-pixels* is `#f`, the scrollbar is not enabled in the corresponding direction, and the canvas's virtual size in that direction is the same as its client size.

The *h-value* and *v-value* arguments specify the initial values of the scrollbars as a fraction of the scrollbar's range. A `0.0` value initializes the scrollbar to its left/top, while a `1.0` value initializes the scrollbar to its right/bottom.

It is possible to adjust the virtual sizes by calling this function again.

See also `on-scroll` and `get-virtual-size`.

```
(send a-canvas init-manual-scrollbars h-length
                                      v-length
                                      h-page
                                      v-page
                                      h-value
                                      v-value) → void?
  h-length : (or/c dimension-integer? #f)
  v-length : (or/c dimension-integer? #f)
  h-page : positive-dimension-integer?
  v-page : positive-dimension-integer?
  h-value : dimension-integer?
  v-value : dimension-integer?
```

Enables and initializes manual scrollbars for the canvas. A horizontal or vertical scrollbar can be activated only in a canvas that was created with the `'hscroll` or `'vscroll` style flag, respectively.

With manual scrollbars, the programmer is responsible for managing all details of the scrollbars, and the scrollbar state has no effect on the canvas's virtual size. Instead, the canvas's virtual size is the same as its client size.

See also `init-auto-scrollbars` for information about automatic scrollbars. The horizontal and vertical scrollbars are always either both manual or both automatic, but they are

independently enabled. Automatic scrollbars can be re-initialized as manual, and vice versa.

The *h-length* and *v-length* arguments specify the length of each scrollbar in scroll steps (i.e., the maximum value of each scrollbar). If either is #f, the scrollbar is disabled in the corresponding direction.

The *h-page* and *v-page* arguments set the number of scrollbar steps in a page, i.e., the amount moved when pressing above or below the value indicator in the scrollbar control.

The *h-value* and *v-value* arguments specify the initial values of the scrollbars.

If *h-value* is greater than *h-length* or *v-value* is greater than *v-length*, an exn:fail:contract exception is raised. (The page step may be larger than the total size of a scrollbar.)

See also on-scroll and get-virtual-size.

```
(send a-canvas make-bitmap width height) → (is-a/c? bitmap%)
  width : exact-positive-integer?
  height : exact-positive-integer?
```

Creates a bitmap that draws in a way that is the same as drawing to the canvas. See also make-screen-bitmap and §1.8 “Portability and Bitmap Variants”.

```
(send a-canvas on-paint) → void?
```

Overrides on-paint in canvas<%>.

Calls the procedure supplied as the paint-callback argument when the canvas% was created.

```
(send a-canvas on-scroll event) → void?
  event : (is-a?/c scroll-event%)
```

Called when the user changes one of the canvas’s scrollbars. A scroll-event% argument provides information about the scroll action.

This method is called only when manual scrollbars are changed (see init-manual-scrollbars), not automatic scrollbars; for automatic scrollbars, the on-paint method is called, instead.

```
(send a-canvas refresh-now [paint-proc
                            #:flush? flush?]) → void?
  paint-proc : ((is-a?/c dc<%>) . -> . any)
             = (lambda (dc) (send a-canvas on-paint))
  flush? : any/c = #t
```

Calls *paint-proc* with the canvas's drawing context to immediately update the canvas (in contrast to refresh, which merely queues an update request to be handled at the windowing system's discretion).

Before *paint-proc* is called, flushing is disabled for the canvas. Also, the canvas is erased, unless the canvas has the 'no-autoclear style. After *paint-proc* returns, flushing is enabled, and if *flush?* is true, then flush is called immediately.

```
(send a-canvas scroll h-value v-value) → void?
  h-value : (or/c (real-in 0.0 1.0) #f)
  v-value : (or/c (real-in 0.0 1.0) #f)
```

Sets the values of automatic scrollbars. (This method has no effect on manual scrollbars.)

If either argument is #f, the scrollbar value is not changed in the corresponding direction.

The *h-value* and *v-value* arguments each specify a fraction of the scrollbar's movement. A 0.0 value sets the scrollbar to its left/top, while a 1.0 value sets the scrollbar to its right/bottom. A 0.5 value sets the scrollbar to its middle. In general, if the canvas's virtual size is *v*, its client size is *c*, and (> *v c*), then scrolling to *p* sets the view start to (floor (* *p* (- *v c*))).

See also init-auto-scrollbars and get-view-start.

```
(send a-canvas set-scroll-page which value) → void?
  which : (or/c 'horizontal 'vertical)
  value : positive-dimension-integer?
```

Set the current page step size of a manual scrollbar. (This method has no effect on automatic scrollbars.)

The *which* argument is either 'horizontal or 'vertical, indicating whether to set the page step size of the horizontal or vertical scrollbar, respectively.

See also init-manual-scrollbars.

```
(send a-canvas set-scroll-pos which value) → void?
  which : (or/c 'horizontal 'vertical)
  value : dimension-integer?
```

Sets the current value of a manual scrollbar. (This method has no effect on automatic scrollbars.)

The *which* argument is either 'horizontal or 'vertical, indicating whether to set the value of the horizontal or vertical scrollbar set, respectively.

The value of the canvas's scrollbar can be changed by the user scrolling, and such changes do not go through this method; use `on-scroll` to monitor scrollbar value changes.

See also `init-manual-scrollbars` and `scroll`.

```
(send a-canvas set-scroll-range which
                                 value) → void?
  which : (or/c 'horizontal 'vertical)
  value : dimension-integer?
```

Sets the current maximum value of a manual scrollbar. (This method has no effect on automatic scrollbars.)

The *which* argument is either `'horizontal` or `'vertical`, indicating whether to set the maximum value of the horizontal or vertical scrollbar, respectively.

See also `init-manual-scrollbars`.

```
(send a-canvas show-scrollbars show-horiz?
                               show-vert?) → void?
  show-horiz? : any/c
  show-vert? : any/c
```

Shows or hides the scrollbars as indicated by *show-horiz?* and *show-vert?*. If *show-horiz?* is true and the canvas was not created with the `'hscroll` style, an `exn:fail:contract` exception is raised. Similarly, if *show-vert?* is true and the canvas was not created with the `'vscroll` style, an `exn:fail:contract` exception is raised.

The horizontal scrollbar can be shown only if the canvas was created with the `'hscroll` style, and the vertical scrollbar can be shown only if the canvas was created with the `'vscroll` style. See also `init-auto-scrollbars` and `init-manual-scrollbars`.

```
(send a-canvas swap-gl-buffers) → void?
```

Calls `swap-buffers` on the result of `get-gl-context` for this canvas's DC as returned by `get-dc`.

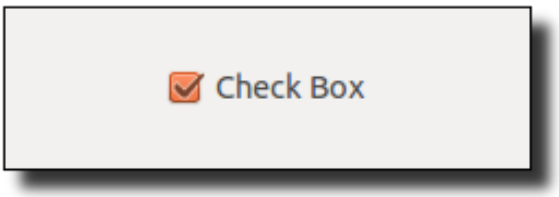
The `swap-buffers` in `gl-context<%>` method acquires a re-entrant lock, so nested calls to `swap-gl-buffers` or `with-gl-context` on different threads or OpenGL contexts can block or deadlock.

```
(send a-canvas with-gl-context  thunk
                                [#:fail fail]) → any
  thunk : (-> any)
  fail : (-> any) = (lambda () (error ....))
```

Passes the given thunk to `call-as-current` of the result of `get-gl-context` for this canvas's DC as returned by `get-dc`. If `get-gl-context` returns `#f`, then *`fail`* is called, instead.

The `call-as-current` in `gl-context<%>` method acquires a re-entrant lock, so nested calls to `with-gl-context` or `swap-gl-buffers` on different threads or OpenGL contexts can block or deadlock.

3.7 check-box%




```
check-box% : class?
  superclass: object%
  extends: control<%>
```

A check box is a labeled box which is either checked or unchecked.

Whenever a check box is clicked by the user, the check box's value is toggled and its callback procedure is invoked. A callback procedure is provided as an initialization argument when each check box is created.

```
(new check-box%
     [label label]
     [parent parent]
    [[callback callback]
     [style style]
     [value value]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c check-box%)
 label : (or/c label-string? (is-a?/c bitmap%))
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
```

```
 callback : ((is-a?/c check-box%) (is-a?/c control-event%)
              . -> . any)
          = (lambda (c e) (void))
 style : (listof (or/c 'deleted)) = null
 value : any/c = #f
 font : (is-a?/c font%) = normal-control-font
 enabled : any/c = #t
 vert-margin : spacing-integer? = 2
 horiz-margin : spacing-integer? = 2
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #f
 stretchable-height : any/c = #f
```

Creates a check box with a string or bitmap label. If *label* is a bitmap, and if the bitmap has a mask (see get-loaded-mask in bitmap%) that is the same size as the bitmap, then the mask is used for the label. Modifying a bitmap while it is used as a label has an unspecified effect on the displayed label.

If & occurs in *label* (when *label* is a string), it is specially parsed as for button%.

The *callback* procedure is called (with the event type 'check-box) whenever the user clicks the check box.

If *style* includes 'deleted, then the check box is created as hidden, and it does not affect its parent's geometry; the check box can be made active later by calling *parent*'s add-child method.

If *value* is true, it is passed to set-value so that the box is initially checked.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

```
(send a-check-box get-value) → boolean?
```

Gets the state of the check box: #t if it is checked, #f otherwise.

```
(send a-check-box set-label label) → void?
  label : (or/c label-string? (is-a?/c bitmap%))
```

Overrides set-label in window<%>.

The same as set-label in window<%> when *label* is a string.

Otherwise, sets the bitmap label for a bitmap check box. Since *label* is a bitmap, if the bitmap has a mask (see get-loaded-mask in bitmap%) that is the same size as the bitmap, then the mask is used for the label. Modifying a bitmap while it is used as a label has an unspecified effect on the displayed label. The bitmap label is installed only if the control was originally created with a bitmap label.

```
(send a-check-box set-value state) → void?
  state : any/c
```

Sets the check box's state. (The control's callback procedure is *not* invoked.)

The check box's state can be changed by the user clicking the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor state changes.

If *state* is #f, the box is unchecked, otherwise it is checked.

3.8 checkable-menu-item%

```
checkable-menu-item% : class?
  superclass: object%
  extends: selectable-menu-item<%>
```

A checkable-menu-item% is a string-labelled menu item that maintains a check mark. Its parent must be a menu% or popup-menu%. When the user selects the menu item, the item's check mark is toggled and its callback procedure is called.

```
(new checkable-menu-item%
     [label label]
     [parent parent]
    [[callback callback]
     [shortcut shortcut]
     [help-string help-string]
     [demand-callback demand-callback]
     [checked checked]
     [shortcut-prefix shortcut-prefix]])
→ (is-a?/c checkable-menu-item%)
 label : label-string?
 parent : (or/c (is-a?/c menu%) (is-a?/c popup-menu%))
 callback : ((is-a?/c checkable-menu-item%) (is-a?/c control-event%)
              . -> . any)
            = (lambda (i e) (void))
 shortcut : (or/c char? symbol? #f) = #f
```

```
help-string : (or/c label-string? #f) = #f
demand-callback : ((is-a?/c menu-item%) . -> . any)
                = (lambda (i) (void))
checked : any/c = #f
shortcut-prefix : (and/c (listof (or/c 'alt 'cmd 'meta 'ctl
                                       'shift 'option))
                         (λ (x) (implies (equal? 'unix (system-type))
                                         (not (and (member 'alt x)
                                                   (member 'meta x)))))
                         (λ (x) (equal? x (remove-duplicates x))))
                = (get-default-shortcut-prefix)
```

Creates a new menu item in *parent*. The item is initially shown, appended to the end of its parent, and unchecked. The *callback* procedure is called (with the event type `'menu`) when the menu item is selected (either via a menu bar, `popup-menu` in `window<%>`, or `popup-menu` in `editor-admin%`).

See `set-label` for information about mnemonic `&`s in *label*.

If *shortcut* is not `#f`, the item has a shortcut. See `get-shortcut` for more information. The *shortcut-prefix* argument determines the set of modifier keys for the shortcut; see `get-shortcut-prefix`.

If `help` is not `#f`, the item has a help string. See `get-help-string` for more information.

The *demand-callback* procedure is called by the default `on-demand` method with the object itself.

By default, the menu item is initially unchecked. If *checked* is true, then `check` is called so that the menu item is initially checked.

```
(send a-checkable-menu-item check check?) → void?
  check? : any/c
```

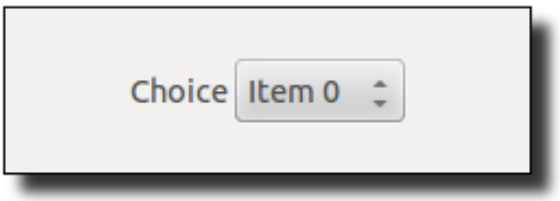
Checks or unchecks the menu item.

A menu item's check state can be changed by the user selecting the item, and such changes do not go through this method; use the menu item callback procedure (provided as an initialization argument) to monitor check state changes.

```
(send a-checkable-menu-item is-checked?) → boolean?
```

Returns `#t` if the item is checked, `#f` otherwise.

3.9 choice%




```
choice% : class?
  superclass: object%
  extends: list-control<%>
```

A choice item allows the user to select one string item from a pop-up list of items. Unlike a list box, only the currently selection is visible until the user pops-up the menu of choices.

Whenever the selection of a choice item is changed by the user, the choice item's callback procedure is invoked. A callback procedure is provided as an initialization argument when each choice item is created.

See also list-box%.

```
(new choice%
     [label label]
     [choices choices]
     [parent parent]
    [[callback callback]
     [style style]
     [selection selection]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c choice%)
 label : (or/c label-string? #f)
 choices : (listof label-string?)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 callback : ((is-a?/c choice%) (is-a?/c control-event%) . -> . any)
          = (lambda (c e) (void))
 style : (listof (or/c 'horizontal-label 'vertical-label = null
                       'deleted))
```

```
selection : exact-nonnegative-integer? = 0
font : (is-a?/c font%) = normal-control-font
enabled : any/c = #t
vert-margin : spacing-integer? = 2
horiz-margin : spacing-integer? = 2
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #f
stretchable-height : any/c = #f
```

Creates a choice item. If *label* is a string, it is used as the label for the choice item.

If & occurs in *label*, it is specially parsed as for button%.

The *choices* list specifies the initial list of user-selectable items for the control. The initial set of choices determines the control's minimum graphical width (see §1.4 "Geometry Management" for more information).

The *callback* procedure is called (with the event type 'choice) when the user selects a choice item (or re-selects the currently selected item).

If *style* includes 'vertical-label, then the choice item is created with a label above the control; if *style* does not include 'vertical-label (and optionally includes 'horizontal-label), then the label is created to the left of the choice item. If *style* includes 'deleted, then the choice item is created as hidden, and it does not affect its parent's geometry; the choice item can be made active later by calling *parent*'s add-child method.

By default, the first choice (if any) is initially selected. If *selection* is positive, it is passed to set-selection to set the initial choice selection. Although *selection* normally must be less than the length of *choices*, it can be 0 when *choices* is empty.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

3.10 clipboard-client%

```
clipboard-client% : class?
  superclass: object%
```

A clipboard-client% object allows a program to take over the clipboard and service requests for clipboard data. See clipboard<%> for more information.

A clipboard-client% object is associated to an eventspace when it becomes the current client; see set-clipboard-client for more information.

```
(new clipboard-client%) → (is-a?/c clipboard-client%)
```

Creates a clipboard client that supports no data formats.

```
(send a-clipboard-client add-type format) → void?
  format : string?
```

Adds a new data format name to the list supported by the clipboard client.

The *format* string is typically four capital letters. (On Mac OS, only four characters for *format* are ever used.) For example, "TEXT" is the name of the UTF-8-encoded string format. New format names can be used to communicate application- and platform-specific data formats.

```
(send a-clipboard-client get-data format)
 → (or/c bytes? string? #f)
  format : string?
```

Called when a process requests clipboard data while this client is the current one for the clipboard. The requested format is passed to the method, and the result should be a byte string matching the requested format, or #f if the request cannot be fulfilled.

Only data format names in the client's list will be passed to this method; see add-type.

When this method is called by the clipboard, the current eventspace is the same as the client's eventspace. If, at the point of the clipboard request, the current eventspace is not the client's eventspace, then current thread is guaranteed to be the handler thread of the client's eventspace.

```
(send a-clipboard-client get-types) → (listof string?)
```

Returns a list of names that are the data formats supported by the clipboard client.

```
(send a-clipboard-client on-replaced) → void?
```

Called when a clipboard client is dismissed as the clipboard owner (because the clipboard has be taken by another client or by an external application).

3.11 clipboard<%>

```
clipboard<%> : interface?
```

A single clipboard<%> object, the-clipboard, manages the content of the system-wide clipboard for cut and paste.

On Unix, a second clipboard<%> object, the-x-selection-clipboard, manages the content of the system-wide X11 selection. If the 'GRacket:selectionAsClipboard preference preference (see §10 "Preferences") is set to a non-zero true value, however, then the-clipboard is always the same as the-x-selection-clipboard, and the system-wide X11 clipboard is not used.

On Windows and Mac OS, the-x-selection-clipboard is always the same as the-clipboard.

Data can be entered into a clipboard in one of two ways: by setting the current clipboard string or byte string, or by installing a clipboard-client% object. When a client is installed, requests for clipboard data are directed to the client.

Generic data is always retrieved from the clipboard as a byte string. When retrieving clipboard data, a data type string specifies the format of the data string. The availability of different clipboard formats is determined by the current clipboard owner.

```
(send a-clipboard get-clipboard-bitmap time)
 → (or/c (is-a?/c bitmap%) #f)
  time : exact-integer?
```

Gets the current clipboard contents as a bitmap (Windows, Mac OS), returning #f if the clipboard does not contain a bitmap.

See get-clipboard-data for information on eventspaces and the current clipboard client.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-clipboard get-clipboard-data format
                                       time)
 → (or/c bytes? string? #f)
  format : string?
  time : exact-integer?
```

Gets the current clipboard contents in a specific format, returning #f if the clipboard does not contain data in the requested format.

If the clipboard client is associated to an eventspace that is not the current one, the data is retrieved through a callback event in the client's eventspace. If no result is available within one second, the request is abandoned and #f is returned.

See add-type in clipboard-client% for information on *format*.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-clipboard get-clipboard-string time) → string?
  time : exact-integer?
```

Gets the current clipboard contents as simple text, returning "" if the clipboard does not contain any text.

See get-clipboard-data for information on eventspaces and the current clipboard client.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-clipboard same-clipboard-client? owner) → boolean?
  owner : (is-a?/c clipboard-client%)
```

Returns #t if *owner* currently owns the clipboard, #f otherwise.

```
(send a-clipboard set-clipboard-bitmap new-bitmap
                                        time)      → void?
  new-bitmap : (is-a?/c bitmap%)
  time : exact-integer?
```

Changes the current clipboard contents to *new-bitmap* (Windows, Mac OS) and releases the current clipboard client (if any).

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-clipboard set-clipboard-client new-owner
                                        time)     → void?
  new-owner : (is-a?/c clipboard-client%)
  time : exact-integer?
```

Changes the clipboard-owning client: sets the client to *new-owner* and associates *new-owner* with the current eventspace (as determined by current-eventspace). The eventspace association is removed when the client is no longer the current one.

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-clipboard set-clipboard-string new-text
                                        time)    → void?
  new-text : string?
  time : exact-integer?
```

Changes the current clipboard contents to *new-text*, and releases the current clipboard client (if any).

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

3.12 combo-field%

```
combo-field% : class?
  superclass: text-field%
```

A combo-field% object is a text-field% object that also resembles a choice% object, because it has a small popup button to the right of the text field. Clicking the button pops up a menu, and selecting a menu item typically copies the item into the text field.

```
(new combo-field%
     [label label]
     [choices choices]
     [parent parent]
    [[callback callback]
     [init-value init-value]
     [style style]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c combo-field%)
 label : (or/c label-string? #f)
 choices : (listof label-string?)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 callback : ((is-a?/c combo-field%) (is-a?/c control-event%)
              . -> . any)
          = (lambda (c e) (void))
 init-value : string = ""
 style : (listof (or/c 'horizontal-label 'vertical-label = null
                       'deleted))
 font : (is-a?/c font%) = normal-control-font
 enabled : any/c = #t
 vert-margin : spacing-integer? = 2
 horiz-margin : spacing-integer? = 2
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = #f
```

If *label* is not #f, it is used as the combo label. Otherwise, the combo does not display its label.

If & occurs in *label*, it is specially parsed as for button%.

The *choices* list specifies the initial list of items for the combo's popup menu. The append method adds a new item to the menu with a callback to install the appended item into the combo's text field. The get-menu method returns a menu that can be changed to adjust the content and actions of the combo's menu.

The *callback* procedure is called when the user changes the text in the combo or presses

the Enter key (and Enter is not handled by the combo's frame or dialog; see on-traverse-char in top-level-window<%>). If the user presses Enter, the type of event passed to the callback is 'text-field-enter, otherwise it is 'text-field.

If *init-value* is not "", the minimum width of the text item is made wide enough to show *init-value*. Otherwise, a built-in default width is selected.

If *style* includes 'vertical-label, then the combo is created with a label above the control; if *style* does not include 'vertical-label (and optionally includes 'horizontal-label), then the label is created to the left of the combo. If *style* includes 'deleted, then the combo is created as hidden, and it does not affect its parent's geometry; the combo can be made active later by calling *parent*'s add-child method..

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

```
(send a-combo-field append l) → void?
  l : label-string?
```

Adds a new item to the combo's popup menu. The given label is used for the item's name, and the item's callback installs the label into the combo's text field.

```
(send a-combo-field get-menu) → (is-a?/c popup-menu%)
```

Returns a popup-menu% that is effectively copied into the combo's popup menu when the combo is clicked. Only the labels and callbacks of the menu's items are used; the enable state, submenus, or separators are ignored.

```
(send a-combo-field on-popup event) → void?
  event : (is-a?/c control-event%)
```

Specification: Called when the user clicks the combo's popup button. Override this method to adjust the content of the combo menu on demand.

Default implementation: Does nothing.

3.13 control<%>

```
control<%> : interface?
  implements: subwindow<%>
```

The control<%> interface is implemented by the built-in control window classes:

- message%
- button%
- check-box%
- slider%
- gauge%
- text-field%
- radio-box%
- choice%
- list-box%

```
(send a-control command event) → void?
  event : (is-a?/c control-event%)
```

Calls the control's callback function, passing on the given control-event% object.

3.14 column-control-event%

```
column-control-event% : class?
  superclass: control-event%
```

A column-control-event% object contains information about a event on an list-box% column header. Except on Windows, the 'clickable-headers style must be specified when creating a list-box% for column events to be generated.

```
(new column-control-event%
     [column column]
     [event-type event-type]
    [[time-stamp time-stamp]])
→ (is-a?/c column-control-event%)
  column : exact-nonnegative-integer?
  event-type : (or/c 'list-box-column)
  time-stamp : exact-integer? = 0
```

The *column* argument indicates the column that was clicked.

```
(send a-column-control-event get-column)
 → exact-nonnegative-integer?
```

Returns the column number (counting from 0) of the clicked column.

```
(send a-column-control-event set-column column) → void?
  column : exact-nonnegative-integer?
```

Sets the column number (counting from 0) of the clicked column.

3.15 control-event%

```
control-event% : class?
  superclass: event%
```

A control-event% object contains information about a control event. An instance of control-event% is always provided to a control or menu item callback procedure.

```
(new control-event%
     [event-type event-type]
   [[time-stamp time-stamp]])
→ (is-a?/c control-event%)
 event-type : (or/c 'button 'check-box 'choice
                    'list-box 'list-box-dclick 'list-box-column
                    'text-field 'text-field-enter
                    'menu 'slider 'radio-box 'tab-panel
                    'menu-popdown 'menu-popdown-none)
 time-stamp : exact-integer? = 0
```

The *event-type* argument is one of the following:

- 'button — for button% clicks
- 'check-box — for check-box% toggles
- 'choice — for choice% item selections
- 'list-box — for list-box% selections and deselections
- 'list-box-dclick — for list-box% double-clicks

- 'list-box-column — for list-box% column clicks in a column-control-event% instance
- 'text-field — for text-field% changes
- 'text-field-enter — for single-line text-field% Enter event
- 'menu — for selectable-menu-item<%> callbacks
- 'slider — for slider% changes
- 'radio-box — for radio-box% selection changes
- 'tab-panel — for tab-panel% tab changes
- 'menu-popdown — for popup-menu% callbacks (item selected)
- 'menu-popdown-none — for popup-menu% callbacks (no item selected)

This value is extracted out of a control-event% object with the get-event-type method.

See get-time-stamp for information about *time-stamp*.

```
(send a-control-event get-event-type)
 → (or/c 'button 'check-box 'choice
         'list-box 'list-box-dclick 'text-field
         'text-field-enter 'menu 'slider 'radio-box
         'menu-popdown 'menu-popdown-none 'tab-panel)
```

Returns the type of the control event. See control-event% for information about each event type symbol.

```
(send a-control-event set-event-type type) → void?
  type : (or/c 'button 'check-box 'choice
               'list-box 'list-box-dclick 'text-field
               'text-field-enter 'menu 'slider 'radio-box
               'menu-popdown 'menu-popdown-none 'tab-panel)
```

Sets the type of the event. See control-event% for information about each event type symbol.

3.16 cursor%

```
cursor% : class?
  superclass: object%
```

A cursor is a small icon that indicates the location of the mouse pointer. The bitmap image typically indicates the current mode or meaning of a mouse click at its current location.

A cursor is assigned to each window (or the window may use its parent's cursor; see set-cursor for more information), and the pointer image is changed to match the window's cursor when the pointer is moved over the window. Each cursor object may be assigned to many windows.

```
(make-object cursor% image
                     mask
                    [hot-spot-x
                     hot-spot-y]) → (is-a?/c cursor%)
  image : (is-a?/c bitmap%)
  mask : (is-a?/c bitmap%)
  hot-spot-x : (integer-in 0 15) = 0
  hot-spot-y : (integer-in 0 15) = 0
(make-object cursor% id) → (is-a?/c cursor%)
  id : (or/c 'arrow 'bullseye 'cross 'hand 'ibeam 'watch 'blank
             'size-n/s 'size-e/w 'size-ne/sw 'size-nw/se)
```

The first case creates a cursor using an image bitmap and a mask bitmap. Both bitmaps must have depth 1 and size 16 by 16 pixels. The *hot-spot-x* and *hot-spot-y* arguments determine the focus point of the cursor within the cursor image, relative to its top-left corner.

The second case creates a cursor using a stock cursor, specified as one of the following:

- 'arrow — the default cursor
- 'bullseye — concentric circles
- 'cross — a crosshair
- 'hand — an open hand
- 'ibeam — a vertical line, indicating that clicks control a text-selection caret
- 'watch — a watch or hourglass, indicating that the user must wait for a computation to complete
- 'arrow+watch — the default cursor with a watch or hourglass, indicating that some computation is in progress, but the cursor can still be used
- 'blank — invisible

- 'size-e/w — arrows left and right
- 'size-n/s — arrows up and down
- 'size-ne/sw — arrows up-right and down-left
- 'size-nw/se — arrows up-left and down-right

If the cursor is created successfully, ok? returns #t, otherwise the cursor object cannot be assigned to a window.

```
(send a-cursor ok?) → boolean?
```

Returns #t if the cursor is can be assigned to a window, #f otherwise.

3.17 dialog%

```
dialog% : class?
  superclass: object%
  extends: top-level-window<%>
```

A dialog is a top-level window that is *modal*: while the dialog is shown, key and mouse press/release events are disabled for all other top-level windows in the dialog's eventspace.

```
(new dialog%
     [label label]
    [[parent parent]
     [width width]
     [height height]
     [x x]
     [y y]
     [style style]
     [enabled enabled]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c dialog%)
 label : label-string?
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
```

```
width : (or/c dimension-integer? #f) = #f
height : (or/c dimension-integer? #f) = #f
x : (or/c dimension-integer? #f) = #f
y : (or/c dimension-integer? #f) = #f
style : (listof (or/c 'no-caption 'resize-border = null
                      'no-sheet 'close-button))
enabled : any/c = #t
border : spacing-integer? = 0
spacing : spacing-integer? = 0
alignment : (list/c (or/c 'left 'center 'right)
                    (or/c 'top 'center 'bottom))
          = '(center top)
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #t
stretchable-height : any/c = #t
```

The *label* string is used as the dialog's title in its title bar. If the dialog's label is changed (see set-label), the title bar is updated.

The *parent* argument can be #f or an existing frame or dialog. On Windows, if *parent* is not #f, the new dialog is always on top of its parent. On Windows and Unix, a dialog is iconized when its parent is iconized.

If *parent* is #f, then the eventspace for the new dialog is the current eventspace, as determined by current-eventspace. Otherwise, *parent*'s eventspace is the new dialog's eventspace.

If the *width* or *height* argument is not #f, it specifies an initial size for the dialog (in pixels) assuming that it is larger than the minimum size, otherwise the minimum size is used. On Windows and Mac OS (and with some Unix window managers) dialogs are not resizeable.

If the *x* or *y* argument is not #f, it specifies an initial location for the dialog. Otherwise, if no location is set before the dialog is shown, it is centered (with respect *parent* if not #f, the screen otherwise).

The *style* flags adjust the appearance of the dialog on some platforms:

- 'no-caption — omits the title bar for the dialog (Windows)
- 'resize-border — adds a resizeable border around the window (Windows), ability to resize the window (Mac OS), or grow box in the bottom right corner (older Mac OS)
- 'no-sheet — uses a movable window for the dialog, even if a parent window is provided (Mac OS)

- `'close-button` — include a close button in the dialog's title bar, which would not normally be included (Mac OS)

Even if the dialog is not shown, a few notification events may be queued for the dialog on creation. Consequently, the new dialog's resources (e.g., memory) cannot be reclaimed until some events are handled, or the dialog's eventspace is shut down.

For information about the *enabled* argument, see `window<%>`. For information about the *border*, *spacing*, and *alignment* arguments, see `area-container<%>`. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see `area<%>`.

```
(send a-dialog on-subwindow-char receiver
                                 event)   → boolean?
  receiver : (is-a?/c window<%>)
  event : (is-a?/c key-event%)
```

Overrides `on-subwindow-char` in `window<%>`.

Returns the result of

```
(or (send this on-system-menu-char event)
    (send this on-traverse-char event))
```

```
(send a-dialog show show?) → void?
  show? : any/c
```

Overrides `show` in `top-level-window<%>`.

If *show?* is true, the dialog is shown and all frames (and other dialogs) in the eventspace become disabled until the dialog is closed. Furthermore, the method does not immediately return. Instead, it loops with `yield` until the dialog is found to be hidden between calls to `yield`. An internal semaphore is used with `yield` to avoid a busy-wait, and to ensure that the `show` method returns as soon as possible after the dialog is hidden.

If *show?* is false, the dialog is hidden and other frames and dialogs are re-enabled (unless a different, pre-existing dialog is still shown).

```
(send a-dialog show-without-yield) → void?
```

Like `(send a-dialog show #t)`, but returns immediately instead of `yield`ding.

3.18 event%

```
(require racket/gui/event)
```
package: gui-lib

The bindings documented in this section are also provided by the racket/gui/base library.

Changed in version 7.3.0.1 of package gui-lib: Added racket/gui/event that exports event% and subclasses.

```
event% : class?
  superclass: object%
```

An event% object contains information about a control, keyboard, mouse, or scroll event. See also control-event%, key-event%, mouse-event%, and scroll-event%.

```
(new event% [[time-stamp time-stamp]]) → (is-a?/c event%)
  time-stamp : exact-integer? = 0
```

See get-time-stamp for information about *time-stamp*.

```
(send an-event get-time-stamp) → exact-integer?
```

Returns a time, in milliseconds, when the event occurred.

This time is *not* necessarily compatible with times reported by Racket's current-milliseconds procedure. It may be based on milliseconds since the system was rebooted. It may also "wrap around" (instead of always increasing) due to the system's representation of time.

```
(send an-event set-time-stamp time) → void?
  time : exact-integer?
```

Set a time, in milliseconds, when the event occurred. See also get-time-stamp.

If the supplied value is outside the platform-specific range of time values, an exn:fail:contract exception is raised.

3.19 frame%

```
frame% : class?
  superclass: object%
  extends: top-level-window<%>
```

A frame is a top-level container window. It has a title bar (which displays the frame's label), an optional menu bar, and an optional status line.

```
(new frame%
     [label label]
   [[parent parent]
    [width width]
    [height height]
    [x x]
    [y y]
    [style style]
    [enabled enabled]
    [border border]
    [spacing spacing]
    [alignment alignment]
    [min-width min-width]
    [min-height min-height]
    [stretchable-width stretchable-width]
    [stretchable-height stretchable-height]])
→ (is-a?/c frame%)
 label : label-string?
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog) #f) = #f
 width : (or/c dimension-integer? #f) = #f
 height : (or/c dimension-integer? #f) = #f
 x : (or/c position-integer? #f) = #f
 y : (or/c position-integer? #f) = #f
 style : (listof (or/c 'no-resize-border 'no-caption
                       'no-system-menu 'hide-menu-bar
                       'toolbar-button 'float 'metal
                       'fullscreen-button 'fullscreen-aux))
       = null
 enabled : any/c = #t
 border : spacing-integer? = 0
 spacing : spacing-integer? = 0
 alignment : (list/c (or/c 'left 'center 'right)
                     (or/c 'top 'center 'bottom))
           = '(center top)
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = #t
```

The *label* string is displayed in the frame's title bar. If the frame's label is changed (see set-label), the title bar is updated.

The *parent* argument can be #f or an existing frame or dialog. On Windows, if *parent* is not #f, the new frame is always on top of its parent. On Windows and Unix (for many window managers), a frame is iconized when its parent is iconized.

If *parent* is #f, then the eventspace for the new frame is the current eventspace, as determined by current-eventspace. Otherwise, *parent*'s eventspace is the new frame's eventspace.

If the *width* or *height* argument is not #f, it specifies an initial size for the frame (in pixels) assuming that it is larger than the minimum size, otherwise the minimum size is used.

If the *x* or *y* argument is not #f, it specifies an initial location for the frame. Otherwise, a location is selected automatically (tiling frames and dialogs as they are created).

The *style* flags adjust the appearance of the frame on some platforms:

- 'no-resize-border — omits the resizeable border around the window (Windows, Unix), ability to resize the window (Mac OS), or grow box in the bottom right corner (older Mac OS)
- 'no-caption — omits the title bar for the frame (Windows, Mac OS, Unix)
- 'no-system-menu — omits the system menu (Windows)
- 'toolbar-button — includes a toolbar button on the frame's title bar (Mac OS 10.6 and earlier); a click on the toolbar button triggers a call to on-toolbar-button-click
- 'hide-menu-bar — hides the menu bar and dock when the frame is active (Mac OS) or asks the window manager to make the frame fullscreen (Unix)
- 'float — causes the frame to stay in front of all other non-floating windows (Windows, Mac OS, Unix); on Mac OS, a floating frame shares the focus with an active non-floating frame; when this style is combined with 'no-caption, then showing the frame does not cause the keyboard focus to shift to the window, and on Unix, clicking the frame does not move the focus; on Windows, a floating frame has no taskbar button
- 'metal — ignored (formerly supported for Mac OS)
- 'fullscreen-button — includes a button on the frame's title bar to put the frame in fullscreen mode (Mac OS 10.7 and later)
- 'fullscreen-aux — allows the frame to accompany another that is in fullscreen mode (Mac OS 10.7 and later)

Even if the frame is not shown, a few notification events may be queued for the frame on creation. Consequently, the new frame's resources (e.g., memory) cannot be reclaimed until some events are handled, or the frame's eventspace is shut down.

For information about the *enabled* argument, see window<%>. For information about the *border*, *spacing*, and *alignment* arguments, see area-container<%>. For information

about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

Changed in version 1.1 of package gui-lib: Added 'fullscreen-button and 'fullscreen-aux options for *style*.
Changed in version 1.66: Allow a dialog% instance as *parent*.

(send *a-frame* create-status-line) → void?

Creates a status line at the bottom of the frame. The width of the status line is the whole width of the frame (adjusted automatically when resizing), and the height and text size are platform-specific.

See also set-status-text.

(send *a-frame* fullscreen *fullscreen?*) → void?
  fullscreen? : any/c

Puts the frame in fullscreen mode or restores the frame to non-fullscreen mode. The frame's show state is not affected.

A frame's mode can be changed by the user, and such changes do not go through this method. A program cannot detect when a frame has been put in fullscreen mode except by polling is-fullscreened?.

On Mac OS, the frame% must be created with the style 'fullscreen-button for fullscreen mode to work, and Mac OS 10.7 or later is required.

Added in version 1.9 of package gui-lib.
Changed in version 1.18: Changed fullscreen with #t to not imply show on Windows and Mac OS.

(send *a-frame* get-menu-bar) → (or/c (is-a?/c menu-bar%) #f)

Returns the frame's menu bar, or #f if none has been created for the frame.

(send *a-frame* has-status-line?) → boolean?

Returns #t if the frame's status line has been created, #f otherwise. See also create-status-line.

(send *a-frame* iconize *iconize?*) → void?
  iconize? : any/c

Iconizes (minimizes) or deiconizes (restores) the frame. Deiconizing brings the frame to the front.

A frame's iconization can be changed by the user, and such changes do not go through this method. A program cannot detect when a frame has been iconized except by polling `is-iconized?`.

```
(send a-frame is-fullscreened?) → boolean?
```

Returns `#t` if the frame is in fullscreen mode, `#f` otherwise.

Added in version 6.0.0.6 of package `gui-lib`.

```
(send a-frame is-iconized?) → boolean?
```

Returns `#t` if the frame is iconized (minimized), `#f` otherwise.

```
(send a-frame is-maximized?) → boolean?
```

On Windows and Mac OS, returns `#t` if the frame is maximized, `#f` otherwise. On Unix, the result is always `#f`.

```
(send a-frame maximize maximize?) → void?
  maximize? : any/c
```

Specification: Maximizes or restores the frame on Windows and Mac OS; the frame's show state is not affected. On Windows, an iconized frame cannot be maximized or restored.

A window's maximization can be changed by the user, and such changes do not go through this method; use `on-size` to monitor size changes.

Default implementation: If *maximize?* is `#f`, the window is restored, otherwise it is maximized.

```
(send a-frame modified) → boolean?
(send a-frame modified modified?) → void?
  modified? : any/c
```

Gets or sets the frame's modification state as reflected to the user. On Mac OS, the modification state is reflected as a dot in the frame's close button. On Windows and Unix, the modification state is reflected by an asterisk at the end of the frame's displayed title.

```
(send a-frame on-menu-char event) → boolean?
  event : (is-a?/c key-event%)
```

If the frame has a menu bar with keyboard shortcuts, and if the key event includes a Control, Alt, Option, Meta, Command, Shift, or Function key, then `on-menu-char` attempts to match the given event to a menu item. If a match is found, `#t` is returned, otherwise `#f` is returned.

When the match corresponds to a complete shortcut combination, the menu item's callback is called (before `on-menu-char` returns).

If the event does not correspond to a complete shortcut combination, the event may be handled anyway if it corresponds to a mnemonic in the menu bar (i.e., an underlined letter in a menu's title, which is installed by including an ampersand in the menu's label). If a mnemonic match is found, the keyboard focus is moved to the menu bar (selecting the menu with the mnemonic), and `#t` is returned.

```
(send a-frame on-subwindow-char receiver
                                event)   → boolean?
  receiver : (is-a?/c window<%>)
  event : (is-a?/c key-event%)
```

Overrides `on-subwindow-char` in `window<%>`.

Returns the result of

```
(or (send this on-menu-char event)
    (send this on-system-menu-char event)
    (send this on-traverse-char event))
```

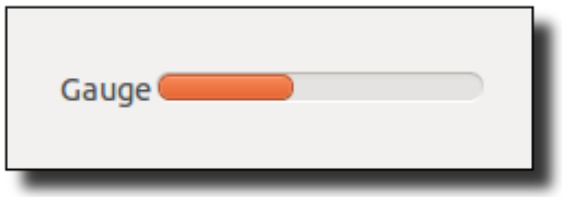
```
(send a-frame on-toolbar-button-click) → void?
```

On Mac OS, called when the user clicks the toolbar button on a frame created with the `'toolbar-button` style.

```
(send a-frame set-status-text text) → void?
  text : string?
```

Sets the frame's status line text and redraws the status line. See also `create-status-line`.

3.20 gauge%




```
gauge% : class?
  superclass: object%
  extends: control<%>
```

A gauge is a horizontal or vertical bar for displaying the output value of a bounded integer quantity. Each gauge has an adjustable range, and the gauge's current value is always between 0 and its range, inclusive. Use `set-value` to set the value of the gauge.

```
(new gauge%
     [label label]
     [range range]
     [parent parent]
    [[style style]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c gauge%)
 label : (or/c label-string? #f)
 range : positive-dimension-integer?
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 style : (listof (or/c 'horizontal 'vertical
                       'vertical-label 'horizontal-label
                       'deleted))
       = '(horizontal)
 font : (is-a?/c font%) = normal-control-font
 enabled : any/c = #t
 vert-margin : spacing-integer? = 2
 horiz-margin : spacing-integer? = 2
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
```

```
  stretchable-width : any/c = (memq 'horizontal style)
  stretchable-height : any/c = (memq 'vertical style)
```

If *label* is a string, it is used as the gauge label; otherwise the gauge does not display a label.

If & occurs in *label*, it is specially parsed; under Windows and X, the character following & is underlined in the displayed control to indicate a keyboard mnemonic. (Under Mac OS, mnemonic underlines are not shown.) The mnemonic is meaningless for a gauge (as far as on-traverse-char in top-level-window<%> is concerned), but it is supported for consistency with other control types. A programmer may assign a meaning to the mnemonic (e.g., by overriding on-traverse-char).

The *range* argument is an integer specifying the maximum value of the gauge (inclusive). The minimum gauge value is always 0.

The *style* list must include either 'horizontal, specifying a horizontal gauge, or 'vertical, specifying a vertical gauge. If *style* includes 'vertical-label, then the gauge is created with a label above the control; if *style* does not include 'vertical-label (and optionally includes 'horizontal-label), then the label is created to the left of the gauge. If *style* includes 'deleted, then the gauge is created as hidden, and it does not affect its parent's geometry; the gauge can be made active later by calling *parent*'s add-child method.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

```
(send a-gauge get-range) → positive-dimension-integer?
```

Returns the range (maximum value) of the gauge.

```
(send a-gauge get-value) → dimension-integer?
```

Returns the gauge's current value.

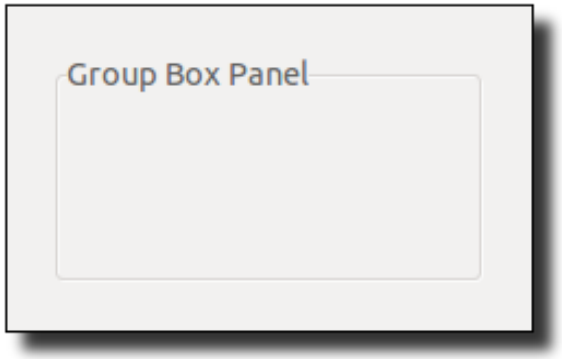
```
(send a-gauge set-range range) → void?
  range : positive-dimension-integer?
```

Sets the range (maximum value) of the gauge.

```
(send a-gauge set-value pos) → void?
  pos : dimension-integer?
```

Sets the gauge's current value. If the specified value is larger than the gauge's range, an exn:fail:contract exception is raised.

3.21 group-box-panel%




```
group-box-panel% : class?
  superclass: vertical-panel%
```

A group-box panel arranges its subwindows in a single column, but also draws an optional label at the top of the panel and a border around the panel content.

Unlike most panel classes, a group-box panel's horizontal and vertical margins default to 2.

```
(new group-box-panel%
     [label label]
     [parent parent]
    [[style style]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c group-box-panel%)
 label : label-string?
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
```

```
style : (listof (or/c 'deleted)) = null
font : (is-a?/c font%) = small-control-font
enabled : any/c = #t
vert-margin : spacing-integer? = 2
horiz-margin : spacing-integer? = 2
border : spacing-integer? = 0
spacing : spacing-integer? = 0
alignment : (list/c (or/c 'left 'center 'right)
                    (or/c 'top 'center 'bottom))
          = '(center top)
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #t
stretchable-height : any/c = #t
```

Creates a group pane whose title is *label*.

If *style* includes 'deleted, then the group panel is created as hidden, and it does not affect its parent's geometry; the group panel can be made active later by calling *parent*'s add-child method.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

3.22 grow-box-spacer-pane%

```
grow-box-spacer-pane% : class?
  superclass: pane%
```

A grow-box-spacer-pane% object is intended for use as a lightweight spacer in the bottom-right corner of a frame, rather than as a container. On older version of Mac OS, a grow-box-spacer-pane% has the same width and height as the grow box that is inset into the bottom-right corner of a frame. On Windows, Unix, and recent Mac OS, a grow-box-spacer-pane% has zero width and height. Unlike all other container types, a grow-box-spacer-pane% is unstretchable by default.

```
(new grow-box-spacer-pane% ...superclass-args...)
 → (is-a?/c grow-box-spacer-pane%)
```

See pane% for information on initialization arguments.

3.23 horizontal-pane%

```
horizontal-pane% : class?
  superclass: pane%
```

A horizontal pane arranges its subwindows in a single row. See also pane%.

```
(new horizontal-pane%
     [parent parent]
    [[vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c horizontal-pane%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 vert-margin : spacing-integer? = 0
 horiz-margin : spacing-integer? = 0
 border : spacing-integer? = 0
 spacing : spacing-integer? = 0
 alignment : (list/c (or/c 'left 'center 'right)
                     (or/c 'top 'center 'bottom))
           = '(left center)
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = #t
```

For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *border*, *spacing*, and *alignment* arguments, see area-container<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

3.24 horizontal-panel%

```
horizontal-panel% : class?
  superclass: panel%
```

A horizontal panel arranges its subwindows in a single row. See also panel%.

```
(new horizontal-panel%
     [parent parent]
    [[style style]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c horizontal-panel%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 style : (listof (or/c 'border 'deleted
                       'hscroll 'auto-hscroll 'hide-hscroll
                       'vscroll 'auto-vscroll 'hide-vscroll))
       = null
 enabled : any/c = #t
 vert-margin : spacing-integer? = 0
 horiz-margin : spacing-integer? = 0
 border : spacing-integer? = 0
 spacing : spacing-integer? = 0
 alignment : (list/c (or/c 'left 'center 'right)
                     (or/c 'top 'center 'bottom))
           = '(left center)
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = #t
```

The *style* flags are the same as for panel%.

For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *border*, *spacing*, and *alignment* arguments, see area-container<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

```
(send a-horizontal-panel set-orientation horizontal?) → void?
  horizontal? : boolean?
```

Sets the orientation of the panel, switching it between the behavior of the vertical-panel% and that of the horizontal-panel%.

```
(send a-horizontal-panel get-orientation) → boolean?
```

Initially returns #t, but if set-orientation is called, this method returns whatever the last value passed to it was.

3.25 key-event%

```
key-event% : class?
  superclass: event%
```

A key-event% object contains information about a key press or release event. Key events are primarily processed by on-subwindow-char in window<%> and on-char in canvas<%>.

For a key-press event, a virtual key code is provided by get-key-code. For a key-release event, get-key-code reports 'release, and a virtual key code is provided by get-key-release-code.

See also §1.5 “Mouse and Keyboard Events”.

```
(new key-event%
     [[key-code key-code]
      [shift-down shift-down]
      [control-down control-down]
      [meta-down meta-down]
      [alt-down alt-down]
      [x x]
      [y y]
      [time-stamp time-stamp]
      [caps-down caps-down]
      [mod3-down mod3-down]
      [mod4-down mod4-down]
      [mod5-down mod5-down]
      [control+meta-is-altgr control+meta-is-altgr]])
→ (is-a?/c key-event%)
 key-code : (or/c char? key-code-symbol?) = #\nul
 shift-down : any/c = #f
 control-down : any/c = #f
 meta-down : any/c = #f
 alt-down : any/c = #f
```

```
x : exact-integer? = 0
y : exact-integer? = 0
time-stamp : exact-integer? = 0
caps-down : any/c = #f
mod3-down : any/c = #f
mod4-down : any/c = #f
mod5-down : any/c = #f
control+meta-is-altgr : any/c = #f
```

See the corresponding `get-` and `set-` methods for information about *key-code*, *shift-down*, *control-down*, *meta-down*, *mod3-down*, *mod4-down*, *mod5-down*, *alt-down*, *x*, *y*, *time-stamp*, *caps-down*, *mod3-down*, *mod4-down*, *mod5-down*, and *control+meta-is-altgr*.

The release key code, as returned by `get-key-release-code`, is initialized to `'press`.

Changed in version 1.1 of package `gui-lib`: Added *mod3-down*, *mod4-down*, and *mod5-down*.
Changed in version 1.2: Added *control+meta-is-altgr*.

```
(send a-key-event get-alt-down) → boolean?
```

Returns `#t` if the Option (Mac OS) key was down for the event. When the Alt key is pressed in Windows, it is reported as a Meta press (see `get-meta-down`).

```
(send a-key-event get-caps-down) → boolean?
```

Returns `#t` if the Caps Lock key was on for the event.

```
(send a-key-event get-control-down) → boolean?
```

Returns `#t` if the Control key was down for the event.

On Mac OS, if a Control-key press is combined with a mouse button click, the event is reported as a right-button click and `get-control-down` for the event reports `#f`.

```
(send a-key-event get-control+meta-is-altgr) → boolean?
```

Returns `#t` if a Control plus Meta event should be treated as an AltGr event on Windows. By default, AltGr treatment applies if the Control key was the left one and the Alt key (as Meta) was the right one—typed that way on a keyboard with a right Alt key, or produced by a single AltGr key. See also `any-control+alt-is-altgr`, which controls whether other Control plus Alt combinations are treated as AltGr.

Added in version 1.2 of package `gui-lib`.

```
(send a-key-event get-key-code)
 → (or/c char? key-code-symbol?)
```

Gets the virtual key code for the key event. The virtual key code is either a character or a special key symbol, one of the following:

- `'start`
- `'cancel`
- `'clear`
- `'shift` — Shift key
- `'rshift` — right Shift key
- `'control` — Control key
- `'rcontrol` — right Control key
- `'menu`
- `'pause`
- `'capital`
- `'prior`
- `'next`
- `'end`
- `'home`
- `'left`
- `'up`
- `'right`
- `'down`
- `'escape`
- `'select`
- `'print`
- `'execute`
- `'snapshot`

- 'insert
- 'help
- 'numpad0
- 'numpad1
- 'numpad2
- 'numpad3
- 'numpad4
- 'numpad5
- 'numpad6
- 'numpad7
- 'numpad8
- 'numpad9
- 'numpad-enter
- 'multiply
- 'add
- 'separator
- 'subtract
- 'decimal
- 'divide
- 'f1
- 'f2
- 'f3
- 'f4
- 'f5
- 'f6
- 'f7
- 'f8
- 'f9

- 'f10
- 'f11
- 'f12
- 'f13
- 'f14
- 'f15
- 'f16
- 'f17
- 'f18
- 'f19
- 'f20
- 'f21
- 'f22
- 'f23
- 'f24
- 'numlock
- 'scroll
- 'wheel-up — mouse wheel up; see get-wheel-steps
- 'wheel-down — mouse wheel down; see get-wheel-steps
- 'wheel-left — mouse wheel left; see get-wheel-steps
- 'wheel-right — mouse wheel right; see get-wheel-steps
- 'release — indicates a key-release event
- 'press — indicates a key-press event; usually only from get-key-release-code

The special key symbols attempt to capture useful keys that have no standard ASCII representation. A few keys have standard representations that are not obvious:

- #\space — the space bar
- #\return — the Enter or Return key (on all platforms), but not necessarily the Enter key near the numpad (which is reported as 'numpad-enter Unix and Mac OS)

- `#\tab` — the tab key
- `#\backspace` — the backspace key
- `#\rubout` — the delete key

If a suitable special key symbol or ASCII representation is not available, `#\nul` (the NUL character) is reported.

A `'wheel-up`, `'wheel-down`, `'wheel-left`, or `'wheel-right` event may be sent to a window other than the one with the keyboard focus, because some platforms generate wheel events based on the location of the mouse pointer instead of the keyboard focus.

On Windows, when the Control key is pressed without Alt, the key code for ASCII characters is downcased, roughly cancelling the effect of the Shift key. On Mac OS, the key code is computed without Caps Lock effects when the Control or Command key is pressed; in the case of Control, Caps Lock is used normally if special handling is disabled for the Control key via `special-control-key`. On Unix, the key code is computed with Caps Lock effects when the Control key is pressed without Alt.

See also `get-other-shift-key-code`.

Changed in version 6.1.0.8 of package `gui-lib`: Changed reporting of numpad Enter to `'numpad-enter` as documented, instead of `#\u0003`.

```
(send a-key-event get-key-release-code)
 → (or/c char? key-code-symbol?)
```

Gets the virtual key code for a key-release event; the result is `'press` for a key-press event. See `get-key-code` for the list of virtual key codes.

```
(send a-key-event get-meta-down) → boolean?
```

Returns `#t` if the Meta (Unix), Alt (Windows), or Command (Mac OS) key was down for the event.

```
(send a-key-event get-mod3-down) → boolean?
```

Returns `#t` if the Mod3 (Unix) key was down for the event.

Added in version 1.1 of package `gui-lib`.

```
(send a-key-event get-mod4-down) → boolean?
```

Returns #t if the Mod4 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-key-event get-mod5-down) → boolean?
```

Returns #t if the Mod5 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-key-event get-other-altgr-key-code)
 → (or/c char? key-code-symbol? #f)
```

See get-other-shift-key-code.

```
(send a-key-event get-other-caps-key-code)
 → (or/c char? key-code-symbol? #f)
```

See get-other-shift-key-code.

```
(send a-key-event get-other-shift-altgr-key-code)
 → (or/c char? key-code-symbol? #f)
```

See get-other-shift-key-code.

```
(send a-key-event get-other-shift-key-code)
 → (or/c char? key-code-symbol? #f)
```

Since keyboard mappings vary, it is sometimes useful in key mappings for a program to know the result that the keyboard would have produced for an event if the Shift key had been toggled differently. The get-other-shift-key-code produces that other mapping, returning #f if the alternate mapping is unavailable, otherwise returning the same kind of result as get-key-code.

The get-other-altgr-key-code method provides the same information with respect to the AltGr key (i.e., Alt combined with Control) on Windows and Unix, or the Option key on Mac OS. The get-other-shift-altgr-key-code method reports a mapping for in tha case that both Shift and AltGr/Option were different from the actual event.

The get-other-shift-key-code, get-other-altgr-key-code, and get-other-shift-altgr-key-code results all report key mappings where Caps Lock is off, independent of whether Caps Lock was on for the actual event. The get-other-caps-key-code

method reports a mapping for in that case that the Caps Lock state was treated opposite as for the get-key-code result. (Caps Lock normally has either no effect or the same effect as Shift, so further combinations involving Caps Lock and other modifier keys would not normally produce further alternatives.)

Alternate mappings are not available for all events. On Windows, alternate mappings are reported when they produce ASCII letters, ASCII digits, and ASCII symbols. On Mac OS and Unix, alternate mappings are usually available.

```
(send a-key-event get-shift-down) → boolean?
```

Returns #t if the Shift key was down for the event.

```
(send a-key-event get-wheel-steps) → nonnegative-real?
```

Returns the number of wheel steps represented by a 'wheel-up, 'wheel-down, 'wheel-left, or 'wheel-right event. For a system-generated event, the value is always positive for a wheel event, and it is always 0.0 for other events. The initial value for a newly created key-event% is 0.0.

See also wheel-event-mode in window<%>.

Added in version 1.43 of package gui-lib.

```
(send a-key-event get-x) → exact-integer?
```

Returns the x-position of the mouse at the time of the event, in the target's window's (client-area) coordinate system.

```
(send a-key-event get-y) → exact-integer?
```

Returns the y-position of the mouse at the time of the event in the target's window's (client-area) coordinate system.

```
(send a-key-event set-alt-down down?) → void?
  down? : any/c
```

Sets whether the Option (Mac OS) key was down for the event. When the Alt key is pressed in Windows, it is reported as a Meta press (see set-meta-down).

```
(send a-key-event set-caps-down down?) → void?
  down? : any/c
```

Sets whether the Caps Lock key was on for the event.

```
(send a-key-event set-control-down down?) → void?
  down? : any/c
```

Sets whether the Control key was down for the event.

On Mac OS, if a control-key press is combined with a mouse button click, the event is reported as a right-button click and `get-control-down` for the event reports `#f`.

```
(send a-key-event set-control+meta-is-altgr down?) → void?
  down? : any/c
```

Sets whether a Control plus Meta combination on Windows should be treated as an AltGr combinations. See `get-control+meta-is-altgr`.

Added in version 1.2 of package `gui-lib`.

```
(send a-key-event set-key-code code) → void?
  code : (or/c char? key-code-symbol?)
```

Sets the virtual key code for the event, either a character or one of the special symbols listed with `get-key-code`.

```
(send a-key-event set-key-release-code code) → void?
  code : (or/c char? key-code-symbol?)
```

Sets the virtual key code for a release event, either a character or one of the special symbols listed with `get-key-code`. See also `get-key-release-code`.

```
(send a-key-event set-meta-down down?) → void?
  down? : any/c
```

Sets whether the Meta (Unix), Alt (Windows), or Command (Mac OS) key was down for the event.

```
(send a-key-event set-mod3-down down?) → void?
  down? : any/c
```

Sets whether the Mod3 (Unix) key was down for the event.

Added in version 1.1 of package `gui-lib`.

```
(send a-key-event set-mod4-down down?) → void?
  down? : any/c
```

Sets whether the Mod4 (Unix) key was down for the event.

Added in version 1.1 of package `gui-lib`.

```
(send a-key-event set-mod5-down down?) → void?
  down? : any/c
```

Sets whether the Mod5 (Unix) key was down for the event.

Added in version 1.1 of package `gui-lib`.

```
(send a-key-event set-other-altgr-key-code code) → void?
  code : (or/c char? key-code-symbol? #f)
```

Sets the key code produced by `get-other-altgr-key-code`.

```
(send a-key-event set-other-caps-key-code code) → void?
  code : (or/c char? key-code-symbol? #f)
```

Sets the key code produced by `get-other-caps-key-code`.

```
(send a-key-event set-other-shift-altgr-key-code code) → void?
  code : (or/c char? key-code-symbol? #f)
```

Sets the key code produced by `get-other-shift-altgr-key-code`.

```
(send a-key-event set-other-shift-key-code code) → void?
  code : (or/c char? key-code-symbol? #f)
```

Sets the key code produced by `get-other-shift-key-code`.

```
(send a-key-event set-shift-down down?) → void?
  down? : any/c
```

Sets whether the Shift key was down for the event.

```
(send a-key-event set-wheel-steps steps) → void?
  steps : nonnegative-real?
```

Sets the number of steps for a wheel event. See get-wheel-steps.

Added in version 1.43 of package gui-lib.

```
(send a-key-event set-x pos) → void?
  pos : exact-integer?
```

Sets the x-position of the mouse at the time of the event in the target's window's (client-area) coordinate system.

```
(send a-key-event set-y pos) → void?
  pos : exact-integer?
```

Sets the y-position of the mouse at the time of the event in the target's window's (client-area) coordinate system.

3.26 labelled-menu-item<%>

```
labelled-menu-item<%> : interface?
  implements: menu-item<%>
```

A labelled-menu-item<%> object is a menu-item<%> with a string label (i.e., any menu item other than a separator). More specifically, it is an instance of either menu-item% (a plain menu item), checkable-menu-item% (a checkable menu item), or menu% (a submenu).

```
(send a-labelled-menu-item enable enabled?) → void?
  enabled? : any/c
```

Enables or disables the menu item. If the item is a submenu (or menu in a menu bar), the entire menu is disabled, but each submenu item's is-enabled? method returns #f only if the item is specifically disabled (in addition to the submenu).

```
(send a-labelled-menu-item get-help-string)
 → (or/c label-string? #f)
```

Returns the help string for the menu item, or #f if the item has no help string.

When an item has a help, the string may be used to display help information to the user.

```
(send a-labelled-menu-item get-label) → label-string?
```

Returns the item's label.

See also set-label and get-plain-label.

```
(send a-labelled-menu-item get-plain-label) → label-string?
```

Like get-label, except that &s and tab characters in the label are stripped in the same way as for set-label.

```
(send a-labelled-menu-item is-enabled?) → boolean?
```

Returns #t if the menu item is enabled, #f otherwise.

See also enable.

```
(send a-labelled-menu-item on-demand) → void?
```

Specification: Normally called when the user clicks on the menu bar containing the item (before the user sees any menu items), just before the popup menu containing the item is popped up, or just before inspecting the menu bar containing the item for a shortcut key binding. See on-demand in menu-item-container<%> for further details.

A on-demand in menu-item-container<%> method can be overridden in such a way that the container does not call the on-demand method of its items.

Default implementation: Calls the demand-callback procedure that was provided when the object was created.

```
(send a-labelled-menu-item set-help-string help) → void?
  help : (or/c label-string? #f)
```

Sets the help string for the menu item. Use #f to remove the help string for an item.

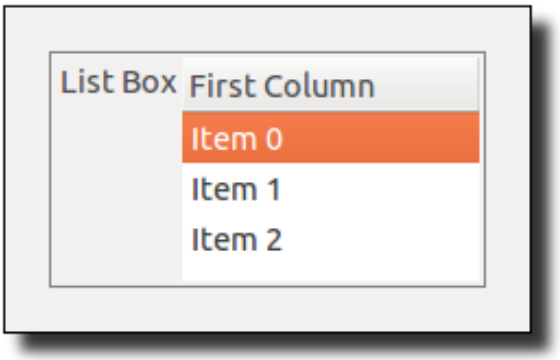
```
(send a-labelled-menu-item set-label label) → void?
  label : label-string?
```

Sets the menu item's label. If the item has a shortcut, the shortcut is not affected.

If the label contains `&` and the window is a control, the label is parsed specially; on Windows and Unix, the character following a `&` is underlined in the displayed menu to indicate a keyboard mnemonic. Pressing the Alt key with an underlined character from a menu's name in the menu bar causes the menu to be selected (via `on-menu-char`). When a menu has the focus, the mnemonic characters are used for navigation without Alt. A `&&` in the label is replaced by a literal (non-navigation) `&`. On Mac OS, `&`s in the label are parsed in the same way as for Unix and Windows, but no mnemonic underline is displayed. On Mac OS, a parenthesized mnemonic character is removed (along with any surrounding space) before the label is displayed, since a parenthesized mnemonic is often used for non-Roman languages. Finally, for historical reasons, if a label contains a tab character, then the tab and all remaining characters are hidden in the displayed menu. All of these rules are consistent with label handling in `button%` and other windows.

A `&` is always preserved in the label returned by `get-label`, but never preserved in the label returned by `get-plain-label`.

3.27 `list-box%`




```
list-box% : class?
  superclass: object%
  extends: list-control<%>
```

A list box allows the user to select one or more string items from a scrolling list. A list box is either a single-selection control (if an item is selected, the previous selection is removed) or a multiple-selection control (clicking an item toggles the item on or off independently of other selections).

Whenever the user changes the selection in a list box, the list box's callback procedure is called. A callback procedure is provided as an initialization argument when each list box is

created.

A list box can have multiple columns with optional column headers. An item in the list corresponds to a row that spans all columns. When column headers are displayed, the column widths can be changed by a user. In addition, columns can optionally support dragging by the user to change the display order of columns, while the logical order remains fixed.

List box rows and columns are indexed from 0.

See also choice%.

```
(new list-box%
   [label label]
   [choices choices]
   [parent parent]
  [[callback callback]
   [style style]
   [selection selection]
   [font font]
   [label-font label-font]
   [enabled enabled]
   [vert-margin vert-margin]
   [horiz-margin horiz-margin]
   [min-width min-width]
   [min-height min-height]
   [stretchable-width stretchable-width]
   [stretchable-height stretchable-height]
   [columns columns]
   [column-order column-order]])
→ (is-a?/c list-box%)
 label : (or/c label-string? #f)
 choices : (listof label-string?)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 callback : ((is-a?/c list-box%) (is-a?/c control-event%)
             . -> . any)
          = (lambda (c e) (void))
 style : (listof (or/c 'single 'multiple 'extended
                       'vertical-label 'horizontal-label
                       'variable-columns 'column-headers
                       'clickable-headers 'reorderable-headers
                       'deleted))
       = '(single)
 selection : (or/c exact-nonnegative-integer? #f) = #f
 font : (is-a?/c font%) = view-control-font
 label-font : (is-a?/c font%) = normal-control-font
 enabled : any/c = #t
```

```
vert-margin : spacing-integer? = 2
horiz-margin : spacing-integer? = 2
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #t
stretchable-height : any/c = #t
columns : (cons/c label-string? (listof label-string?))
        = '("Column")
column-order : (or/c #f (listof exact-nonnegative-integer?))
             = #f
```

If *label* is not #f, it is used as the list box label. Otherwise, the list box will not display its label.

If & occurs in *label*, it is specially parsed as for button%.

The *choices* list specifies the initial list of items to appear in the list box. If the list box has multiple columns, *choices* determines the content of the first column, and other columns are initialized to the empty string.

The *callback* procedure is called when the user changes the list box selection, by either selecting, re-selecting, deselecting, or double-clicking an item. The type of the event provided to the callback is 'list-box-dclick when the user double-clicks on an item, or 'list-box otherwise.

The *columns* list determines the number of columns in the list box. The column titles in *columns* are shown only if *style* includes 'column-headers. If *style* also includes 'clickable-headers, then a click on a header triggers a call to *callback* with a column-control-event% argument whose event type is 'list-box-column; for historical reasons, 'clickable-headers has no effect on Windows and header clicks are always reported.

The *style* specification must include exactly one of the following:

- 'single — Creates a single-selection list.
- 'multiple — Creates a multiple-selection list where a single click deselects other items and selects a new item. Use this style for a list when single-selection is common, but multiple selections are allowed.
- 'extended — Creates a multiple-selection list where a single click extends or contracts the selection by toggling the clicked item. Use this style for a list when multiple selections are the rule rather than the exception.

The 'multiple and 'extended styles determine a platform-independent interpretation of unmodified mouse clicks, but dragging, shift-clicking, control-clicking, etc. have platform-

standard interpretations. Whatever the platform-specific interface, the user can always select disjoint sets of items or deselect items (and leave no items selected). On some platforms, the user can deselect the (sole) selected item in a `'single` list box.

If *style* includes `'vertical-label`, then the list box is created with a label above the control; if *style* does not include `'vertical-label` (and optionally includes `'horizontal-label`), then the label is created to the left of the list box. If *style* includes `'deleted`, then the list box is created as hidden, and it does not affect its parent's geometry; the list box can be made active later by calling *parent*'s `add-child` method.

If *style* includes `'variable-columns`, then the number of columns in the list box can be changed via `append-column` and `delete-column`.

If *selection* is an integer, it is passed to `set-selection` to set the initial selection. The *selection* must be less than the length of *choices*.

The *font* argument determines the font for the control content, and *label-font* determines the font for the control label. For information about the *enabled* argument, see `window<%>`. For information about the *horiz-margin* and *vert-margin* arguments, see `subarea<%>`. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see `area<%>`.

It the *column-order* argument is not `#f`, it determines the order in which logical columns are initially displayed. See `set-column-order` for more information. If *style* includes `'column-headers` and `'reorderable-headers`, then a user can reorder columns as displayed (but the display order does not change the logical order of the columns).

```
(send a-list-box append item [data]) → void?
  item : label-string?
  data : any/c = #f
```

Overrides `append` in `list-control<%>`.

Adds a new item to the list box with an associated "data" object. The *data* object is not displayed in the list box; it is provided merely as a convenience for use with `get-data`, possibly allowing a programmer to avoid managing a separate item-to-data mapping in addition to the list box control.

See also `append` in `list-control<%>`.

```
(send a-list-box append-column label) → void?
  label : label-string?
```

Adds a new column with title *label* to the list box, but only if the list box is created with the `'variable-columns` style. The new column is logically the last column, and it is initially displayed as the last column.

```
(send a-list-box delete-column n) → void?
  n : exact-nonnegative-integer?
```

Deletes the column with logical position *n*, but only if the list box is created with the 'variable-columns style, and only if the list box currently has more than one column (i.e., the number of columns can never be zero).

```
(send a-list-box get-column-labels)
 → (cons/c label-string? (listof label-string?))
```

Returns the labels of the list box's columns, and the number of returned strings indicates the number of columns in the list box.

```
(send a-list-box get-column-order)
 → (listof exact-nonnegative-integer?)
```

Returns the display order of logical columns. Each column is represented by its logical position in the result list, and the order of the column positions indicates the display order.

See also set-column-order.

```
(send a-list-box get-column-width column) → dimension-integer?
                                            dimension-integer?
                                            dimension-integer?
  column : exact-nonnegative-integer?
```

Gets the width of the column identified by *column* (in logical positions, as opposed to display positions), which must be between 0 and one less than the number of columns.

The result includes the column's current width as well as its minimum and maximum widths to constrain the column size as adjusted by a user.

See also set-column-width.

```
(send a-list-box get-data n) → any/c
  n : exact-nonnegative-integer?
```

Returns the data for the item indexed by *n*, or #f if there is no associated data. List box rows are indexed from 0. If *n* is equal to or larger than the number of choices, an exn:fail:contract exception is raised.

See also append and set-data.

```
(send a-list-box get-first-visible-item)
 → exact-nonnegative-integer?
```

Reports the index of the item currently scrolled to the top of the list box. List box rows are indexed from `0`.

```
(send a-list-box get-label-font) → (is-a?/c font%)
```

Returns the font used for the control's label, which is optionally supplied when a list box is created.

```
(send a-list-box get-selections)
 → (listof exact-nonnegative-integer?)
```

Returns a list of indices for all currently selected items. List box rows are indexed from `0`.

For single-selection lists, the result is always either `null` or a list containing one number.

```
(send a-list-box is-selected? n) → boolean?
  n : exact-nonnegative-integer?
```

Returns `#t` if the items indexed by *n* is selected, `#f` otherwise. List box rows are indexed from `0`. If *n* is equal to or larger than the number of choices, an `exn:fail:contract` exception is raised.

A list box's selection can be changed by the user clicking the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor selection changes.

```
(send a-list-box number-of-visible-items)
 → exact-positive-integer?
```

Returns the maximum number of items in the list box that are visible to the user with the control's current size (rounding down if the exact answer is fractional, but returning at least `1`).

```
(send a-list-box select n [select?]) → void?
  n : exact-nonnegative-integer?
  select? : any/c = #t
```

Selects or deselects an item. For selection in a single-selection list box, if a different choice is currently selected, it is automatically deselected. For selection in a multiple-selection list box, other selections are preserved, unlike `set-selection`.

If *select?* is `#f`, the item indexed by *n* is deselected; otherwise it is selected. List box rows are indexed from `0`. If *n* is equal to or larger than the number of choices, an `exn:fail:contract` exception is raised.

A list box's selection can be changed by the user clicking the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor selection changes.

The control's callback procedure is *not* invoked.

```
(send a-list-box set choices0 choices ...) → void?
  choices0 : (listof label-string?)
  choices : (listof label-string?)
```

Clears the list box and installs a new list of items. The number of *choices0* plus *choices* lists must match the number of columns, and all *choices* lists must have the same number of items, otherwise an `exn:fail:contract` exception is raised.

```
(send a-list-box set-column-label column
                                  label) → void?
  column : exact-nonnegative-integer?
  label : label-string?
```

Sets the label of the column identified by *column* (in logical positions, as opposed to display positions), which must be between 0 and one less than the number of columns.

```
(send a-list-box set-column-order column-order) → void?
  column-order : (listof exact-nonnegative-integer?)
```

Sets the order in which logical columns are displayed. Each element of *column-order* must identify a unique column by its logical position, and all logical columns must be represented in the list.

See also `get-column-order`.

```
(send a-list-box set-column-width column
                                  width
                                  min-width
                                  max-width) → void?
  column : exact-nonnegative-integer?
```

```
  width : dimension-integer?
  min-width : dimension-integer?
  max-width : dimension-integer?
```

Sets the width of the column identified by *column* (in logical positions, as opposed to display positions), which must be between 0 and one less than the number of columns.

The *width* argument sets the current display width, while *min-width* and *max-width* constrain the width of the column when the user resizes it. The *width* argument must be no less than *min-width* and no more than *max-width*.

The default width of a column is platform-specific, and the last column of a list box may extend to the end of the control independent of its requested size.

See also get-column-width.

```
(send a-list-box set-data n data) → void?
  n : exact-nonnegative-integer?
  data : any/c
```

Sets the associated data for item indexed by *n*. List box rows are indexed from 0. If *n* is equal to or larger than the number of choices, an exn:fail:contract exception is raised.

See also append.

```
(send a-list-box set-first-visible-item n) → void?
  n : exact-nonnegative-integer?
```

Scrolls the list box so that the item indexed by *n* is at the top of the list box display. List box rows are indexed from 0. If *n* is equal to or larger than the number of choices, an exn:fail:contract exception is raised.

A list box's scroll position can be changed by the user clicking the control, and such changes do not go through this method. A program cannot detect when the scroll position changes except by polling get-first-visible-item.

```
(send a-list-box set-string n label [column]) → void?
  n : exact-nonnegative-integer?
  label : label-string?
  column : exact-nonnegative-integer? = 0
```

Sets the item indexed by *n* in logical column *column*. List box rows and columns are indexed from 0. If *n* is equal to or larger than the number of choices, or if *column* is equal to or larger than the number of columns, an exn:fail:contract exception is raised.

3.28 list-control<%>

```
list-control<%> : interface?
  implements: control<%>
```

A list control gives the user a list of string items to choose from. There are two built-in classes that implement list-control<%>:

- choice% — presents the list in a popup menu (so the user can choose only one item at a time)
- list-box% — presents the list in a scrolling box, allowing the use to choose one item (if the style includes 'single) or any number of items

In either case, the set of user-selectable items can be changed dynamically.

```
(send a-list-control append item) → void?
  item : label-string?
```

Adds a new item to the list of user-selectable items. The current selection is unchanged (unless the list control is an empty choice control, in which case the new item is selected).

```
(send a-list-control clear) → void?
```

Removes all user-selectable items from the control.

```
(send a-list-control delete n) → void?
  n : exact-nonnegative-integer?
```

Deletes the item indexed by *n* (where items are indexed from 0). If *n* is equal to or larger than the number of items in the control, an exn:fail:contract exception is raised.

Selected items that are not deleted remain selected, and no other items are selected.

```
(send a-list-control find-string s)
 → (or/c exact-nonnegative-integer? #f)
  s : string?
```

Finds a user-selectable item matching the given string. If no matching choice is found, #f is returned, otherwise the index of the matching choice is returned (where items are indexed from 0).

```
(send a-list-control get-number) → exact-nonnegative-integer?
```

Returns the number of user-selectable items in the control (which is also one more than the greatest index in the list control).

```
(send a-list-control get-selection)
 → (or/c exact-nonnegative-integer? #f)
```

Returns the index of the currently selected item (where items are indexed from 0). If the choice item currently contains no choices or no selections, #f is returned. If multiple selections are allowed and multiple items are selected, the index of the first selection is returned.

```
(send a-list-control get-string n)
 → (and/c immutable? label-string?)
  n : exact-nonnegative-integer?
```

Returns the item for the given index (where items are indexed from 0). If the provided index is larger than the greatest index in the list control, an exn:fail:contract exception is raised.

```
(send a-list-control get-string-selection)
 → (or/c (and/c immutable? label-string?) #f)
```

Returns the currently selected item. If the control currently contains no choices, #f is returned. If multiple selections are allowed and multiple items are selected, the first selection is returned.

```
(send a-list-control set-selection n) → void?
  n : exact-nonnegative-integer?
```

Selects the item specified by the given index (where items are indexed from 0). If the given index larger than the greatest index in the list control, an exn:fail:contract exception is raised.

In a list box control, all other items are deselected, even if multiple selections are allowed in the control. See also select in list-box%.

The control's callback procedure is *not* invoked when this method is called.

The list control's selection can be changed by the user clicking the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor selection changes.

```
(send a-list-control set-string-selection s) → void?
  s : string?
```

Selects the item that matches the given string. If no match is found in the list control, an `exn:fail:contract` exception is raised.

In a list box control, all other items are deselected, even if multiple selections are allowed in the control. See also `select` in `list-box%`.

The control's callback procedure is *not* invoked when this method is called.

The list control's selection can be changed by the user clicking the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor selection changes.

3.29 menu%

```
menu% : class?
  superclass: object%
  extends: menu-item-container<%>
           labelled-menu-item<%>
```

A `menu%` object is a submenu within a `menu%` or `popup-menu%`, or as a top-level menu in a `menu-bar%`.

```
(new menu%
     [label label]
     [parent parent]
    [[help-string help-string]
     [demand-callback demand-callback]])
→ (is-a?/c menu%)
 label : label-string?
 parent : (or/c (is-a?/c menu%) (is-a?/c popup-menu%)
                (is-a?/c menu-bar%))
 help-string : (or/c label-string? #f) = #f
 demand-callback : ((is-a?/c menu%) . -> . any)
                 = (lambda (m) (void))
```

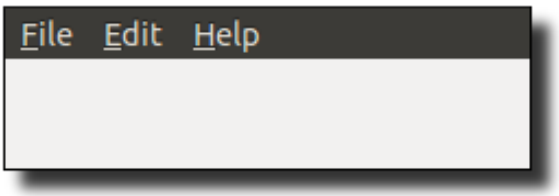
Creates a new menu with the given label.

If `label` contains a `&` or tab characters, they are handled specially in the same way as for menu-item labels and buttons. See `set-label` and `button%`.

If *help-string* is not #f, the menu has a help string. See get-help-string for more information.

The *demand-callback* procedure is called by the default on-demand method with the object itself.

3.30 menu-bar%




```
menu-bar% : class?
  superclass: object%
  extends: menu-item-container<%>
```

A menu-bar% object is created for a particular frame% object. A frame can have at most one menu bar; an exn:fail:contract exception is raised when a new menu bar is created for a frame that already has a menu bar.

```
(new menu-bar%
     [parent parent]
    [[demand-callback demand-callback]])
→ (is-a?/c menu-bar%)
 parent : (or/c (is-a?/c frame%) 'root)
 demand-callback : ((is-a?/c menu-bar%) . -> . any)
                 = (lambda (m) (void))
```

Creates a menu bar in the specified frame. The menu bar is initially empty. If 'root is supplied as *parent*, the menu bar becomes active only when no other frames are shown. A 'root *parent* is allowed only when current-eventspace-has-menu-root? returns #t, and only if no such menu bar has been created before, otherwise an exn:fail:contract exception is raised.

The *demand-callback* procedure is called by the default on-demand method with the object itself.

```
(send a-menu-bar enable enable?) → void?
  enable? : any/c
```

Enables or disables the menu bar (i.e., all of its menus). Each menu's `is-enabled?` method returns `#f` only if the menu is specifically disabled (in addition to the menu bar).

```
(send a-menu-bar get-frame) → (or/c (is-a?/c frame%) 'root)
```

Returns the menu bar's frame, or returns `'root` if the menu bar is shown when no other frames are shown.

```
(send a-menu-bar is-enabled?) → boolean?
```

Returns `#t` if the menu bar is enabled, `#f` otherwise.

3.31 menu-item<%>

```
menu-item<%> : interface?
```

A `menu-item<%>` object is an element within a `menu%`, `popup-menu%`, or `menu-bar%`. Operations that affect the parent — such as renaming the item, deleting the item, or adding a check beside the item — are accomplished via the `menu-item<%>` object.

A menu item is either a `separator-menu-item%` object (merely a separator), or a `labelled-menu-item<%>` object; the latter is more specifically an instance of either `menu-item%` (a plain menu item), `checkable-menu-item%` (a checkable menu item), or `menu%` (a submenu).

```
(send a-menu-item delete) → void?
```

Removes the item from its parent. If the menu item is already deleted, `delete` has no effect.

See also `restore`.

```
(send a-menu-item get-parent)
 → (or/c (is-a?/c menu%) (is-a?/c popup-menu%) (is-a?/c menu-bar%))
```

Returns the menu, popup menu, or menu bar containing the item. The parent for a menu item is specified when the menu item is created, and it cannot be changed.

```
(send a-menu-item is-deleted?) → boolean?
```

Returns `#t` if the menu item is deleted from its parent, `#f` otherwise.

```
(send a-menu-item restore) → void?
```

Adds a deleted item back into its parent. The item is always restored to the end of the parent, regardless of its original position. If the item is not currently deleted, `restore` has no effect.

3.32 menu-item%

```
menu-item% : class?
  superclass: object%
  extends: selectable-menu-item<%>
```

A `menu-item%` is a plain string-labelled menu item. Its parent must be a `menu%` or `popup-menu%`. When the user selects the menu item, its callback procedure is called.

```
(new menu-item%
     [label label]
     [parent parent]
     [callback callback]
    [[shortcut shortcut]
     [help-string help-string]
     [demand-callback demand-callback]
     [shortcut-prefix shortcut-prefix]])
→ (is-a?/c menu-item%)
 label : label-string?
 parent : (or/c (is-a?/c menu%) (is-a?/c popup-menu%))
 callback : ((is-a?/c menu-item%) (is-a?/c control-event%) . -> . any)
 shortcut : (or/c char? symbol? #f) = #f
 help-string : (or/c label-string? #f) = #f
 demand-callback : ((is-a?/c menu-item%) . -> . any)
                 = (lambda (i) (void))
 shortcut-prefix : (and/c (listof (or/c 'alt 'cmd 'meta 'ctl
                                        'shift 'option))
                          (λ (x) (implies (equal? 'unix (system-type))
                                          (not (and (member 'alt x)
                                                    (member 'meta x)))))
                          (λ (x) (equal? x (remove-duplicates x))))
                 = (get-default-shortcut-prefix)
```

Creates a new menu item in *parent*. The item is initially shown, appended to the end of its parent. The *callback* procedure is called (with the event type `'menu`) when the user selects the menu item (either via a menu bar, `popup-menu` in `window<%>`, or `popup-menu` in `editor-admin%`).

See set-label for information about mnemonic &s in label.

If shortcut is not #f, the item has a shortcut. See get-shortcut for more information. The shortcut-prefix argument determines the set of modifier keys for the shortcut; see get-shortcut-prefix.

If help is not #f, the item has a help string. See get-help-string for more information.

The demand-callback procedure is called by the default on-demand method with the object itself.

3.33 menu-item-container<%>

```
menu-item-container<%> : interface?
```

A menu-item-container<%> object is a menu%, popup-menu%, or menu-bar%.

```
(send a-menu-item-container get-items)
 → (listof (is-a?/c menu-item<%>))
```

Returns a list of the items in the menu, popup menu, or menu bar. The order of the items in the returned list corresponds to the order as the user sees them in the menu or menu bar.

```
(send a-menu-item-container on-demand) → void?
```

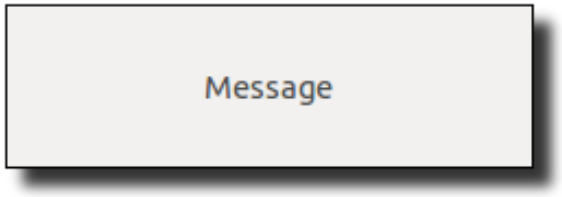
Specification: Called when the user clicks on the container as a menu bar (before the user sees any menu items, except with Unity's global menu bar as noted below), just before the container as a popup menu is popped up, or just before inspecting the menu bar containing the item for a shortcut key binding.

If the container is not a menu bar or a popup menu, this method is normally called via the on-demand method of the container's owning menu bar or popup menu, because the default implementation of the method chains to the on-demand method of its items. However, the method can be overridden in a container such that it does not call the on-demand method of its items.

On Unix with the Unity window manager using the global menu bar (which is the default on Ubuntu), racket/gui/base receives no notification when the user clicks the menu bar. To approximate on-demand triggered by user clicks of the menu bar, on-demand is called for a menu bar whenever its frame% object loses the keyboard focus. Beware that if keyboard focus was lost because a menu was clicked, then items added to the clicked menu during an on-demand invocation may not appear for the user.

Default implementation: Calls the `demand-callback` procedure that was provided when the object was created, then calls the `on-demand` method of the contained items.

3.34 message%




```
message% : class?
  superclass: object%
  extends: control<%>
```

A message control is a static line of text or a static bitmap. The text or bitmap corresponds to the message's label (see `set-label`).

```
(new message%
     [label label]
     [parent parent]
    [[style style]
     [font font]
     [color color]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]
     [auto-resize auto-resize]])
→ (is-a?/c message%)
 label : (or/c label-string? (is-a?/c bitmap%)
              (or/c 'app 'caution 'stop))
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 style : (listof (or/c 'deleted)) = null
 font : (is-a?/c font%) = normal-control-font
 color : (or/c #f string? (is-a?/c color%)) = #f
 enabled : any/c = #t
 vert-margin : spacing-integer? = 2
```

```
  horiz-margin : spacing-integer? = 2
  min-width : (or/c dimension-integer? #f) = #f
  min-height : (or/c dimension-integer? #f) = #f
  stretchable-width : any/c = #f
  stretchable-height : any/c = #f
  auto-resize : any/c = #f
```

Creates a string or bitmap message initially showing *label*. If *label* is a bitmap, and if the bitmap has a mask (see get-loaded-mask in bitmap%) that is the same size as the bitmap, then the mask is used for the label. Modifying a bitmap while it is used as a label has an unspecified effect on the displayed label. An 'app, 'caution, or 'stop symbol for *label* indicates an icon; 'app is the application icon (Windows and Mac OS) or a generic "info" icon (X), 'caution is a caution-sign icon, and 'stop is a stop-sign icon.

If & occurs in *label*, it is specially parsed; under Windows and X, the character following & is underlined in the displayed control to indicate a keyboard mnemonic. (Under Mac OS, mnemonic underlines are not shown.) The mnemonic is meaningless for a message (as far as on-traverse-char in top-level-window<%> is concerned), but it is supported for consistency with other control types. A programmer may assign a meaning to the mnemonic (e.g., by overriding on-traverse-char).

If *style* includes 'deleted, then the message is created as hidden, and it does not affect its parent's geometry; the message can be made active later by calling *parent*'s add-child method.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

The *color* argument determines the color of the text label. It has no effect on symbol and bitmap labels. If it is #f, the system default text color is used. If it is a string, then the color is looked up in the-color-database.

If *auto-resize* is not #f, then automatic resizing is initially enabled (see auto-resize), and the message% object's graphical minimum size is as small as possible.

Changed in version 1.58 of package gui-lib: Added the *color* argument.

```
(send a-message auto-resize) → boolean?
(send a-message auto-resize on?) → void?
  on? : any/c
```

Reports or sets whether the message%'s min-width and min-height are automatically set when the label is changed via set-label.

```
(send a-message set-label label) → void?
  label : (or/c label-string? (is-a?/c bitmap%))
```

Overrides `set-label` in `window<%>`.

The same as `set-label` in `window<%>` when *label* is a string.

Otherwise, sets the bitmap label for a bitmap message. Since *label* is a bitmap, if the bitmap has a mask (see `get-loaded-mask` in `bitmap%`) that is the same size as the bitmap, then the mask is used for the label. Modifying a bitmap while it is used as a label has an unspecified effect on the displayed label. The bitmap label is installed only if the control was originally created with a bitmap label.

```
(send a-message set-color color) → void?
  color : (or/c #f (is-a?/c color%))
(send a-message set-color color-name) → void?
  color-name : string?
```

Sets the label's text color. When *color* is `#f`, sets the label's text color to the platform default. This method has no effect if the label is a symbol or a bitmap.

Added in version 1.58 of package `gui-lib`.
Changed in version 1.71: Added support for setting the color to the system default.

```
(send a-message get-color) → (or/c #f (is-a?/c color%))
```

Returns the current user-specified label color or `#f` if the system default is used.

Added in version 1.58 of package `gui-lib`.

3.35 mouse-event%

```
mouse-event% : class?
  superclass: event%
```

A `mouse-event%` object encapsulates a mouse event. Mouse events are primarily processed by `on-subwindow-event` in `window<%>` and `on-event` in `canvas<%>`.

See also §1.5 "Mouse and Keyboard Events".

```
(new mouse-event%
     [event-type event-type]
    [[left-down left-down]
     [middle-down middle-down]
     [right-down right-down]
     [x x]
     [y y]
     [shift-down shift-down]
     [control-down control-down]
     [meta-down meta-down]
     [alt-down alt-down]
     [time-stamp time-stamp]
     [caps-down caps-down]
     [mod3-down mod3-down]
     [mod4-down mod4-down]
     [mod5-down mod5-down]])
→ (is-a?/c mouse-event%)
 event-type : (or/c 'enter 'leave 'left-down 'left-up
                    'middle-down 'middle-up
                    'right-down 'right-up 'motion)
 left-down : any/c = #f
 middle-down : any/c = #f
 right-down : any/c = #f
 x : exact-integer? = 0
 y : exact-integer? = 0
 shift-down : any/c = #f
 control-down : any/c = #f
 meta-down : any/c = #f
 alt-down : any/c = #f
 time-stamp : exact-integer? = 0
 caps-down : any/c = #f
 mod3-down : any/c = #f
 mod4-down : any/c = #f
 mod5-down : any/c = #f
```

Creates a mouse event for a particular type of event. The event types are:

- `'enter` — mouse pointer entered the window
- `'leave` — mouse pointer left the window
- `'left-down` — left mouse button pressed
- `'left-up` — left mouse button released
- `'middle-down` — middle mouse button pressed

- 'middle-up — middle mouse button released
- 'right-down — right mouse button pressed (Mac OS: click with control key pressed)
- 'right-up — right mouse button released (Mac OS: release with control key pressed)
- 'motion — mouse moved, with or without button(s) pressed

See the corresponding get- and set- methods for information about *left-down*, *middle-down*, *right-down*, *x*, *y*, *shift-down*, *control-down*, *meta-down*, *alt-down*, *time-stamp*, *caps-down*, *mod3-down*, *mod4-down*, and *mod5-down*.

Changed in version 1.1 of package gui-lib: Added *mod3-down*, *mod4-down*, and *mod5-down*.

```
(send a-mouse-event button-changed? [button]) → boolean?
  button : (or/c 'left 'middle 'right 'any) = 'any
```

Returns #t if this was a mouse button press or release event (i.e., type 'left-down, 'left-up, 'middle-down, 'middle-up, 'right-down, or 'right-up), #f otherwise. See also button-up? and button-down?.

If *button* is not 'any, then #t is only returned if it is a press or release event for a specific button.

```
(send a-mouse-event button-down? [button]) → boolean?
  button : (or/c 'left 'middle 'right 'any) = 'any
```

Returns #t if the event is for a button press (i.e., type 'left-down, 'middle-down, or 'right-down), #f otherwise.

If *button* is not 'any, then #t is only returned if it is a press event for a specific button.

```
(send a-mouse-event button-up? [button]) → boolean?
  button : (or/c 'left 'middle 'right 'any) = 'any
```

Returns #t if the event is for a button release (i.e., type 'left-up, 'middle-up, or 'right-up), #f otherwise. (As noted in §1.5 “Mouse and Keyboard Events”, button release events are sometimes dropped.)

If *button* is not 'any, then #t is only returned if it is a release event for a specific button.

```
(send a-mouse-event dragging?) → boolean?
```

Returns #t if this was a dragging event: type 'motion while a button is pressed (as reported by get-left-down, get-middle-down, or or get-right-down), #f otherwise.

```
(send a-mouse-event entering?) → boolean?
```

Returns #t if this event is for the mouse entering a window (i.e., type 'enter), #f otherwise.

When the mouse button is up, an enter/leave event notifies a window that it will start/stop receiving mouse events. When the mouse button is down, however, the window receiving the mouse-down event receives all mouse events until the button is released; enter/leave events are not sent to other windows, and are not reliably delivered to the click-handling window (since the window can detect movement out of its region via get-x and get-y). See also §1.5 "Mouse and Keyboard Events".

```
(send a-mouse-event get-alt-down) → boolean?
```

Returns #t if the Option (Mac OS) key was down for the event. When the Alt key is pressed in Windows, it is reported as a Meta press (see get-meta-down).

```
(send a-mouse-event get-caps-down) → boolean?
```

Returns #t if the Caps Lock key was on for the event.

```
(send a-mouse-event get-control-down) → boolean?
```

Returns #t if the Control key was down for the event.

On Mac OS, if a control-key press is combined with a mouse button click, the event is reported as a right-button click and get-control-down for the event reports #f.

```
(send a-mouse-event get-event-type)
 → (or/c 'enter 'leave 'left-down 'left-up
         'middle-down 'middle-up
         'right-down 'right-up 'motion)
```

Returns the type of the event; see mouse-event% for information about each event type. See also set-event-type.

```
(send a-mouse-event get-left-down) → boolean?
```

Returns #t if the left mouse button was down (but not pressed) during the event.

```
(send a-mouse-event get-meta-down) → boolean?
```

Returns #t if the Meta (Unix), Alt (Windows), or Command (Mac OS) key was down for the event.

```
(send a-mouse-event get-middle-down) → boolean?
```

Returns #t if the middle mouse button was down (but not pressed) for the event. On Mac OS, a middle-button click is impossible.

```
(send a-mouse-event get-mod3-down) → boolean?
```

Returns #t if the Mod3 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-mouse-event get-mod4-down) → boolean?
```

Returns #t if the Mod4 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-mouse-event get-mod5-down) → boolean?
```

Returns #t if the Mod5 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-mouse-event get-right-down) → boolean?
```

Returns #t if the right mouse button was down (but not pressed) for the event. On Mac OS, a control-click combination is treated as a right-button click.

```
(send a-mouse-event get-shift-down) → boolean?
```

Returns #t if the Shift key was down for the event.

```
(send a-mouse-event get-x) → exact-integer?
```

Returns the x-position of the mouse at the time of the event, in the target's window's (client-area) coordinate system.

```
(send a-mouse-event get-y) → exact-integer?
```

Returns the y-position of the mouse at the time of the event in the target's window's (client-area) coordinate system.

```
(send a-mouse-event leaving?) → boolean?
```

Returns `#t` if this event is for the mouse leaving a window (i.e., type `'leave`), `#f` otherwise.

See `entering?` for information about enter and leave events while the mouse button is clicked.

```
(send a-mouse-event moving?) → boolean?
```

Returns `#t` if this was a moving event (i.e., type `'motion`), `#f` otherwise.

```
(send a-mouse-event set-alt-down down?) → void?
  down? : any/c
```

Sets whether the Option (Mac OS) key was down for the event. When the Alt key is pressed in Windows, it is reported as a Meta press (see `set-meta-down`).

```
(send a-mouse-event set-caps-down down?) → void?
  down? : any/c
```

Sets whether the Caps Lock key was on for the event.

```
(send a-mouse-event set-control-down down?) → void?
  down? : any/c
```

Sets whether the Control key was down for the event.

On Mac OS, if a control-key press is combined with a mouse button click, the event is reported as a right-button click and `get-control-down` for the event reports `#f`.

```
(send a-mouse-event set-event-type event-type) → void?
  event-type : (or/c 'enter 'leave 'left-down 'left-up
                     'middle-down 'middle-up
                     'right-down 'right-up 'motion)
```

Sets the type of the event; see mouse-event% for information about each event type. See also get-event-type.

```
(send a-mouse-event set-left-down down?) → void?
  down? : any/c
```

Sets whether the left mouse button was down (but not pressed) during the event.

```
(send a-mouse-event set-meta-down down?) → void?
  down? : any/c
```

Sets whether the Meta (Unix), Alt (Windows), or Command (Mac OS) key was down for the event.

```
(send a-mouse-event set-middle-down down?) → void?
  down? : any/c
```

Sets whether the middle mouse button was down (but not pressed) for the event. On Mac OS, a middle-button click is impossible.

```
(send a-mouse-event set-mod3-down down?) → void?
  down? : any/c
```

Sets whether the Mod3 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-mouse-event set-mod4-down down?) → void?
  down? : any/c
```

Sets whether the Mod4 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-mouse-event set-mod5-down down?) → void?
  down? : any/c
```

Sets whether the Mod5 (Unix) key was down for the event.

Added in version 1.1 of package gui-lib.

```
(send a-mouse-event set-right-down down?) → void?
  down? : any/c
```

Sets whether the right mouse button was down (but not pressed) for the event. On Mac OS, a control-click combination by the user is treated as a right-button click.

```
(send a-mouse-event set-shift-down down?) → void?
  down? : any/c
```

Sets whether the Shift key was down for the event.

```
(send a-mouse-event set-x pos) → void?
  pos : exact-integer?
```

Sets the x-position of the mouse at the time of the event in the target's window's (client-area) coordinate system.

```
(send a-mouse-event set-y pos) → void?
  pos : exact-integer?
```

Sets the y-position of the mouse at the time of the event in the target's window's (client-area) coordinate system.

3.36 pane%

```
pane% : class?
  superclass: object%
  extends: area-container<%>
           subarea<%>
```

A pane is a both a container and a containee area. It serves only as a geometry management device. A pane% cannot be hidden or disabled like a panel% object.

A pane% object has a degenerate placement strategy for managing its children: it places each child as if it was the only child of the panel. The horizontal-pane% and vertical-pane% classes provide useful geometry management for multiple children.

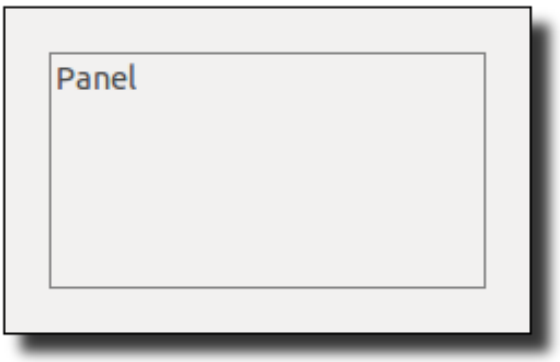
See also grow-box-spacer-pane%.

Changed in version 1.3 of package gui-lib: Changed the placement strategy to stretch and align children, instead of placing all children at the top-left corner.

```
(new pane%
     [parent parent]
    [[vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c pane%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 vert-margin : spacing-integer? = 0
 horiz-margin : spacing-integer? = 0
 border : spacing-integer? = 0
 spacing : spacing-integer? = 0
 alignment : (list/c (or/c 'left 'center 'right)
                     (or/c 'top 'center 'bottom))
           = '(center top)
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = #t
```

For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *border*, *spacing*, and *alignment* arguments, see area-container<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

3.37 panel%




```
panel% : class?
  superclass: object%
  extends: area-container-window<%>
           subwindow<%>
```

A panel is a both a container and a containee window. It serves mainly as a geometry management device, but the 'border creates a container with a border. Unlike a pane% object, a panel% object can be hidden or disabled.

A panel% object has a degenerate placement strategy for managing its children: it places each child as if it was the only child of the panel. The horizontal-panel% and vertical-panel% classes provide useful geometry management for multiple children.

Changed in version 1.3 of package gui-lib: Changed the placement strategy to stretch and align children, instead of placing all children at the top-left corner.

```
(new panel%
     [parent parent]
    [[style style]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c panel%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
```

```
style : (listof (or/c 'border 'deleted
                      'hscroll 'auto-hscroll 'hide-hscroll
                      'vscroll 'auto-vscroll 'hide-vscroll))
      = null
enabled : any/c = #t
vert-margin : spacing-integer? = 0
horiz-margin : spacing-integer? = 0
border : spacing-integer? = 0
spacing : spacing-integer? = 0
alignment : (list/c (or/c 'left 'center 'right)
                    (or/c 'top 'center 'bottom))
          = '(center center)
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #t
stretchable-height : any/c = #t
```

If the 'border style is specified, the window is created with a thin border (in which case the client size of the panel may be less than its total size). If *style* includes 'deleted, then the panel is created as hidden, and it does not affect its parent's geometry; the panel can be made active later by calling *parent*'s add-child method.

If the 'hscroll or 'vscroll style is specified, then the panel includes a scrollbar in the corresponding direction, and the panel's own size in the corresponding direction is not constrained by the size of its children subareas. The 'auto-hscroll and 'auto-vscroll styles imply 'hscroll and 'vscroll, respectively, but they cause the corresponding scrollbar to disappear when no scrolling is needed in the corresponding direction; the 'auto-vscroll and 'auto-hscroll modes assume that children subareas are placed using the default algorithm for a panel%, vertical-panel%, or horizontal-panel%. The 'hide-hscroll and 'hide-vscroll styles imply 'auto-hscroll and 'auto-vscroll, respectively, but the corresponding scroll bar is never made visible (while still allowing the panel content to exceed its own size).

For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *border*, *spacing*, and *alignment* arguments, see area-container<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

Changed in version 1.25 of package gui-lib: Added 'hide-vscroll and 'hide-hscroll.

3.38 popup-menu%

```
popup-menu% : class?
```

superclass: object%
extends: menu-item-container<%>

A popup-menu% object is created without a parent. Dynamically display a popup-menu% with popup-menu in window<%> or popup-menu in editor-admin%.

A popup menu is *not* a control. A choice% control, however, displays a single value that the user selects from a popup menu. A choice% control's popup menu is built into the control, and it is not accessible to the programmer.

```
(new popup-menu%
   [[title title]
    [popdown-callback popdown-callback]
    [demand-callback demand-callback]
    [font font]])
→ (is-a?/c popup-menu%)
 title : (or/c label-string? #f) = #f
 popdown-callback : ((is-a?/c popup-menu%) (is-a?/c control-event%)
                     . -> . any)
                  = (lambda (p e) (void))
 demand-callback : ((is-a?/c popup-menu%) . -> . any)
                 = (lambda (p) (void))
 font : (is-a?/c font%) = normal-control-font
```

If *title* is not #f, it is used as a displayed title at the top of the popup menu.

If *title* contains &, it is handled specially, the same as for menu% titles. A popup menu mnemonic is not useful, but it is supported for consistency with other menu labels.

The *popdown-callback* procedure is invoked when a popup menu is dismissed. If the popup menu is dismissed without an item being selected, *popdown-callback* is given a control-event% object with the event type 'menu-popdown-none. If the popup menu is dismissed via an item selection, the item's callback is invoked first, and then *popdown-callback* is given a control-event% object with the event type 'menu-popdown.

The *demand-callback* procedure is called by the default on-demand method with the object itself.

The *font* argument determines the font for the popup menu's items.

```
(send a-popup-menu get-font) → (is-a?/c font%)
```

Returns the font used for the popup menu's items, which is optionally supplied when a popup menu is created.

```
(send a-popup-menu get-popup-target)
 → (or/c (is-a?/c window<%>) (is-a?/c editor<%>) #f)
```

Returns the context in which the popup menu is currently displayed, or #f if it is not popped up in any window.

The context is set before the on-demand method is called, and it is not removed until after the popup-menu's callback is invoked. (Consequently, it is also set while an item callback is invoked, if the user selected an item.)

```
(send a-popup-menu set-min-width width) → void?
  width : dimension-integer?
```

Sets the popup menu's minimum width in pixels.

3.39 printer-dc%

```
printer-dc% : class?
  superclass: object%
  extends: dc<%>
```

A printer-dc% object is a printer device context. A newly created printer-dc% object obtains orientation (portrait versus landscape) and scaling information from the current ps-setup% object, as determined by the current-ps-setup parameter. This information can be configured by the user through a dialog shown by get-page-setup-from-user.

Be sure to use the following methods to start/end drawing:

- start-doc
- start-page
- end-page
- end-doc

Attempts to use a drawing method outside of an active page raises an exception.

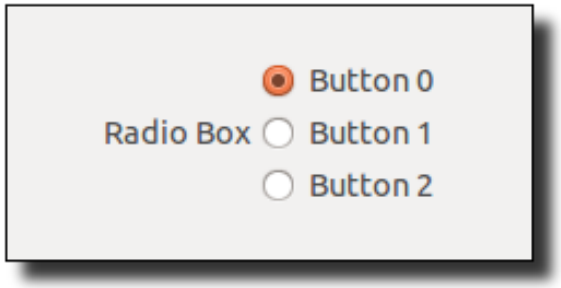
See also post-script-dc%.

When the end-doc method is called on a printer-dc% instance, the user may receive a dialog to determine how the document is printed.

```
(new printer-dc% [[parent parent]]) → (is-a?/c printer-dc%)
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
```

If *parent* is not #f, it is may be as the parent window of the dialog (if any) presented by end-doc.

3.40 radio-box%




```
radio-box% : class?
  superclass: object%
  extends: control<%>
```

A radio-box% control allows the user to select one of a number of mutually exclusive items. The items are displayed as a vertical column or horizontal row of labelled *radio buttons*. Unlike a list-control<%>, the set of items in a radio-box% cannot be changed dynamically.

Whenever the user changes the selected radio button, the radio box's callback procedure is invoked. A callback procedure is provided as an initialization argument when each radio box is created.

```
(new radio-box%
     [label label]
     [choices choices]
     [parent parent]
    [[callback callback]
     [style style]
     [selection selection]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c radio-box%)
 label : (or/c label-string? #f)
```

```
choices : (or/c (listof label-string?) (listof (is-a?/c bitmap%)))
parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
               (is-a?/c panel%) (is-a?/c pane%))
callback : ((is-a?/c radio-box%) (is-a?/c control-event%)
            . -> . any)
         = (lambda (r e) (void))
style : (listof (or/c 'horizontal 'vertical
                      'vertical-label 'horizontal-label
                      'deleted))
      = '(vertical)
selection : (or/c exact-nonnegative-integer? #f) = 0
font : (is-a?/c font%) = normal-control-font
enabled : any/c = #t
vert-margin : spacing-integer? = 2
horiz-margin : spacing-integer? = 2
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #f
stretchable-height : any/c = #f
```

Creates a radio button set with string or bitmap labels. The *choices* list specifies the radio button labels; the list of choices must be homogeneous, either all strings or all bitmaps.

If `&` occurs in *label*, it is specially parsed as for button%.

Each string in *choices* can also contain a `&`, which creates a mnemonic for clicking the corresponding radio button. As for *label*, a `&&` is converted to a `&`.

If *choices* is a list of bitmaps, and if a bitmap has a mask (see get-loaded-mask in bitmap%) that is the same size as the bitmap, then the mask is used for the label. Modifying a bitmap while it is used as a label has an unspecified effect on the displayed label.

If *label* is a string, it is used as the label for the radio box. Otherwise, the radio box does not display its label.

The *callback* procedure is called (with the event type `'radio-box`) when the user changes the radio button selection.

The *style* argument must include either `'vertical` for a collection of radio buttons vertically arranged, or `'horizontal` for a horizontal arrangement. If *style* includes `'vertical-label`, then the radio box is created with a label above the control; if *style* does not include `'vertical-label` (and optionally includes `'horizontal-label`), then the label is created to the left of the radio box. If *style* includes `'deleted`, then the radio box is created as hidden, and it does not affect its parent's geometry; the radio box can be made active later by calling *parent*'s add-child method.

By default, the first radio button is initially selected. If *selection* is positive or #f, it is passed to set-selection to set the initial radio button selection.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

```
(send a-radio-box enable enable?) → void?
  enable? : any/c
(send a-radio-box enable n enable?) → void?
  n : exact-nonnegative-integer?
  enable? : any/c
```

Overrides enable in window<%>.

If a single argument is provided, the entire radio box is enabled or disabled.

If two arguments are provided, then if *enable?* is #f, the *n*th radio button is disabled, otherwise it is enabled (assuming the entire radio box is enabled). Radio buttons are numbered from 0. If *n* is equal to or larger than the number of radio buttons in the radio box, an exn:fail:contract exception is raised.

```
(send a-radio-box get-item-label n) → string?
  n : exact-nonnegative-integer?
```

Gets the label of a radio button by position. Radio buttons are numbered from 0. If *n* is equal to or larger than the number of radio buttons in the radio box, an exn:fail:contract exception is raised.

```
(send a-radio-box get-item-plain-label n) → string?
  n : exact-nonnegative-integer?
```

Like get-item-label, except that the label must be a string and &s in the label are removed.

```
(send a-radio-box get-number) → exact-nonnegative-integer?
```

Returns the number of radio buttons in the radio box.

```
(send a-radio-box get-selection)
 → (or/c exact-nonnegative-integer? #f)
```

Gets the position of the selected radio button, returning #f if no button is selected. Radio buttons are numbered from 0.

```
(send a-radio-box is-enabled?) → boolean?
(send a-radio-box is-enabled? n) → boolean?
  n : exact-nonnegative-integer?
```

Overrides `is-enabled?` in `window<%>`.

If no arguments are provided, the enable state of the entire radio box is reported.

Otherwise, returns `#f` if *n*th radio button is disabled (independent of disabling the entire radio box), `#t` otherwise. Radio buttons are numbered from `0`. If *n* is equal to or larger than the number of radio buttons in the radio box, an `exn:fail:contract` exception is raised.

```
(send a-radio-box set-selection n) → void?
  n : (or/c exact-nonnegative-integer? #f)
```

Sets the selected radio button by position, or deselects all radio buttons if *n* is `#f`. (The control's callback procedure is *not* invoked.) Radio buttons are numbered from `0`. If *n* is equal to or larger than the number of radio buttons in the radio box, an `exn:fail:contract` exception is raised.

A radio box's selection can be changed by the user clicking the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor selection changes.

3.41 selectable-menu-item<%>

```
selectable-menu-item<%> : interface?
  implements: labelled-menu-item<%>
```

A `selectable-menu-item<%>` object is a `labelled-menu-item<%>` that the user can select. It may also have a keyboard shortcut; the shortcut is displayed in the menu, and the default `on-subwindow-char` method in the menu's frame dispatches to the menu item when the shortcut key combination is pressed.

```
(send a-selectable-menu-item command event) → void?
  event : (is-a?/c control-event%)
```

Invokes the menu item's callback procedure, which is supplied when an instance of `menu-item%` or `checkable-menu-item%` is created.

```
(send a-selectable-menu-item get-shortcut)
 → (or/c char? symbol? #f)
```

Gets the keyboard shortcut character or virtual key for the menu item. This character or key is combined with the shortcut prefix, which is reported by `get-shortcut-prefix`.

If the menu item has no shortcut, `#f` is returned.

The shortcut part of a menu item name is not included in the label returned by `get-label`.

For a list of allowed key symbols, see `get-key-code` in `key-event%`, except that the following are disallowed: `'shift`, `'control`, `'numlock`, `'scroll`, `'wheel-up`, `'wheel-down`, `'release`, and `'press`.

```
(send a-selectable-menu-item get-shortcut-prefix)
 → (and/c (listof (or/c 'alt 'cmd 'meta 'ctl
                        'shift 'option))
          (λ (x) (implies (equal? 'unix (system-type))
                          (not (and (member 'alt x)
                                    (member 'meta x)))))
          (λ (x) (equal? x (remove-duplicates x))))
```

Returns a list of symbols that indicates the keyboard prefix used for the menu item's keyboard shortcut. The allowed symbols for the list are the following:

- `'alt` — Meta (Windows and X only)
- `'cmd` — Command (Mac OS only)
- `'meta` — Meta (Unix only)
- `'ctl` — Control
- `'shift` — Shift
- `'option` — Option (Mac OS only)

On Unix, at most one of `'alt` and `'meta` can be supplied; the only difference between `'alt` and `'meta` is the key combination's display in a menu.

The default shortcut prefix is available from `get-default-shortcut-prefix`.

The shortcut key, as determined by `get-shortcut`, matches a key event using either the normally reported key code or the other-Shift/AltGr key code (as produced by `get-other-shift-key-code` in `key-event%`, etc.). When the shortcut key is a key-code symbol or an ASCII letter or digit, then the shortcut matches only the exact combination of modifier keys listed in the prefix. For character shortcuts other than ASCII letters and digits, however, then the shortcut prefix merely determines a minimum set of modifier keys, because additional modifiers may be needed to access the character; an exception is that, on Windows or Unix,

the Alt/Meta key press must match the prefix exactly (i.e., included or not). In all cases, the most precise match takes precedence; see map-function in keymap% for more information on match ranking.

An empty list can be used for a shortcut prefix. However, the default on-menu-char in frame% method checks for menu shortcuts only when the key event includes either a non-Shift modifier or a Function key. Thus, an empty shortcut prefix is normally useful only if the shortcut key is a Function key.

```
(send a-selectable-menu-item set-shortcut shortcut) → void?
  shortcut : (or/c char? symbol? #f)
```

Sets the keyboard shortcut character for the menu item. See get-shortcut for more information.

If the shortcut character is set to #f, then menu item has no keyboard shortcut.

```
(send a-selectable-menu-item set-shortcut-prefix prefix)
 → void?
  prefix : (and/c (listof (or/c 'alt 'cmd 'meta 'ctl
                                'shift 'option))
                  (λ (x) (implies (equal? 'unix (system-type))
                                  (not (and (member 'alt x)
                                            (member 'meta x)))))
                  (λ (x) (equal? x (remove-duplicates x))))
```

Sets a list of symbols to indicates the keyboard prefix used for the menu item's keyboard shortcut.

See get-shortcut-prefix for more information.

3.42 separator-menu-item%

```
separator-menu-item% : class?
  superclass: object%
  extends: menu-item<%>
```

A separator is an unselectable line in a menu. Its parent must be a menu% or popup-menu%.

```
(new separator-menu-item% [parent parent])
 → (is-a?/c separator-menu-item%)
  parent : (or/c (is-a?/c menu%) (is-a?/c popup-menu%))
```

Creates a new separator in the menu.

3.43 scroll-event%

```
scroll-event% : class?
  superclass: event%
```

A scroll-event% object contains information about a scroll event. An instance of scroll-event% is always provided to on-scroll.

See get-event-type for a list of the scroll event types.

```
(new scroll-event%
   [[event-type event-type]
    [direction direction]
    [position position]
    [time-stamp time-stamp]])
→ (is-a?/c scroll-event%)
 event-type : (or/c 'top 'bottom 'line-up 'line-down = 'thumb
                    'page-up 'page-down 'thumb)
 direction : (or/c 'horizontal 'vertical) = 'vertical
 position : dimension-integer? = 0
 time-stamp : exact-integer? = 0
```

See the corresponding get- and set- methods for information about *event-type*, *direction*, *position*, and *time-stamp*.

```
(send a-scroll-event get-direction)
 → (or/c 'horizontal 'vertical)
```

Gets the identity of the scrollbar that was modified by the event, either the horizontal scrollbar or the vertical scrollbar, as 'horizontal or 'vertical, respectively. See also set-direction.

```
(send a-scroll-event get-event-type)
 → (or/c 'top 'bottom 'line-up 'line-down
         'page-up 'page-down 'thumb)
```

Returns the type of the event, one of the following:

- 'top — user clicked a scroll-to-top button

- 'bottom — user clicked a scroll-to-bottom button
- 'line-up — user clicked an arrow to scroll up or left one step
- 'line-down — user clicked an arrow to scroll down or right one step
- 'page-up — user clicked an arrow to scroll up or left one page
- 'page-down — user clicked an arrow to scroll down or right one page
- 'thumb — user dragged the scroll position indicator

```
(send a-scroll-event get-position) → dimension-integer?
```

Returns the position of the scrollbar after the action triggering the event. See also set-position.

```
(send a-scroll-event set-direction direction) → void?
  direction : (or/c 'horizontal 'vertical)
```

Sets the identity of the scrollbar that was modified by the event, either the horizontal scrollbar or the vertical scrollbar, as 'horizontal or 'vertical, respectively. See also get-direction.

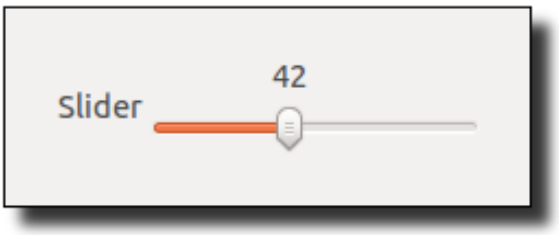
```
(send a-scroll-event set-event-type type) → void?
  type : (or/c 'top 'bottom 'line-up 'line-down
               'page-up 'page-down 'thumb)
```

Sets the type of the event. See get-event-type for information about each event type.

```
(send a-scroll-event set-position position) → void?
  position : dimension-integer?
```

Records the position of the scrollbar after the action triggering the event. (The scrollbar itself is unaffected). See also get-position.

3.44 slider%




```
slider% : class?
  superclass: object%
  extends: control<%>
```

A slider object is a panel item with a handle that the user can drag to change the control's value. Each slider has a fixed minimum and maximum value.

Whenever the user changes the value of a slider, its callback procedure is invoked. A callback procedure is provided as an initialization argument when each slider is created.

```
(new slider%
     [label label]
     [min-value min-value]
     [max-value max-value]
     [parent parent]
    [[callback callback]
     [init-value init-value]
     [style style]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c slider%)
 label : (or/c label-string? #f)
 min-value : position-integer?
 max-value : position-integer?
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 callback : ((is-a?/c slider%) (is-a?/c control-event%) . -> . any)
          = (lambda (b e) (void))
 init-value : position-integer? = min-value
```

```
style : (listof (or/c 'horizontal 'vertical 'upward 'plain
                      'vertical-label 'horizontal-label
                      'deleted))
      = '(horizontal)
font : (is-a?/c font%) = normal-control-font
enabled : any/c = #t
vert-margin : spacing-integer? = 2
horiz-margin : spacing-integer? = 2
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = (memq 'horizontal style)
stretchable-height : any/c = (memq 'vertical style)
```

If *label* is a string, it is used as the label for the slider. Otherwise, the slider does not display its label.

If & occurs in *label*, it is specially parsed as for button%.

The *min-value* and *max-value* arguments specify the range of the slider, inclusive. The *init-value* argument optionally specifies the slider's initial value. The sequence [*min-value*, *init-value*, *max-value*] must be non-decreasing. Otherwise, an exn:fail:contract exception is raised.

The *callback* procedure is called (with the event type 'slider) when the user changes the slider's value.

The *style* argument must include either 'horizontal for a horizontal slider going left-to-right, 'upward for a vertical slider going up, or 'vertical for a vertical slider going down (but beware that 'vertical might render with misleading colors on Mac OS, where the system toolkit supports only upward sliders). If *style* includes 'plain, the slider does not display numbers for its range and current value to the user. If *style* includes 'vertical-label, then the slider is created with a label above the control; if *style* does not include 'vertical-label (and optionally includes 'horizontal-label), then the label is created to the left of the slider. If *style* includes 'deleted, then the slider is created as hidden, and it does not affect its parent's geometry; the slider can be made active later by calling *parent*'s add-child method.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

Changed in version 1.73 of package gui-lib: Added 'upward as a possible *style* element.

```
(send a-slider get-value) → position-integer?
```

Gets the current slider value.

```
(send a-slider set-value value) → void?
  value : position-integer?
```

Sets the value (and displayed position) of the slider. (The control's callback procedure is *not* invoked.) If `value` is outside the slider's minimum and maximum range, an `exn:fail:contract` exception is raised.

A slider's value can be changed by the user clicking the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor value changes.

3.45 subarea<%>

```
subarea<%> : interface?
  implements: area<%>
```

A `subarea<%>` is a containee `area<%>`.

All `subarea<%>` classes accept the following named instantiation arguments:

- `horiz-margin` — default is `2` for `control<%>` classes and `group-box-panel%`, `0` for others; passed to `horiz-margin`
- `vert-margin` — default is `2` for `control<%>` classes and `group-box-panel%`, `0` for others; passed to `vert-margin`

```
(send a-subarea horiz-margin) → spacing-integer?
(send a-subarea horiz-margin margin) → void?
  margin : spacing-integer?
```

Gets or sets the area's horizontal margin, which is added both to the right and left, for geometry management. See §1.4 "Geometry Management" for more information.

```
(send a-subarea vert-margin) → spacing-integer?
(send a-subarea vert-margin margin) → void?
  margin : spacing-integer?
```

Gets or sets the area's vertical margin, which is added both to the top and bottom, for geometry management. See §1.4 "Geometry Management" for more information.

3.46 subwindow<%>

```
subwindow<%> : interface?
  implements: subarea<%>
              window<%>
```

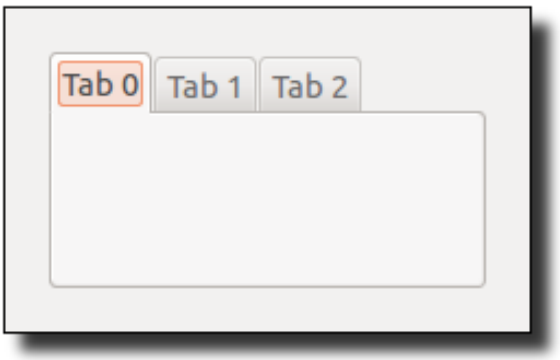
A subwindow<%> is a containee window.

```
(send a-subwindow reparent new-parent) → void?
  new-parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                     (is-a?/c panel%) (is-a?/c pane%))
```

Removes the window from its current parent and makes it a child of *new-parent*. The current and new parents must have the same eventspace, and *new-parent* cannot be a descendant of *a-subwindow*.

If *a-subwindow* is deleted within its current parent, it remains deleted in *new-parent*. Similarly, if *a-subwindow* is shown in its current parent, it is shown in *new-parent*.

3.47 tab-panel%




```
tab-panel% : class?
  superclass: vertical-panel%
```

A tab panel arranges its subwindows in a single column, but also includes a horizontal row of tabs at the top of the panel. See also panel%.

The tab-panel% class does not implement the virtual swapping of the panel content when a new tab is selected. Instead, it merely invokes a callback procedure to indicate that a user changed the tab selection.

```
(new tab-panel%
   [choices choices]
   [parent parent]
  [[callback callback]
   [style style]
   [font font]
   [enabled enabled]
   [vert-margin vert-margin]
   [horiz-margin horiz-margin]
   [border border]
   [spacing spacing]
   [alignment alignment]
   [min-width min-width]
   [min-height min-height]
   [stretchable-width stretchable-width]
   [stretchable-height stretchable-height]])
→ (is-a?/c tab-panel%)
 choices : (listof label-string?)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 callback : ((is-a?/c tab-panel%) (is-a?/c control-event%)
             . -> . any)
          = (lambda (b e) (void))
 style : (listof (or/c 'no-border
                       'can-reorder 'can-close 'new-button
                       'flat-portable 'deleted))
       = null
 font : (is-a?/c font%) = normal-control-font
 enabled : any/c = #t
 vert-margin : spacing-integer? = 0
 horiz-margin : spacing-integer? = 0
 border : spacing-integer? = 0
 spacing : spacing-integer? = 0
 alignment : (list/c (or/c 'left 'center 'right)
                     (or/c 'top 'center 'bottom))
           = '(center top)
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = #t
```

Creates a tab pane, where the *choices* list specifies the tab labels.

Each string in *choices* can contain an ampersand, which (in the future) may create a mnemonic for clicking the corresponding tab. A double ampersand is converted to a sin-

gle ampersand.

The *callback* procedure is called (with the event type 'tab-panel) when the user changes the tab selection.

If the *style* list includes 'no-border, no border is drawn around the panel content. If the *style* list includes 'can-reorder, then the user may be able to drag tabs to reorder them, in which case on-reorder is called; reordering is always enabled if 'no-border is also included in *style*. If the *style* list includes 'can-close, then the user may be able to click a close icon for a tab, in which case on-close-request is called; closing is always enabled if 'no-border is also included in *style*. If the *style* list includes 'flat-portable or if the PLT_FLAT_PORTABLE_TAB_PANEL environment variable is defined when racket/gui is loaded, and if the style list also includes 'no-border, then a platform-independent implementation is used for the tab control; the 'flat-portable flag is effectively always included in *style* on Windows if either 'can-reorder or 'can-close is included. If the *style* list includes 'new-button and the platform-independent implementation is used for the tab control, then a new tab button is added to the right of the last tab to allow inserting new tabs. If the new tab button is clicked, on-new-request is called. If *style* includes 'deleted, then the tab panel is created as hidden, and it does not affect its parent's geometry; the tab panel can be made active later by calling *parent*'s add-child method.

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

Changed in version 1.55 of package gui-lib: Added the 'can-reorder and 'can-close styles.
Changed in version 1.56: Added the 'flat-portable style with reordering and closing support on Windows.
Changed in version 1.62: Added the 'new-button style.

```
(send a-tab-panel append choice) → void?
  choice : label-string?
```

Adds a tab to the right end of panel's top row of tabs.

The label string *choice* can contain &, which (in the future) may create a mnemonic for clicking the new tab. A && is converted to &.

```
(send a-tab-panel delete n) → void?
  n : exact-nonnegative-integer?
```

Deletes an existing tab. If *n* is equal to or larger than the number of tabs on the panel, an exn:fail:contract exception is raised.

```
(send a-tab-panel get-item-label n) → string?
  n : exact-nonnegative-integer?
```

Gets the label of a tab by position. Tabs are numbered from `0`. If *n* is equal to or larger than the number of tabs in the panel, an `exn:fail:contract` exception is raised.

```
(send a-tab-panel get-number) → exact-nonnegative-integer?
```

Returns the number of tabs on the panel.

```
(send a-tab-panel get-selection)
 → (or/c exact-nonnegative-integer? #f)
```

Returns the index (counting from 0) of the currently selected tab. If the panel has no tabs, the result is `#f`.

```
(send a-tab-panel on-reorder former-indices) → void?
  former-indices : (listof exact-nonnegative-integer?)
```

Refine this method with `augment`.

Called when the user reorders tabs by dragging, which is enabled where available by including the `'can-reorder` style (possibly with `'no-border`) when creating the panel. The *former-indices* list reports, for each new tab position, the position where the tab was located before reordering.

Added in version 1.55 of package `gui-lib`.

```
(send a-tab-panel on-close-request index) → void?
  index : exact-nonnegative-integer?
```

Called when the user clicks the close box in a tab, which is enabled where available by including the `'can-close` style (possibly with `'no-border`) when creating the panel. The *index* argument identifies the tab to potentially close.

Added in version 1.55 of package `gui-lib`.

```
(send a-tab-panel on-new-request) → void?
```

Called when the user clicks the new tab button in a tab panel, which is enabled where available by including the `'new-button` style.

Added in version 1.62 of package `gui-lib`.

```
(send a-tab-panel set choices) → void?
  choices : (listof label-string?)
```

Removes all tabs from the panel and installs tabs with the given labels.

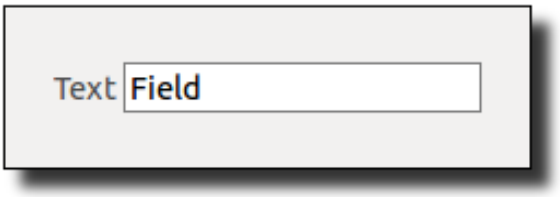
```
(send a-tab-panel set-item-label n label) → void?
  n : exact-nonnegative-integer?
  label : label-string?
```

Set the label for tab *n* to *label*. If *n* is equal to or larger than the number of tabs in the panel, an `exn:fail:contract` exception is raised.

```
(send a-tab-panel set-selection n) → void?
  n : exact-nonnegative-integer?
```

Sets the currently selected tab by index (counting from 0). If *n* is equal to or larger than the number of tabs in the panel, an `exn:fail:contract` exception is raised.

3.48 text-field%




```
text-field% : class?
  superclass: object%
  extends: control<%>
```

A `text-field%` object is an editable text field with an optional label displayed in front of it. There are two text field styles:

- A single line of text is visible, and a special control event is generated when the user presses Return or Enter (when the text field has the focus) and the event is not handled by the text field's frame or dialog (see `on-traverse-char` in `top-level-window<%>`).
- Multiple lines of text are visible, and Enter is not handled specially.

Whenever the user changes the content of a text field, its callback procedure is invoked. A callback procedure is provided as an initialization argument when each text field is created.

The text field is implemented using a `text%` editor (with an inaccessible display). Thus, whereas `text-field%` provides only `get-value` and `set-value` to manipulate the text in a text field, the `get-editor` returns the field's editor, which provides a vast collection of methods for more sophisticated operations on the text.

The keymap for the text field's editor is initialized by calling the current keymap initializer procedure, which is determined by the `current-text-keymap-initializer` parameter.

```
(new text-field%
     [label label]
     [parent parent]
    [[callback callback]
     [init-value init-value]
     [style style]
     [font font]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c text-field%)
 label : (or/c label-string? #f)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 callback : ((is-a?/c text-field%) (is-a?/c control-event%)
              . -> . any)
          = (lambda (t e) (void))
 init-value : string? = ""
 style : (listof (or/c 'single 'multiple 'hscroll 'password
                       'vertical-label 'horizontal-label
                       'deleted))
       = '(single)
 font : (is-a?/c font%) = normal-control-font
 enabled : any/c = #t
 vert-margin : spacing-integer? = 2
 horiz-margin : spacing-integer? = 2
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = (memq 'multiple style)
```

If *label* is not `#f`, it is used as the text field label. Otherwise, the text field does not display its label.

If & occurs in *label*, it is specially parsed as for button%.

The *callback* procedure is called when the user changes the text in the text field or presses the Enter key (and Enter is not handled by the text field's frame or dialog; see on-traverse-char in top-level-window<%>). If the user presses Enter, the type of event passed to the callback is 'text-field-enter, otherwise it is 'text-field.

If *init-value* is not "", the graphical minimum size for the text item is made wide enough to show *init-value*. Otherwise, a built-in default width is selected. For a text field in single-line mode, the graphical minimum size is set to show one line, and only the control's width is stretchable by default. For a multiple-line text field, the graphical minimum size shows three lines of text, and it is stretchable in both directions by default.

The style must contain exactly one of 'single or 'multiple; the former specifies a single-line field and the latter specifies a multiple-line field. The 'hscroll style applies only to multiple-line fields; when 'hscroll is specified, the field has a horizontal scrollbar and autowrapping is disabled; otherwise, the field has no horizontal scrollbar and autowrapping is enabled. A multiple-line text field always has a vertical scrollbar. The 'password style indicates that the field should draw each character of its content using a generic symbol instead of the actual character. If *style* includes 'vertical-label, then the text field is created with a label above the control; if *style* does not include 'vertical-label (and optionally includes 'horizontal-label), then the label is created to the left of the text field. If *style* includes 'deleted, then the text field is created as hidden, and it does not affect its parent's geometry; the text field can be made active later by calling *parent*'s add-child method..

The *font* argument determines the font for the control. For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

(send *a-text-field* get-editor) → (is-a?/c text%)

Returns the editor used to implement the text field.

For a text field, the most useful methods of a text% object are the following:

- (send a-text get-text) returns the current text of the editor.
- (send a-text erase) deletes all text from the editor.
- (send a-text insert *str*) inserts *str* into the editor at the current caret position.

(send *a-text-field* get-field-background) → (is-a?/c color%)

Gets the background color of the field's editable area.

```
(send a-text-field get-value) → string?
```

Returns the text currently in the text field.

```
(send a-text-field set-field-background color) → void?
  color : (or/c (is-a?/c color%) #f)
```

Sets the background color of the field's editable area to *color* If *color* is `#f` sets the background color to black in dark mode or white if not in dark mode.

```
(send a-text-field set-value val) → void?
  val : string?
```

Sets the text currently in the text field. (The control's callback procedure is *not* invoked.)

A text field's value can be changed by the user typing into the control, and such changes do not go through this method; use the control callback procedure (provided as an initialization argument) to monitor value changes.

3.49 timer%

```
timer% : class?
  superclass: object%
```

A `timer%` object encapsulates an event-based alarm. To use a timer, either instantiate it with a `timer-callback` thunk to perform the alarm-based action, or derive a new class and override the `notify` method to perform the alarm-based action. Start a timer with `start` and stop it with `stop`. Supplying an initial `interval` (in milliseconds) when creating a timer also starts the timer.

Timers have a relatively high priority in the event queue. Thus, if the timer delay is set low enough, repeated notification for a timer can preempt user activities (which might be directed at stopping the timer). For timers with relatively short delays, call `yield` within the `notify` procedure to allow guaranteed event processing.

See §1.6 "Event Dispatching and Eventspaces" for more information about event priorities.

```
(new timer%
  [[notify-callback notify-callback]
   [interval interval]
   [just-once? just-once?]])
```

```
→ (is-a?/c timer%)
 notify-callback : (-> any) = void
 interval : (or/c (integer-in 0 1000000000) #f) = #f
 just-once? : any/c = #f
```

The *notify-callback* thunk is called by the default notify method when the timer expires.

If *interval* is #f (the default), the timer is not started; in that case, start must be called explicitly. If *interval* is a number (in milliseconds), then start is called with *interval* and *just-once?*.

```
(send a-timer interval) → (integer-in 0 1000000000)
```

Returns the number of milliseconds between each timer expiration (when the timer is running).

```
(send a-timer notify) → void?
```

Specification: Called (on an event boundary) when the timer's alarm expires.

Default implementation: Calls the notify-callback procedure that was provided when the object was created.

```
(send a-timer start msec [just-once?]) → void?
  msec : (integer-in 0 1000000000)
  just-once? : any/c = #f
```

Starts (or restarts) the timer. If the timer is already running, its alarm time is not changed.

The timer's alarm expires after *msec* milliseconds, at which point notify is called (on an event boundary). If *just-once?* is true, the timer calls its notify callback when the alarm expires and the timer is stopped. If *just-once?* is #f, the timer is re-started when the notify callback returns; it stops only once stop is called explicitly.

```
(send a-timer stop) → void?
```

Stops the timer. A stopped timer never calls notify. If the timer has expired but the call to notify has not yet been dispatched, the call is removed from the event queue.

3.50 top-level-window<%>

```
top-level-window<%> : interface?
  implements: area-container-window<%>
```

A top-level window is either a frame% or dialog% object.

```
(send a-top-level-window can-close?) → boolean?
```

Refine this method with augment.

Called just before the window might be closed (e.g., by the window manager). If #f is returned, the window is not closed, otherwise on-close is called and the window is closed (i.e., the window is hidden, like calling show with #f).

This method is *not* called by show.

```
(send a-top-level-window can-exit?) → boolean?
```

Specification: Called before on-exit to check whether an exit is allowed. See on-exit for more information.

Default implementation: Calls can-close? and returns the result.

```
(send a-top-level-window center [direction]) → void?
  direction : (or/c 'horizontal 'vertical 'both) = 'both
```

Centers the window on the screen if it has no parent. If it has a parent, the window is centered with respect to its parent's location.

If *direction* is 'horizontal, the window is centered horizontally. If *direction* is 'vertical, the window is centered vertically. If *direction* is 'both, the window is centered in both directions.

```
(send a-top-level-window get-edit-target-object)
 → (or/c (or/c (is-a?/c window<%>) (is-a?/c editor<%>)) #f)
```

Like get-edit-target-window, but if an editor canvas had the focus and it also displays an editor, the editor is returned instead of the canvas. Further, if the editor's focus is delegated to an embedded editor, the embedded editor is returned.

See also get-focus-object.

```
(send a-top-level-window get-edit-target-window)
 → (or/c (is-a?/c window<%>) #f)
```

Returns the window that most recently had the keyboard focus, either the top-level window or one of its currently-shown children. If neither the window nor any of its currently-shown children has even owned the keyboard focus, `#f` is returned.

See also `get-focus-window` and `get-edit-target-object`.

```
(send a-top-level-window get-eventspace) → eventspace?
```

Returns the window's eventspace.

```
(send a-top-level-window get-focus-object)
 → (or/c (or/c (is-a?/c window<%>) (is-a?/c editor<%>)) #f)
```

Like `get-focus-window`, but if an editor canvas has the focus and it also displays an editor, the editor is returned instead of the canvas. Further, if the editor's focus is delegated to an embedded editor, the embedded editor is returned.

See also `get-edit-target-object`.

```
(send a-top-level-window get-focus-window)
 → (or/c (is-a?/c window<%>) #f)
```

Returns the window that has the keyboard focus, either the top-level window or one of its children. If neither the window nor any of its children has the focus, `#f` is returned.

See also `get-edit-target-window` and `get-focus-object`.

```
(send a-top-level-window move x y) → void?
  x : position-integer?
  y : position-integer?
```

Moves the window to the given position on the screen.

A window's position can be changed by the user dragging the window, and such changes do not go through this method; use `on-move` to monitor position changes.

```
(send a-top-level-window on-activate active?) → void?
  active? : any/c
```

Called when a window is *activated* or *deactivated*. A top-level window is activated when the keyboard focus moves from outside the window to the window or one of its children. It is

deactivated when the focus moves back out of the window. On Mac OS, a child of a floating frames can have the focus instead of a child of the active non-floating frame; in other words, floating frames act as an extension of the active non-frame for keyboard focus.

The method's argument is `#t` when the window is activated, `#f` when it is deactivated.

```
(send a-top-level-window on-close) → void?
```

Refine this method with `augment`.

Called just before the window is closed (e.g., by the window manager). This method is *not* called by `show`.

See also `can-close?`.

```
(send a-top-level-window on-exit) → void?
```

Specification: Called by the default application quit handler (as determined by the `application-quit-handler` parameter) when the operating system requests that the application shut down (e.g., when the Quit menu item is selected in the main application menu on Mac OS). In that case, this method is called for the most recently active top-level window in the initial eventspace, but only if the window's `can-exit?` method first returns true.

Default implementation: Calls `on-close` and then `show` to hide the window.

```
(send a-top-level-window on-message message) → any/c
  message : any/c
```

Specification: A generic message method, usually called by `send-message-to-window`.

If the method is invoked by `send-message-to-window`, then it is invoked in the thread where `send-message-to-window` was called (which is possibly *not* the handler thread of the window's eventspace).

Default implementation: Returns `#<void>`.

```
(send a-top-level-window display-changed) → any/c
```

Specification: Called when the displays configuration changes.

To determine the new monitor configuration, use `get-display-count`, `get-display-size`, `get-display-left-top-inset`, and `get-display-backing-scale`.

Note that this method may be invoked multiple times for a single logical change to the monitors.

Default implementation: Returns `#<void>`.

```
(send a-top-level-window on-traverse-char event) → boolean?
  event : (is-a?/c key-event%)
```

Specification: Attempts to handle the given keyboard event as a navigation event, such as a Tab key event that moves the keyboard focus. If the event is handled, `#t` is returned, otherwise `#f` is returned.

Default implementation: The following rules determine, in order, whether and how *event* is handled:

- If the window that currently owns the focus specifically handles the event, then `#f` is returned. The following describes window types and the keyboard events they specifically handle:
  - `editor-canvas%` — tab-exit is disabled (see `allow-tab-exit`): all keyboard events, except alphanumeric key events when the Meta (Unix) or Alt (Windows) key is pressed; when tab-exit is enabled: all keyboard events except Tab, Enter, Escape, and alphanumeric Meta/Alt events.
  - `canvas%` — when tab-focus is disabled (see `accept-tab-focus`): all keyboard events, except alphanumeric key events when the Meta (Unix) or Alt (Windows) key is pressed; when tab-focus is enabled: no key events
  - `text-field%`, `'single` style — arrow key events and alphanumeric key events when the Meta (Unix) or Alt (Windows) key is not pressed (and all alphanumeric events on Mac OS)
  - `text-field%`, `'multiple` style — all keyboard events, except alphanumeric key events when the Meta (Unix) or Alt (Windows) key is pressed
  - `choice%` — arrow key events and alphanumeric key events when the Meta (Unix) or Alt (Windows) key is not pressed
  - `list-box%` — arrow key events and alphanumeric key events when the Meta (Unix) or Alt (Windows) key is not pressed
- If *event* is a Tab or arrow key event, the keyboard focus is moved within the window and `#t` is returned. Across platforms, the types of windows that accept the keyboard focus via navigation may vary, but `text-field%` windows always accept the focus, and `message%`, `gauge%`, and `panel%` windows never accept the focus.
- If *event* is a Space key event and the window that currently owns the focus is a `button%`, `check-box%`, or `radio-box%` object, the event is handled in the same way as a click on the control and `#t` is returned.
- If *event* is an Enter key event and the current top-level window contains a border button, the button's callback is invoked and `#t` is returned. (The `'border` style for

a button% object indicates to the user that pressing Enter is the same as clicking the button.) If the window does not contain a border button, #t is returned if the window with the current focus is not a text field or editor canvas.

- In a dialog, if *event* is an Escape key event, the event is handled the same as a click on the dialog's close box (i.e., the dialog's can-close? and on-close methods are called, and the dialog is hidden) and #t is returned.
- If *event* is an alphanumeric key event and the current top-level window contains a control with a mnemonic matching the key (which is installed via a label that contains &; see get-label for more information), then the keyboard focus is moved to the matching control. Furthermore, if the matching control is a button%, check-box%, or radio-box% button, the keyboard event is handled in the same way as a click on the control.
- Otherwise, #f is returned.

```
(send a-top-level-window on-system-menu-char event) → boolean?
  event : (is-a?/c key-event%)
```

Checks whether the given event pops open the system menu in the top-left corner of the window (Windows only). If the window's system menu is opened, #t is returned, otherwise #f is returned.

```
(send a-top-level-window resize width
                                height) → void?
  width : dimension-integer?
  height : dimension-integer?
```

Sets the size of the window (in pixels), but only if the given size is larger than the window's minimum size.

A window's size can be changed by the user, and such changes do not go through this method; use on-size to monitor size changes.

```
(send a-top-level-window set-icon  icon
                                   [mask
                                    which]) → void?
  icon : (is-a?/c bitmap%)
  mask : (is-a?/c bitmap%) = #f
  which : (or/c 'small 'large 'both) = 'both
```

Sets the large or small icon bitmap for the window. Future changes to the bitmap do not affect the window's icon.

The icon is used in a platform-specific way:

- Windows — the small icon is used for the window's icon (in the top-left) and in the task bar, and the large icon is used for the Alt-Tab task switcher.
- Mac OS — both icons are ignored.
- Unix — many window managers use the small icon in the same way as Windows, and others use the small icon when iconifying the frame; the large icon is ignored.

The bitmap for either icon can be any size, but most platforms scale the small bitmap to 16 by 16 pixels and the large bitmap to 32 by 32 pixels.

If a mask bitmap is not provided, then the entire (rectangular) bitmap is used as an icon.

If a mask bitmap is provided, the mask must be monochrome. In the mask bitmap, use black pixels to indicate the icon's region and use white pixels outside the icon's region. In the icon bitmap, use black pixels for the region outside the icon.

```
(send a-top-level-window show show) → void?
  show : any/c
```

If the window is already shown, it is moved front of other top-level windows. If the window is iconized (frames only), it is deiconized.

See also show in window<%>.

3.51 vertical-pane%

```
vertical-pane% : class?
  superclass: pane%
```

A vertical pane arranges its subwindows in a single column. See also pane%.

```
(new vertical-pane%
     [parent parent]
    [[vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
```

```
→ (is-a?/c vertical-pane%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 vert-margin : spacing-integer? = 0
 horiz-margin : spacing-integer? = 0
 border : spacing-integer? = 0
 spacing : spacing-integer? = 0
 alignment : (list/c (or/c 'left 'center 'right)
                     (or/c 'top 'center 'bottom))
           = '(center top)
 min-width : (or/c dimension-integer? #f) = #f
 min-height : (or/c dimension-integer? #f) = #f
 stretchable-width : any/c = #t
 stretchable-height : any/c = #t
```

For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *border*, *spacing*, and *alignment* arguments, see area-container<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

3.52 vertical-panel%

```
vertical-panel% : class?
  superclass: panel%
```

A vertical panel arranges its subwindows in a single column. See also panel%.

```
(new vertical-panel%
     [parent parent]
    [[style style]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [border border]
     [spacing spacing]
     [alignment alignment]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c vertical-panel%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
```

```
style : (listof (or/c 'border 'deleted
                      'hscroll 'auto-hscroll 'hide-hscroll
                      'vscroll 'auto-vscroll 'hide-vscroll))
      = null
enabled : any/c = #t
vert-margin : spacing-integer? = 0
horiz-margin : spacing-integer? = 0
border : spacing-integer? = 0
spacing : spacing-integer? = 0
alignment : (list/c (or/c 'left 'center 'right)
                    (or/c 'top 'center 'bottom))
          = '(center top)
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #t
stretchable-height : any/c = #t
```

The *style* flags are the same as for panel%.

For information about the *enabled* argument, see window<%>. For information about the *horiz-margin* and *vert-margin* arguments, see subarea<%>. For information about the *border*, *spacing*, and *alignment* arguments, see area-container<%>. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see area<%>.

```
(send a-vertical-panel set-orientation horizontal?) → void?
  horizontal? : boolean?
```

Sets the orientation of the panel, switching it between the behavior of the vertical-panel% and that of the horizontal-panel%.

```
(send a-vertical-panel get-orientation) → boolean?
```

Initially returns #f, but if set-orientation is called, this method returns whatever the last value passed to it was.

3.53 window<%>

```
window<%> : interface?
  implements: area<%>
```

A window<%> object is an area<%> with a graphical representation that can respond to events.

All window<%> classes accept the following named instantiation arguments:

- enabled — default is #t; passed to enable if #f

```
(send a-window accept-drop-files) → boolean?
(send a-window accept-drop-files accept-files?) → void?
  accept-files? : any/c
```

Enables or disables drag-and-drop dropping for the window, or gets the enable state. Dropping is initially disabled. See also on-drop-file.

```
(send a-window client->screen x y)
 → position-integer? position-integer?
  x : position-integer?
  y : position-integer?
```

Converts local window coordinates to screen coordinates.

On Mac OS, the screen coordinates start with (0, 0) at the upper left of the menu bar. In contrast, move in top-level-window<%> considers (0, 0) to be below the menu bar. See also get-display-left-top-inset.

```
(send a-window enable enable?) → void?
  enable? : any/c
```

Enables or disables a window so that input events are ignored. (Input events include mouse events, keyboard events, and close-box clicks, but not focus or update events.) When a window is disabled, input events to its children are also ignored.

The enable state of a window can be changed by enabling a parent window, and such changes do not go through this method; use on-superwindow-enable to monitor enable state changes.

If *enable?* is true, the window is enabled, otherwise it is disabled.

```
(send a-window focus) → void?
```

Moves the keyboard focus to the window, relative to its top-level window, if the window ever accepts the keyboard focus. If the focus is in the window's top-level window or if the window's top-level window is visible and floating (i.e., created with the 'float style), then the

focus is immediately moved to this window. Otherwise, the focus is not immediately moved, but when the window's top-level window gets the keyboard focus, the focus is delegated to this window.

See also `on-focus`.

Note that on Unix, keyboard focus can move to the menu bar when the user is selecting a menu item.

The current keyboard focus window can be changed by the user, and such changes do not go through this method; use `on-focus` to monitor focus changes.

```
(send a-window get-client-handle) → cpointer?
```

Returns a handle to the "inside" of the window for the current platform's GUI toolbox. The value that the pointer represents depends on the platform:

- Windows: `HWND`
- Mac OS: `NSView`
- Unix: `GtkWidget`

See also `get-handle`.

```
(send a-window get-client-size)
 → dimension-integer? dimension-integer?
```

Gets the interior size of the window in pixels. For a container, the interior size is the size available for placing subwindows (including the border margin). For a canvas, this is the visible drawing area.

The client size is returned as two values: width and height (in pixels).

See also `reflow-container`.

```
(send a-window get-cursor) → (or/c (is-a?/c cursor%) #f)
```

Returns the window's cursor, or `#f` if this window's cursor defaults to the parent's cursor. See `set-cursor` for more information.

```
(send a-window get-handle) → cpointer?
```

Returns a handle to the “outside” of the window for the current platform’s GUI toolbox. The value that the pointer represents depends on the platform:

- Windows: `HWND`
- Mac OS: `NSWindow` for a `top-level-window<%>` object, `NSView` for other windows
- Unix: `GtkWidget`

See also `get-client-handle`.

```
(send a-window get-height) → dimension-integer?
```

Returns the window’s total height (in pixels).

See also `reflow-container`.

```
(send a-window get-label)
 → (or/c label-string?
         (is-a?/c bitmap%)
         (or/c 'app 'caution 'stop)
         (list/c (is-a?/c bitmap%)
                 label-string?
                 (or/c 'left 'top 'right 'bottom))
         #f)
```

Gets a window’s label, if any. Control windows generally display their label in some way. Frames and dialogs display their label as a window title. Panels do not display their label, but the label can be used for identification purposes. Messages, buttons, and check boxes can have bitmap labels (only when they are created with bitmap labels), but all other windows have string labels. In addition, a message label can be an icon symbol `'app`, `'caution`, or `'stop`, and a button can have both a bitmap label and a string label (along with a position for the bitmap).

A label string may contain `&`s, which serve as keyboard navigation annotations for controls on Windows and Unix. The ampersands are not part of the displayed label of a control; instead, ampersands are removed in the displayed label (on all platforms), and any character preceding an ampersand is underlined (Windows and Unix) indicating that the character is a mnemonic for the control. Double ampersands are converted into a single ampersand (with no displayed underline). See also `on-traverse-char`.

If the window does not have a label, `#f` is returned.

```
(send a-window get-plain-label) → (or/c string? #f)
```

Like get-label, except that:

- If the label includes (&c) for any character c, then the sequenece and any surrounding whitespace is removed.
- If the label contains &c for any character c, the & is removed.
- If the label contains a tab character, then the tab character and all following characters are removed.

See also button%'s handling of labels.

If the window has no label or the window's label is not a string, #f is returned.

```
(send a-window get-size)
 → dimension-integer? dimension-integer?
```

Gets the current size of the entire window in pixels, not counting horizontal and vertical margins. (On Unix, this size does not include a title bar or borders for a frame/dialog.) See also get-client-size.

The geometry is returned as two values: width and height (in pixels).

See also reflow-container.

```
(send a-window get-width) → dimension-integer?
```

Returns the window's current total width (in pixels).

See also reflow-container.

```
(send a-window get-x) → position-integer?
```

Returns the position of the window's left edge in its parent's coordinate system.

See also reflow-container.

```
(send a-window get-y) → position-integer?
```

Returns the position of the window's top edge in its parent's coordinate system.

See also reflow-container.

```
(send a-window has-focus?) → boolean?
```

Indicates whether the window currently has the keyboard focus. See also on-focus.

```
(send a-window is-enabled?) → boolean?
```

Indicates whether the window is currently enabled or not. The result is #t if this window is enabled when its ancestors are enabled, or #f if this window remains disable when its ancestors are enabled. (That is, the result of this method is affected only by calls to enable for a-window, not by the enable state of parent windows.)

```
(send a-window is-shown?) → boolean?
```

Indicates whether the window is currently shown or not. The result is #t if this window is shown when its ancestors are shown, or #f if this window remains hidden when its ancestors are shown. (That is, the result of this method is affected only by calls to show for a-window, not by the visibility of parent windows.)

```
(send a-window on-drop-file pathname) → void?
  pathname : path?
```

Called when the user drags a file onto the window. (On Unix, drag-and-drop is supported via the XDND protocol.) Drag-and-drop must first be enabled for the window with accept-drop-files.

On Mac OS, when the application is running and user double-clicks an application-handled file or drags a file onto the application's icon, the main thread's application file handler is called (see application-file-handler). The default handler calls the on-drop-file method of the most-recently activated frame if drag-and-drop is enabled for that frame, independent of the frame's eventspace (but the method is called in the frame's eventspace's handler thread). When the application is not running, the filenames are provided as command-line arguments.

```
(send a-window on-focus on?) → void?
  on? : any/c
```

Specification: Called when a window receives or loses the keyboard focus. If the argument is #t, the keyboard focus was received, otherwise it was lost.

Note that on Unix, keyboard focus can move to the menu bar when the user is selecting a menu item.

Default implementation: Does nothing.

```
(send a-window on-move x y) → void?
  x : position-integer?
  y : position-integer?
```

Specification: Called when the window is moved. (For windows that are not top-level windows, "moved" means moved relative to the parent's top-left corner.) The new position is provided to the method.

Default implementation: Does nothing.

```
(send a-window on-size width height) → void?
  width : dimension-integer?
  height : dimension-integer?
```

Specification: Called when the window is resized. The window's new size (in pixels) is provided to the method. The size values are for the entire window, not just the client area.

Default implementation: Does nothing.

```
(send a-window on-subwindow-char receiver
                                 event)   → boolean?
  receiver : (is-a?/c window<%>)
  event : (is-a?/c key-event%)
```

Specification: Called when this window or a child window receives a keyboard event. The on-subwindow-char method of the receiver's top-level window is called first (see get-top-level-window); if the return value is #f, then the on-subwindow-char method is called for the next child in the path to the receiver, and so on. Finally, if the receiver's on-subwindow-char method returns #f, the event is passed on to the receiver's normal key-handling mechanism.

The *event* argument is the event that was generated for the *receiver* window.

The atomicity limitation on-subwindow-event applies to on-subwindow-char as well. That is, an insufficiently cooperative on-subwindow-char method can effectively disable a control's handling of key events, even when it returns #f

BEWARE: The default on-subwindow-char in frame% and on-subwindow-char in dialog% methods consume certain keyboard events (e.g., arrow keys, Enter) used for navigating within the window. Because the top-level window gets the first chance to handle the keyboard event, some events never reach the "receiver" child unless the default frame or dialog method is overridden.

Default implementation: Returns #f.

```
(send a-window on-subwindow-event receiver
                                  event)    → boolean?
  receiver : (is-a?/c window<%>)
  event : (is-a?/c mouse-event%)
```

Specification: Called when this window or a child window receives a mouse event. The on-subwindow-event method of the receiver's top-level window is called first (see get-top-level-window); if the return value is #f, the on-subwindow-event method is called for the next child in the path to the receiver, and so on. Finally, if the receiver's on-subwindow-event method returns #f, the event is passed on to the receiver's normal mouse-handling mechanism.

The *event* argument is the event that was generated for the *receiver* window.

If the on-subwindow-event method chain does not complete atomically (i.e., without requiring other threads to run) or does not complete fast enough, then the corresponding event may not be delivered to a target control, such as a button. In other words, an insufficiently cooperative on-subwindow-event method can effectively disable a control's handling of mouse events, even when it returns #f.

Default implementation: Returns #f.

```
(send a-window on-subwindow-focus receiver
                                  on?)      → void?
  receiver : (is-a?/c window<%>)
  on? : boolean?
```

Specification: Called when this window or a child window receives or loses the keyboard focus. This method is called after the on-focus method of *receiver*. The on-subwindow-focus method of the receiver's top-level window is called first (see get-top-level-window), then the on-subwindow-focus method is called for the next child in the path to the receiver, and so on.

Default implementation: Does nothing.

```
(send a-window on-superwindow-activate active?) → void?
  active? : any/c
```

Specification: Called via the event queue whenever the containing top-level-window<%> is either activated or deactivated (see on-activate).

Default implementation: Does nothing.

Added in version 1.54 of package gui-lib.

```
(send a-window on-superwindow-enable enabled?) → void?
  enabled? : any/c
```

Specification: Called via the event queue whenever the enable state of a window has changed, either through a call to the window's enable method, or through the enabling/disabling of one of the window's ancestors. The method's argument indicates whether the window is now enabled or not.

This method is not called when the window is initially created; it is called only after a change from the window's initial enable state. Furthermore, if an enable notification event is queued for the window and it reverts its enabled state before the event is dispatched, then the dispatch is canceled.

If the enable state of a window's ancestor changes while the window is deleted (e.g., because it was removed with delete-child), then no enable events are queued for the deleted window. But if the window is later re-activated into an enable state that is different from the window's state when it was de-activated, then an enable event is immediately queued.

Default implementation: Does nothing.

```
(send a-window on-superwindow-show shown?) → void?
  shown? : any/c
```

Specification: Called via the event queue whenever the visibility of a window has changed, either through a call to the window's show, through the showing/hiding of one of the window's ancestors, or through the activating or deactivating of the window or its ancestor in a container (e.g., via delete-child). The method's argument indicates whether the window is now visible or not.

This method is not called when the window is initially created; it is called only after a change from the window's initial visibility. Furthermore, if a show notification event is queued for the window and it reverts its visibility before the event is dispatched, then the dispatch is canceled.

Default implementation: Does nothing.

```
(send a-window popup-menu menu x y) → void?
  menu : (is-a?/c popup-menu%)
  x : position-integer?
  y : position-integer?
```

Pops up the given popup-menu% object at the specified coordinates (in this window's coordinates), and returns after handling an unspecified number of events; the menu may still be

popped up when this method returns. If a menu item is selected from the popup-menu, the callback for the menu item is called. (The eventspace for the menu item's callback is the window's eventspace.)

While the menu is popped up, its target is set to the window. See `get-popup-target` for more information.

The *menu* is popped up within the window at position (*x*, *y*).

```
(send a-window refresh) → void?
```

Enqueues a window-refresh event to repaint the window; see §1.6.1 "Event Types and Priorities" for more information on the event's priority.

```
(send a-window screen->client x y)
 → position-integer? position-integer?
  x : position-integer?
  y : position-integer?
```

Converts global coordinates to window local coordinates. See also `client->screen` for information on screen coordinates.

```
(send a-window set-cursor cursor) → void?
  cursor : (or/c (is-a?/c cursor%) #f)
```

Sets the window's cursor. Providing `#f` instead of a cursor value removes the window's cursor.

If a window does not have a cursor, it uses the cursor of its parent. Frames and dialogs start with the standard arrow cursor, and text fields start with an I-beam cursor. All other windows are created without a cursor.

```
(send a-window set-label l) → void?
  l : label-string?
```

Sets a window's label. The window's natural minimum size might be different after the label is changed, but the window's minimum size is not recomputed.

If the window was not created with a label, or if the window was created with a non-string label, *l* is ignored.

See `get-label` for more information.

```
(send a-window show show?) → void?
  show? : any/c
```

Shows or hides a window.

The visibility of a window can be changed by the user clicking the window's close box, for example, and such changes do not go through this method; use `on-superwindow-show` or `on-close` to monitor visibility changes.

If *show?* is `#f`, the window is hidden. Otherwise, the window is shown.

```
(send a-window warp-pointer x y) → void?
  x : position-integer?
  y : position-integer?
```

Moves the cursor to the given location in the window's local coordinates.

```
(send a-window wheel-event-mode)
 → (or/c 'one 'integer 'fraction)
(send a-window wheel-event-mode mode) → void?
  mode : (or/c 'one 'integer 'fraction)
```

Gets or sets the mode for mouse-wheel events in the window. Wheel events are represented as `key-event%` instances where `get-key-code` in `key-event%` returns `'wheel-up`, `'wheel-down`, `'wheel-right`, or `'wheel-left`. A Window's wheel-event mode determines the handling of variable wheel-sized events reported the underlying platform. Specifically, the wheel-event mode determines the possible values of `get-wheel-steps` in `key-event%` for a system-generated event for the window:

- `'one` — wheel events are always reported for a single step, where the window accumulates increments until it reaches a full step, and where it generates separate events for multi-step accumulations.
- `'integer` — wheel events are always reported as integer-sized steps, where fractional steps are accumulated and preserved as needed to reach integer increments.
- `'fraction` — wheel events are reported as positive real values immediately as received from the underlying platform.

The default wheel-event mode is `'one`, except that `editor-canvas%` initializes the wheel-event mode to `'integer`.

Added in version 1.43 of package `gui-lib`.

4 Windowing Functions

4.1 Dialogs

These functions get input from the user and/or display messages.

```
(get-file [message
           parent
           directory
           filename
           extension
           style
           filters
           #:dialog-mixin dialog-mixin]) → (or/c path? #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  directory : (or/c path-string? #f) = #f
  filename : (or/c path-string? #f) = #f
  extension : (or/c string? #f) = #f
  style : (listof (or/c 'packages 'enter-packages 'common))
        = null
  filters : (listof (list/c string? string?)) = '(("Any" "*.*"))
  dialog-mixin : (make-mixin-contract path-dialog%) = (λ (x) x)
```

Obtains a file pathname from the user via the platform-specific standard (modal) dialog, using *parent* as the parent window if it is specified, and using *message* as a message at the top of the dialog if it is not #f.

The result is #f if the user cancels the dialog, the selected pathname otherwise. The returned pathname may or may not exist, although the style of the dialog is directed towards selecting existing files.

If *directory* is not #f, it is used as the starting directory for the file selector (otherwise the starting directory is chosen automatically in a platform-specific manner, usually based on the current directory and the user's interactions in previous calls to get-file, put-file, etc.). If *filename* is not #f, it is used as the default filename when appropriate, and it should *not* contain a directory path prefix.

Under Windows, if *extension* is not #f, the returned path will use the extension if the user does not supply one; the *extension* string should not contain a period. The extension is ignored on other platforms.

The *style* list can contain 'common, a platform-independent version of the dialog is used instead of a native dialog. On Mac OS, if the *style* list contains 'packages, a user is allowed to select a package directory, which is a directory with a special suffix (e.g., ".app")

that the Finder normally displays like a file. If the list contains `'enter-packages`, a user is allowed to select a file within a package directory. If the list contains both `'packages` and `'enter-packages`, the former is ignored.

On Windows and Unix, *filters* determines a set of filters from which the user can choose in the dialog. Each element of the *filters* list contains two strings: a description of the filter as seen by the user, and a filter pattern matched against file names. Pattern strings can be a simple "glob" pattern, or a number of glob patterns separated by a `;` character. These patterns are not regular expressions and can only be used with a `*` wildcard character. For example, `"*.jp*g;*.png"`. On Unix, a `"*.*"` pattern is implicitly replaced with `"*"`. On Mac OS, suffix names are extracted from all globs that match a fixed suffix (e.g., two suffixes of `"foo"` and `"bar"` are extracted from a `"*.foo;*.bar;*.baz*"` pattern), and files that have any of these suffixes in any filter are selectable; a `"*.*"` glob makes all files available for selection.

The *dialog-mixin* is applied to path-dialog% before creating an instance of the class for this dialog.

See also path-dialog% for a richer interface.

```
(get-file-list [message
                parent
                directory
                filename
                extension
                style
                filters
                #:dialog-mixin dialog-mixin])
 → (or/c (listof path?) #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  directory : (or/c path-string? #f) = #f
  filename : (or/c path-string? #f) = #f
  extension : (or/c string? #f) = #f
  style : (listof (or/c 'packages 'enter-packages 'common))
        = null
  filters : (listof (list/c string? string?)) = '(("Any" "*.*"))
  dialog-mixin : (make-mixin-contract path-dialog%) = (λ (x) x)
```

Like get-file, except that the user can select multiple files, and the result is either a list of file paths or `#f`.

```
(put-file [message
           parent
           directory
           filename
           extension
           style
           filters
           #:dialog-mixin dialog-mixin]) → (or/c path? #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  directory : (or/c path-string? #f) = #f
  filename : (or/c path-string? #f) = #f
  extension : (or/c string? #f) = #f
  style : (listof (or/c 'packages 'enter-packages 'common))
        = null
  filters : (listof (list/c string? string?)) = '(("Any" "*.*"))
  dialog-mixin : (make-mixin-contract path-dialog%) = (λ (x) x)
```

Obtains a file pathname from the user via the platform-specific standard (modal) dialog, using *parent* as the parent window if it is specified, and using *message* as a message at the top of the dialog if it is not #f.

The result is #f if the user cancels the dialog, the selected pathname otherwise. The returned pathname may or may not exist, although the style of the dialog is directed towards creating a new file.

If *directory* is not #f, it is used as the starting directory for the file selector (otherwise the starting directory is chosen automatically in a platform-specific manner, usually based on the current directory and the user's interactions in previous calls to get-file, put-file, etc.). If *filename* is not #f, it is used as the default filename when appropriate, and it should *not* contain a directory path prefix.

On Windows, if *extension* is not #f, the returned path will get a default extension if the user does not supply one. The extension is derived from the user's *filters* choice if the corresponding pattern is of the form (string-append "*." *an-extension*), and the first such pattern is used if the choice has multiple patterns. If the user's choice has the pattern "*.*" and *extension* is the empty string, then no default extension is added. Finally, if *extension* is any string other than the empty string, *extension* is used as the default extension when the user's *filters* choice has the pattern "*.*". Meanwhile, the *filters* argument has the same format and auxiliary role as for get-file. In particular, if the only pattern in *filters* is (string-append "*." *extension*), then the result pathname is guaranteed to have an extension mapping *extension*.

On Mac OS 10.5 and later, if *extension* is not #f or "", the returned path will get a default extension if the user does not supply one. If *filters* contains as "*.*" pattern, then the user can supply any extension that is recognized by the system; otherwise, the extension

on the returned path will be either *extension* or *other-extension* for any (string-append "*." *other-extension*) pattern in *filters*. In particular, if the only pattern in *filters* is empty or contains only (string-append "*." *extension*), then the result pathname is guaranteed to have an extension mapping *extension*.

On Mac OS versions before 10.5, the returned path will get a default extension only if *extension* is not #f, *extension* is not "", and *filters* contains only (string-append "*." *extension*).

On Unix, *extension* is ignored, and *filters* is used to filter the visible list of files as in get-file.

The *style* list is treated as for get-file.

The *dialog-mixin* is applied to path-dialog% before creating an instance of the class for this dialog.

See also path-dialog% for a richer interface.

```
(get-directory [message
                parent
                directory
                style
                #:dialog-mixin dialog-mixin]) → (or/c path? #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  directory : (or/c path-string? #f) = #f
  style : (listof (or/c 'enter-packages 'common)) = null
  dialog-mixin : (make-mixin-contract path-dialog%) = (λ (x) x)
```

Obtains a directory pathname from the user via the platform-specific standard (modal) dialog, using *parent* as the parent window if it is specified.

If *directory* is not #f, it is used on some platforms as the starting directory for the directory selector (otherwise the starting directory is chosen automatically in a platform-specific manner, usually based on the current directory and the user's interactions in previous calls to get-file, put-file, etc.).

The *style* argument is treated as for get-file, except that only 'common or 'enter-packages can be specified. The latter matters only on Mac OS, where 'enter-packages enables the user to select package directory or a directory within a package. A package is a directory with a special suffix (e.g., ".app") that the Finder normally displays like a file.

The *dialog-mixin* is applied to path-dialog% before creating an instance of the class for this dialog.

See also path-dialog% for a richer interface.

```
(message-box  title
              message
             [parent
              style
              #:dialog-mixin dialog-mixin])
 → (or/c 'ok 'cancel 'yes 'no)
  title : label-string?
  message : string?
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  style : (listof (or/c 'ok 'ok-cancel 'yes-no    = '(ok)
                        'caution 'stop 'no-icon))
  dialog-mixin : (make-mixin-contract dialog%) = values
```

See also `message-box/custom`.

Displays a message to the user in a (modal) dialog, using *parent* as the parent window if it is specified. The dialog's title is *title*. The *message* string can be arbitrarily long, and can contain explicit linefeeds or carriage returns for breaking lines.

The style must include exactly one of the following:

- `'ok` — the dialog only has an OK button and always returns `'ok`.
- `'ok-cancel` — the message dialog has Cancel and OK buttons. If the user clicks Cancel, the result is `'cancel`, otherwise the result is `'ok`.
- `'yes-no` — the message dialog has Yes and No buttons. If the user clicks Yes, the result is `'yes`, otherwise the result is `'no`. Note: instead of a Yes/No dialog, best-practice GUI design is to use `message-box/custom` and give the buttons meaningful labels, so that the user does not have to read the message text carefully to make a selection.

In addition, *style* can contain `'caution` to make the dialog use a caution icon instead of the application (or generic "info") icon, `'stop` to make the dialog use a stop icon, or `'no-icon` to suppress the icon. If *style* contains multiple of `'caution`, `'stop`, and `'no-icon`, then `'no-icon` takes precedence followed by `'stop`.

The class that implements the dialog provides a `get-message` method that takes no arguments and returns the text of the message as a string. (The dialog is accessible through the `get-top-level-windows` function.)

The `message-box` function can be called in a thread other than the handler thread of the relevant eventspace (i.e., the eventspace of *parent*, or the current eventspace if *parent* is `#f`), in which case the current thread blocks while the dialog runs on the handler thread.

The *dialog-mixin* argument is applied to the class that implements the dialog before the dialog is created.

```
(message-box/custom  title
                     message
                     button1-label
                     button2-label
                     button3-label
                    [parent
                     style
                     close-result
                     #:return-the-dialog? return-the-dialog?
                     #:dialog-mixin dialog-mixin])
 → (if/c return-the-dialog?
          (is-a?/c dialog%)
          (or/c 1 2 3 close-result))
  title : label-string?
  message : string?
  button1-label : (or/c label-string? (is-a?/c bitmap%) #f)
  button2-label : (or/c label-string? (is-a?/c bitmap%) #f)
  button3-label : (or/c label-string? (is-a?/c bitmap%) #f)
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  style : (listof (or/c 'stop 'caution 'no-icon 'number-order
                        'disallow-close 'no-default
                        'default=1 'default=2 'default=3))
        = '(no-default)
  close-result : any/c = #f
  return-the-dialog? : any/c = #f
  dialog-mixin : (make-mixin-contract dialog%) = values
```

Displays a message to the user in a (modal) dialog, using *parent* as the parent window if it is specified. The dialog's title is *title*. The *message* string can be arbitrarily long, and can contain explicit linefeeds or carriage returns for breaking lines.

The dialog contains up to three buttons for the user to click. The buttons have the labels *button1-label*, *button2-label*, and *button3-label*, where `#f` for a label indicates that the button should be hidden.

If the user clicks the button labelled *button1-label*, a `1` is returned, and so on for `2` and `3`. If the user closes the dialog some other way—which is only allowed when *style* does not contain `'disallow-close`—then the result is the value of *close-result*. For example, the user can usually close a dialog by typing an Escape. Often, `2` is an appropriate value for *close-result*, especially when Button 2 is a Cancel button.

If *style* does not include `'number-order`, the order of the buttons is platform-specific, and labels should be assigned to the buttons based on their role:

- Button 1 is the normal action, and it is usually the default button. For example, if the dialog has an OK button, it is this one. On Windows, this button is leftmost; on Unix and Mac OS, it is rightmost. (See also `system-position-ok-before-cancel?`.) Use this button for dialogs that contain only one button.
- Button 2 is next to Button 1, and it often plays the role of Cancel (even when the default action is to cancel, such as when confirming a file replacement).
- Button 3 tends to be separated from the other two (on Mac OS, it is left-aligned in the dialog). Use this button only for three-button dialogs.

Despite the above guidelines, any combination of visible buttons is allowed in the dialog.

If *`style`* includes `'number-order`, then the buttons are displayed in the dialog left-to-right with equal spacing between all buttons, though aligned within the dialog (centered or right-aligned) in a platform-specific manner. Use `'number-order` sparingly.

The *`style`* list must contain exactly one of `'default=1`, `'default=2`, `'default=3`, and `'no-default` to determine which button (if any) is the default. The default button is "clicked" when the user types Return. If `'default=n` is supplied but button `n` has no label, then it is equivalent to `'no-default`.

In addition, *`style`* can contain `'caution`, `'stop`, or `'no-icon` to adjust the icon that appears in the dialog, the same for `message-box`.

If *`return-the-dialog?`* is a true value, then the dialog is not shown and is instead returned from `message-box/custom`. The dialog responds to these three additional messages (via `send`):

- *`get-message`* This method takes no arguments and returns the text of the message as a string.
- *`set-message`* This method accepts one string argument and changes the message of the dialog to the given argument.
- *`show-and-return-results`* This method accepts no arguments and shows the dialog. It returns after the dialog closes, with the result that the `message-box/custom` would have returned if *`return-the-dialog?`* had been `#false`.

The dialog is also accessible through the `get-top-level-windows` function.

The `message-box/custom` function can be called in a thread other than the handler thread of the relevant eventspace (i.e., the eventspace of *`parent`*, or the current eventspace if *`parent`* is `#f`), in which case the current thread blocks while the dialog runs on the handler thread.

The *dialog-mixin* argument is applied to the class that implements the dialog before the dialog is created.

Changed in version 1.53 of package gui-lib: Added the *return-the-dialog?* argument and the ability to change the dialog box's message.

```
(message+check-box  title
                    message
                    check-label
                   [parent
                    style
                    #:return-the-dialog? return-the-dialog?
                    #:dialog-mixin dialog-mixin])
 → (if/c return-the-dialog?
          (is-a?/c dialog%)
          (values (or/c 'ok 'cancel 'yes 'no) boolean?))
  title : label-string?
  message : string?
  check-label : label-string?
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  style : (listof (or/c 'ok 'ok-cancel 'yes-no
                        'caution 'stop 'no-icon 'checked))
        = '(ok)
  return-the-dialog? : any/c = #f
  dialog-mixin : (make-mixin-contract dialog%) = values
```

See also message+check-box/custom.

Like message-box, except that

- the dialog contains a check box whose label is *check-label*;
- the result is two values: the message-box result, and a boolean indicating whether the box was checked; and
- *style* can contain 'checked to indicate that the check box should be initially checked.
- If *return-the-dialog?* is a true value, the resulting object also has a public *set-check-label* method. That method accepts a single, label-string? argument and sets the checkbox's label to that string.

Changed in version 1.53 of package gui-lib: Added the *return-the-dialog?* argument and the ability to change the dialog box's message and check label.

```
(message+check-box/custom  title
                           message
                           check-label
                           button1-label
                           button2-label
                           button3-label
                          [parent
                           style
                           close-result
                           #:dialog-mixin dialog-mixin])
 → (or/c 1 2 3 (λ (x) (eq? x close-result)))
  title : label-string?
  message : string?
  check-label : label-string?
  button1-label : (or/c label-string? (is-a?/c bitmap%) #f)
  button2-label : (or/c label-string? (is-a?/c bitmap%) #f)
  button3-label : (or/c label-string? (is-a?/c bitmap%) #f)
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  style : (listof (or/c 'stop 'caution 'no-icon 'number-order
                        'disallow-close 'no-default
                        'default=1 'default=2 'default=3))
        = '(no-default)
  close-result : any/c = #f
  dialog-mixin : (make-mixin-contract dialog%) = values
```

Like message-box/custom, except that

- the dialog contains a check box whose label is *check-label*;
- the result is two values: the message-box result, and a boolean indicating whether the box was checked; and
- *style* can contain 'checked to indicate that the check box should be initially checked.

```
(get-text-from-user  title
                     message
                    [parent
                     init-val
                     style]
                     #:validate validate
                    [#:dialog-mixin dialog-mixin])
 → (or/c string? #f)
  title : label-string?
  message : (or/c label-string? #f)
```

```
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  init-val : string? = ""
  style : (listof (or/c 'password 'disallow-invalid)) = null
  validate : (-> string? boolean?)
  dialog-mixin : (make-mixin-contract dialog%) = values
```

Gets a text string from the user via a modal dialog, using *parent* as the parent window, if it is specified. The dialog's title is *title*. The dialog's text field is labelled with *message* and initialized to *init-val* (but *init-val* does not determine the size of the dialog).

The result is `#f` if the user cancels the dialog, the user-provided string otherwise.

If *style* includes `'password`, the dialog's text field draws each character of its content using a generic symbol, instead of the actual character.

The *validate* function is called each time the text field changed, with the contents of the text field. If it returns `#f`, the background of the text is colored pink. If `'disallow-invalid` is included in *style*, the Ok button is disabled whenever the text background is pink.

The *dialog-mixin* argument is applied to the class that implements the dialog before the dialog is created.

```
(get-choices-from-user  title
                        message
                        choices
                       [parent
                        init-choices
                        style])
 → (or/c (listof exact-nonnegative-integer?) #f)
  title : label-string?
  message : (or/c label-string? #f)
  choices : (listof label-string?)
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  init-choices : (listof exact-nonnegative-integer?) = null
  style : (listof (or/c 'single 'multiple 'extended))
        = '(single)
```

Gets a list box selection from the user via a modal dialog, using *parent* as the parent window if it is specified. The dialog's title is *title*. The dialog's list box is labelled with *message* and initialized by selecting the items in *init-choices*.

The style must contain exactly one of `'single`, `'multiple`, or `'extended`. The styles have the same meaning as for creating a `list-box%` object. (For the single-selection style, only the last selection in *init-choices* matters.)

The result is `#f` if the user cancels the dialog, the list of selections otherwise.

```
(get-color-from-user [message
                      parent
                      init-color
                      style])     → (or/c (is-a?/c color%) #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  init-color : (or/c (is-a?/c color%) #f) = #f
  style : (listof 'alpha) = null
```

Lets the user select a color though the platform-specific (modal) dialog, using *parent* as the parent window if it is specified. The *message* string is displayed as a prompt in the dialog if possible. If *init-color* is provided, the dialog is initialized to the given color.

The result is `#f` if the user cancels the dialog, the selected color otherwise.

If *style* contains `'alpha`, then the user is present with a field for filling in the alpha field of the resulting `color%` object. If it does not, then the alpha component of *init-color* is ignored, and the result always has alpha of `1.0`.

```
(get-font-from-user [message
                     parent
                     init-font
                     style])    → (or/c (is-a?/c font%) #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  init-font : (or/c (is-a?/c font%) #f) = #f
  style : null? = null
```

Lets the user select a font though the platform-specific (modal) dialog, using *parent* as the parent window if it is specified. The *message* string is displayed as a prompt in the dialog if possible. If *init-font* is provided, the dialog is initialized to the given font.

The *style* argument is provided for future extensions. Currently, *style* must be the empty list.

The result is `#f` if the user cancels the dialog, the selected font otherwise.

```
(get-ps-setup-from-user [message
                         parent
                         init-setup
                         style])
 → (or/c (is-a?/c ps-setup%) #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  init-setup : (or/c (is-a?/c ps-setup%) #f) = #f
  style : null? = null
```

Lets the user select a PostScript configuration though a (modal) dialog, using *parent* as the parent window if it is specified. The *message* string is displayed as a prompt in the dialog. If *init-setup* is provided, the dialog is initialized to the given configuration, otherwise the current configuration from current-ps-setup is used.

The *style* argument is provided for future extensions. Currently, *style* must be the empty list.

The result is #f if the user cancels the dialog, , a ps-setup% object that encapsulates the selected PostScript configuration otherwise.

```
(get-page-setup-from-user [message
                           parent
                           init-setup
                           style])
 → (or/c (is-a?/c ps-setup%) #f)
  message : (or/c label-string? #f) = #f
  parent : (or/c (is-a?/c frame%) (is-a?/c dialog%) #f) = #f
  init-setup : (or/c (is-a?/c ps-setup%) #f) = #f
  style : null? = null
```

Like get-ps-setup-from-user, but the dialog configures page layout for native printing with printer-dc%. A dialog is shown only if can-get-page-setup-from-user? returns #t, otherwise no dialog is shown and the result is #f.

The *parent* argument is used as the parent window for a dialog if it is specified. The *message* string might be displayed as a prompt in the dialog. If *init-setup* is provided, the dialog is initialized to the given configuration, otherwise the current configuration from current-ps-setup is used.

The *style* argument is provided for future extensions. Currently, *style* must be the empty list.

The result is #f if the user cancels the dialog, a ps-setup% object that encapsulates the selected configuration otherwise.

```
(can-get-page-setup-from-user?) → boolean?
```

Returns #t if the current platform supports a page-layout dialog for use with printer-dc% printing. Currently, all platforms support a page-layout dialog.

4.2 Eventspaces

```
(make-eventspace [#:suspend-to-kill? suspend-to-kill?])
 → eventspace?
  suspend-to-kill? : any/c = #f
```

Creates and returns a new eventspace value. The new eventspace is created as a child of the current eventspace. The eventspace is used by making it the current eventspace with the `current-eventspace` parameter.

If *`suspend-to-kill?`* is not `#f`, then the eventspace's handler thread is created using `thread/suspend-to-kill`. Otherwise, it is created using `thread`.

See §1.6 "Event Dispatching and Eventspaces" for more information about eventspaces.

Changed in version 1.35 of package `gui-lib`: Added the *`suspend-to-kill?`* argument.

```
(current-eventspace) → eventspace?
(current-eventspace e) → void?
  e : eventspace?
```

A parameter (see §11.3.2 "Parameters") that determines the current eventspace.

See §1.6 "Event Dispatching and Eventspaces" for more information about eventspaces.

```
(eventspace? v) → boolean?
  v : any/c
```

Returns `#t` if *`v`* is an eventspace value or `#f` otherwise.

See §1.6 "Event Dispatching and Eventspaces" for more information about eventspaces.

```
(event-dispatch-handler) → (eventspace? . -> . any)
(event-dispatch-handler handler) → void?
  handler : (eventspace? . -> . any)
```

A parameter (see §11.3.2 "Parameters") that determines the current event dispatch handler. The event dispatch handler is called by an eventspace's handler thread for every queue-based event to be processed in the eventspace. The only argument to the handler is the eventspace in which an event should be dispatched. The event dispatch handler gives the programmer control over the timing of event dispatching, but not the order in which events are dispatched within a single eventspace.

An event dispatch handler must ultimately call the primitive event dispatch handler. If an event dispatch handler returns without calling the primitive handler, then the primitive handler is called directly by the eventspace handler thread.

```
(eventspace-event-evt [e]) → evt?
  e : eventspace? = (current-eventspace)
```

Produces a synchronizable event (see `sync`) that is ready when a GUI event (mouse or keyboard action, update event, timer, queued callback, etc.) is ready for dispatch in `e`. That is, the result event is ready when `(yield)` for the eventspace `e` would dispatch a GUI event. The synchronization result is the eventspace `e` itself.

```
(check-for-break) → boolean?
```

Inspects the event queue of the current eventspace, searching for a Shift-Ctl-C (Unix, Windows) or Cmd-. (Mac OS) key combination. Returns `#t` if such an event was found (and the event is dequeued) or `#f` otherwise.

```
(get-top-level-windows)
 → (listof (or/c (is-a?/c frame%) (is-a?/c dialog%)))
```

Returns a list of visible top-level frames and dialogs in the current eventspace.

```
(get-top-level-focus-window)
 → (or/c (is-a?/c frame%) (is-a?/c dialog%) #f)
```

Returns the top level window in the current eventspace that has the keyboard focus (or contains the window with the keyboard focus), or `#f` if no window in the current eventspace has the focus.

```
(get-top-level-edit-target-window)
 → (or/c (is-a?/c frame%) (is-a?/c dialog%) #f)
```

Returns the top level window in the current eventspace that is visible and most recently had the keyboard focus (or contains the window that had the keyboard focus), or `#f` if there is no visible window in the current eventspace.

```
(special-control-key on?) → void?
  on? : any/c
(special-control-key) → boolean?
```

For backward compatibility, only. This function was intended to enable or disable special Control key handling (Mac OS), but it currently has no effect.

```
(special-option-key on?) → void?
  on? : any/c
(special-option-key) → boolean?
```

Enables or disables special Option key handling (Mac OS). When Option is treated as a special key, the `get-key-code` and `get-other-altgr-key-code` results are effectively swapped when the Option key is pressed. By default, Option is not special.

If *on?* is provided as `#f`, key events are reported normally. This setting affects all windows and eventspaces.

If no argument is provided, the result is `#t` if Option is currently treated specially, `#f` otherwise.

```
(any-control+alt-is-altgr on?) → void?
  on? : any/c
(any-control+alt-is-altgr) → boolean?
```

Enables or disables the treatment of any Control plus Alt as equivalent to AltGr (Windows), as opposed to treating only a left-hand Control plus a right-hand Alt (for keyboard configurations that have both) as AltGr.

If *on?* is provided as `#f`, key events are reported normally. This setting affects all windows and eventspaces.

If no argument is provided, the result is `#t` if Control plus Alt is currently treated as AltGr, `#f` otherwise.

Added in version 1.24 of package `gui-lib`.

```
(queue-callback callback [high-priority?]) → void?
  callback : (-> any)
  high-priority? : any/c = #t
```

Installs a procedure to be called via the current eventspace's event queue. The procedure is called once in the same way and under the same restrictions that a callback is invoked to handle a method.

A second (optional) boolean argument indicates whether the callback has a high or low priority in the event queue. See §1.6 "Event Dispatching and Eventspaces" for information about the priority of events.

```
(yield) → boolean?
(yield v) → any/c
  v : (or/c 'wait evt?)
```

Yields control to event dispatching. See §1.6 "Event Dispatching and Eventspaces" for details.

A handler procedure invoked by the system during a call to `yield` can itself call `yield`, creating an additional level of nested (but single-threaded) event handling.

See also `sleep/yield`.

If no argument is provided, `yield` dispatches an unspecified number of events, but only if the current thread is the current eventspace's handler thread (otherwise, there is no effect). The result is `#t` if any events may have been handled, `#f` otherwise.

If *v* is `'wait`, and `yield` is called in the handler thread of an eventspace, then `yield` starts processing events in that eventspace until

- no top-level windows in the eventspace are visible;
- no timers in the eventspace are running;
- no callbacks are queued in the eventspace; and
- no `menu-bar%` has been created for the eventspace with `'root` (i.e., creating a `'root` menu bar prevents an eventspace from ever unblocking).

When called in a non-handler thread, `yield` returns immediately. In either case, the result is `#t`.

Evaluating `(yield 'wait)` is thus similar to `(yield (current-eventspace))`, except that it is sensitive to whether the current thread is a handler thread, instead of the value of the `current-eventspace` parameter.

If *v* is an event in Racket's sense (not to be confused with a GUI event), `yield` blocks on *v* in the same way as `sync`, except that it may start a `sync` on *v* multiple times (but it will complete a `sync` on *v* at most one time). If the current thread is the current eventspace's handler thread, events are dispatched until a *v* sync succeeds on an event boundary. For other threads, calling `yield` with a Racket event is equivalent to calling `sync`. In either case, the result is the same that of `sync`; however, if a wrapper procedure is associated with *v* via `handle-evt`, it is not called in tail position with respect to the `yield`.

Always use `(yield v)` instead of a busy-wait loop.

```
(sleep/yield secs) → void?
  secs : (and/c real? (not/c negative?))
```

Blocks for at least the specified number of seconds, handling events meanwhile if the current thread is the current eventspace's handler thread (otherwise, `sleep/yield` is equivalent to `sleep`).

```
(eventspace-shutdown? e) → boolean?
  e : eventspace?
```

Returns `#t` if the given eventspace has been shut down by its custodian, `#f` otherwise. Attempting to create a new window, timer, or explicitly queued event in a shut-down eventspace raises the `exn:fail` exception.

Attempting to use certain methods of windows and timers in a shut-down eventspace also raises the `exn:fail` exception, but the `get-top-level-window` in `area<%>` and `get-eventspace` in `top-level-window<%>` methods work even after the area's eventspace is shut down.

```
(eventspace-handler-thread e) → (or/c thread? #f)
  e : eventspace?
```

Returns the handler thread of the given eventspace. If the handler thread has terminated (e.g., because the eventspace was shut down), the result is `#f`.

4.3 System Menus

```
(current-eventspace-has-standard-menus?) → boolean?
```

Returns `#t` for Mac OS when the current eventspace is the initial one, since that eventspace is the target for the standard application menus. For any other system or eventspace, the result is `#f`.

This procedure is intended for use in deciding whether to include a Quit, About, and Preferences menu item in a frame's menu. On Mac OS, the application Quit menu triggers a call to a frame's `on-exit` method, the About menu item is controlled by `application-about-handler`, and the Preferences menu item is controlled by `application-preferences-handler`.

```
(current-eventspace-has-menu-root?) → boolean?
```

Returns `#t` for Mac OS when the current eventspace is the initial one, since that eventspace can supply a menu bar to be active when no frame is visible. For any other system or eventspace, the result is `#f`.

This procedure is intended for use in deciding whether to create a `menu-bar%` instance with `'root` as its parent.

```
(application-about-handler) → (-> any)
(application-about-handler handler-thunk) → void?
  handler-thunk : (-> any)
```

When the current eventspace is the initial eventspace, this procedure retrieves or installs a thunk that is called when the user selects the application About menu item on Mac OS. The thunk is always called in the initial eventspace's handler thread (as a callback).

The default handler displays a generic Racket dialog.

If the current eventspace is not the initial eventspace, this procedure returns `void` (when called with zero arguments) or has no effect (when called with a handler).

```
(application-file-handler) → (path? . -> . any)
(application-file-handler handler-proc) → void?
  handler-proc : (path? . -> . any)
```

When the current eventspace is the initial eventspace, this procedure retrieves or installs a procedure that is called on Mac OS and Windows when the application is running and user

double-clicks an application-handled file or drags a file onto the application's icon. The procedure is always called in the initial eventspace's handler thread (as a callback), and the argument is a filename.

The default handler queues a callback to the `on-drop-file` method of the most-recently activated frame in the main eventspace (see `get-top-level-edit-target-window`), if any such frame exists and if drag-and-drop is enabled for that frame. Otherwise, it saves the filename and re-queues the handler event when the application file handler is later changed or when a frame becomes active.

On Windows, when the application is *not* running and a user double-clicks an application-handled file or drags a file onto the application's icon, the filename is provided as a command-line argument to the application.

On Mac OS, if an application is started *without* files, then the `application-start-empty-handler` procedure is called.

If the current eventspace is not the initial eventspace, this procedure returns `void` (when called with zero arguments) or has no effect (when called with a handler).

```
(application-preferences-handler) → (or/c (-> any) #f)
(application-preferences-handler handler-thunk) → void?
  handler-thunk : (or/c (-> any) #f)
```

When the current eventspace is the initial eventspace, this procedure retrieves or installs a thunk that is called when the user selects the application Preferences menu item on Mac OS. The thunk is always called in the initial eventspace's handler thread (as a callback). If the handler is set to `#f`, the Preferences item is disabled.

The default handler is `#f`.

If the current eventspace is not the initial eventspace, this procedure returns `void` (when called with zero arguments) or has no effect (when called with a handler).

```
(application-quit-handler) → (-> any)
(application-quit-handler handler-thunk) → void?
  handler-thunk : (-> any)
```

When the current eventspace is the initial eventspace, this procedure retrieves or installs a thunk that is called when the user requests that the application quit (e.g., through the Quit menu item on Mac OS, or when shutting down the machine in Windows). The thunk is always called in the initial eventspace's handler thread (as a callback). If the result of the thunk is `#f`, then the operating system is explicitly notified that the application does not intend to quit (on Windows).

The default handler queues a call to the `can-exit?` method of the most recently active frame in the initial eventspace (and then calls the frame's `on-exit` method if the result is true).

The result is `#t` if the eventspace is left with no open frames after `on-exit` returns, `#f` otherwise.

If the current eventspace is not the initial eventspace, this procedure returns `void` (when called with zero arguments) or has no effect (when called with a handler).

```
(application-start-empty-handler) → (-> any)
(application-start-empty-handler handler-thunk) → void?
  handler-thunk : (-> any)
```

When the current eventspace is the initial eventspace, this procedure retrieves or installs a thunk that is called when the user starts the application on Mac OS without supplying any initial files (e.g., by double-clicking the application icon instead of double-clicking files that are handled by the application).

The default handler re-queues the handler event when the application start-empty handler is later changed. As a result, if an application sets both `application-start-empty-handler` and `application-file-handler`, then one or the other is eventually called.

If the current eventspace is not the initial eventspace, this procedure returns `void` (when called with zero arguments) or has no effect (when called with a handler).

```
(application-dark-mode-handler) → (-> any)
(application-dark-mode-handler handler-thunk) → void?
  handler-thunk : (-> any)
```

When the current eventspace is the initial eventspace this procedure retrieves or installs a thunk that is called under Mac OS when the OS switches to or from dark mode. See also `white-on-black-panel-scheme?`.

The default handler does nothing.

If the current eventspace is not the initial eventspace, this procedure returns `void` (when called with zero arguments) or has no effect (when called with a handler).

Added in version 1.68 of package `gui-lib`.

4.4 Global Graphics

```
(flush-display) → void?
```

Flushes canvas offscreen drawing and other updates onto the screen.

Normally, drawing is automatically flushed to the screen. Use `flush-display` sparingly to force updates to the screen when other actions depend on updating the display.

```
(get-display-backing-scale [#:monitor monitor])
 → (or/c (>/c 0.0) #f)
  monitor : exact-nonnegative-integer? = 0
```

Returns the number of pixels that correspond to one drawing unit on a monitor. The result is normally `1.0`, but it is `2.0` on Mac OS in Retina display mode, and on Windows or Unix it can be a value such as `1.25`, `1.5`, or `2.0` when the operating-system scale for text is changed. See also §1.8 "Screen Resolution and Text Scaling".

On Mac OS or Unix, the result can change at any time. See also `display-changed` in `top-level-window<%>`.

If *monitor* is not less than the current number of available monitors (which can change at any time), the is `#f`. See also `display-changed` in `top-level-window<%>`.

Changed in version 1.2 of package `gui-lib`: Added backing-scale support on Windows.

```
(get-display-count) → exact-positive-integer?
```

Returns the number of monitors currently active.

On Windows and Mac OS, the result can change at any time. See also `display-changed` in `top-level-window<%>`.

```
(get-display-depth) → exact-nonnegative-integer?
```

Returns the depth of the main display (a value of 1 denotes a monochrome display).

```
(get-display-left-top-inset [avoid-bars?
                             #:monitor monitor])
    (if (= monitor 0)
 →      exact-nonnegative-integer?
        (or/c exact-nonnegative-integer? #f))
    (if (= monitor 0)
        exact-nonnegative-integer?
        (or/c exact-nonnegative-integer? #f))
  avoid-bars? : any/c = #f
  monitor : exact-nonnegative-integer? = 0
```

When the optional argument is `#f` (the default), this function returns the offset of *monitor*'s origin from the top-left of the physical monitor. For *monitor* `0`, on Unix and Windows, the result is always `0` and `0`; on Mac OS, the result is `0` and the height of the menu bar. To position a frame at a given *monitor*'s top-left corner, use the negated results from `get-display-left-top-inset` as the frame's position.

When the optional *avoid-bars?* argument is true, for *monitor* 0, get-display-left-top-inset function returns the amount space at the left and top of the monitor that is occupied by the task bar (Windows) or menu bar and dock (Mac OS). On Unix, for monitor 0, the result is always 0 and 0. For monitors other than 0, *avoid-bars?* has no effect.

If *monitor* is not less than the current number of available monitors (which can change at any time), the results are #f and #f. See also display-changed in top-level-window<%>.

See also §1.8 "Screen Resolution and Text Scaling".

```
(get-display-size [full-screen?
                   #:monitor monitor])
   (if (= monitor 0)
→      exact-nonnegative-integer?
       (or/c exact-nonnegative-integer? #f))
   (if (= monitor 0)
       exact-nonnegative-integer?
       (or/c exact-nonnegative-integer? #f))
 full-screen? : any/c = #f
 monitor : exact-nonnegative-integer? = 0
```

Gets the physical size of the specified *monitor* in pixels. On Windows, this size does not include the task bar by default. On Mac OS, this size does not include the menu bar or dock area by default.

On Windows and Mac OS, if the optional argument is true and *monitor* is 0, then the task bar, menu bar, and dock area are included in the result.

If *monitor* is not less than the current number of available monitors (which can change at any time), the results are #f and #f. See also display-changed in top-level-window<%>.

See also §1.8 "Screen Resolution and Text Scaling".

```
(is-color-display?) → boolean?
```

Returns #t if the main display has color, #f otherwise.

4.5 Fonts

```
menu-control-font : (is-a?/c font%)
```

This font is the default for popup-menu% objects.

On Mac OS, this font is slightly larger than normal-control-font. On Windows and Unix, it is the same size as normal-control-font.

normal-control-font : (is-a?/c font%)

This font is the default for most controls, except list-box% and group-box-panel% objects.

small-control-font : (is-a?/c font%)

This font is the default for group-box-panel% objects, and it is a suitable for controls in a floating window and other contexts that need smaller controls.

On Windows, this font is the same size as normal-control-font, since the Windows control font is already relatively small. On Unix and Mac OS, this font is slightly smaller than normal-control-font.

tiny-control-font : (is-a?/c font%)

This font is for tiny controls, and it is smaller than small-control-font on all platforms.

view-control-font : (is-a?/c font%)

This font is the default for list-box% objects (but not list box labels, which use normal-control-font).

On Mac OS, this font is slightly smaller than normal-control-font, and slightly larger than small-control-font. On Windows and Unix, it is the same size as normal-control-font.

4.6 Miscellaneous

(begin-busy-cursor) → void?

Changes the cursor to a watch cursor for all windows in the current eventspace. Use end-busy-cursor to revert the cursor back to its previous state. Calls to begin-busy-cursor and end-busy-cursor can be nested arbitrarily.

The cursor installed by begin-busy-cursor overrides any window-specific cursors installed with set-cursor.

See also is-busy?.

(bell) → void?

Rings the system bell.

```
(dimension-integer? v) → boolean?
  v : any/c
```

Equivalent to `(integer-in 0 1000000)`.

Beware that certain kinds of windows behave badly when larger than 32,000 or so in either dimension on some platforms. Redraw of the window may be disabled or clipped, for example.

```
(end-busy-cursor) → void?
```

See `begin-busy-cursor`.

```
(file-creator-and-type filename
                       creator-bytes
                       type-bytes)    → void?
  filename : path?
  creator-bytes : (and/c bytes? #rx#"^....$")
  type-bytes : (and/c bytes? #rx#"^....$")
(file-creator-and-type filename) → (and/c bytes? #rx#"^....$")
                                   (and/c bytes? #rx#"^....$")
  filename : path?
```

Gets or sets the creator and type of a file in Mac OS.

The get operation always returns `#"????"` and `#"????"` for Unix or Windows. The set operation has no effect on Unix or Windows.

```
(find-graphical-system-path what) → (or/c path? #f)
  what : (or/c 'init-file 'x-display)
```

Finds a platform-specific (and possibly user- or machine-specific) standard filename or directory. See also `find-system-path`.

The result depends on *what*, and a `#f` result is only possible when *what* is `'x-display`:

- `'init-file` returns the ,path to the user-specific initialization file (containing Racket code). The directory part of the path is the same path as returned for `'init-dir` by Racket's `find-system-path`. The file name is platform-specific:
  - Unix and Mac OS: `".gracketrc"`
  - Windows: `"gracketrc.rktl"`

- `'x-display` returns a "path" whose string identifies the X11 display if specified by either the `-display` flag or the `DISPLAY` environment variable when GRacket starts on Unix. For other platforms, or when neither `-display` nor `DISPLAY` was specified, the result is `#f`.

```
(get-default-shortcut-prefix)
 → (case (system-type)
     [(windows) (list/c 'ctl)]
     [(macosx)  (list/c 'cmd)]
     [(unix)    (list/c (or/c 'alt 'cmd 'meta 'ctl 'shift 'option))])
```

Returns an immutable list specifying the default prefix for menu shortcuts. See also `get-shortcut-prefix` in `selectable-menu-item<%>`.

On Windows, the default is `'(ctl)`. On Mac OS, the default is `'(cmd)`. On Unix, the default is normally `'(ctl)`, but the default can be changed through the `'GRacket:defaultMenuPrefix` preference low-level preference (see §10 "Preferences").

```
(get-panel-background) → (is-a?/c color%)
```

Returns a shade of gray.

Historically, the result matched the color of a `panel%` background, but `panel%` backgrounds can vary on some platforms (e.g., when nested in a `group-box-panel%`), so the result is no longer guaranteed to be related to a `panel%`'s color.

See `get-label-background-color` for a closer approximation to a panel background.

```
(get-highlight-background-color) → (is-a?/c color%)
```

Returns the color that is drawn behind selected text.

```
(get-highlight-text-color) → (or/c (is-a?/c color%) #f)
```

Returns the color that is used to draw selected text or `#f` if selected text is drawn with its usual color.

```
(get-label-background-color) → (is-a?/c color%)
```

Returns an approximation of the color that is likely to appear behind a control label. This color may not match the actual color of a control's background, since themes on some platforms may vary the color for different contexts.

See also `get-label-foreground-color`.

Added in version 1.38 of package `gui-lib`.

```
(get-label-foreground-color) → (is-a?/c color%)
```

Returns an approximation of the color that is likely to be used for the text of a control label. This color may not match the actual color of label text, since themes on some platforms may vary the color for different contexts.

Comparing the results of `get-label-foreground-color` and `get-label-background-color` may be useful for detecting whether a platform's current theme is "dark mode" versus "light mode."

Added in version 1.38 of package `gui-lib`.

```
(get-window-text-extent  string
                         font
                        [combine?]) → exact-nonnegative-integer?
                                      exact-nonnegative-integer?
  string : string?
  font : (is-a?/c font%)
  combine? : any/c = #f
```

Returns the pixel size of a string drawn as a window's label or value when drawn with the given font. The optional *combine?* argument is as for `get-text-extent` in `dc<%>`.

See also `get-text-extent` in `dc<%>`.

```
(graphical-read-eval-print-loop [eval-eventspace
                                 redirect-ports?]) → void?
  eval-eventspace : (or/c eventspace? #f) = #f
  redirect-ports? : any/c = (not eval-eventspace)
```

Similar to `read-eval-print-loop`, except that none of `read-eval-print-loop`'s configuration parameters are used (such as `current-read`) and the interaction occurs in a GUI window instead of using the current input and output ports.

Expressions entered into the graphical read-eval-print loop can be evaluated in an eventspace (and thread) that is distinct from the one implementing the `graphical-read-eval-print-loop` window (i.e., the current eventspace when `graphical-read-eval-print-loop` is called).

If no eventspace is provided, or if `#f` is provided, an evaluation eventspace is created using `(make-eventspace)` with a new custodian; the eventspace and its threads are be shut down when the user closes the `graphical-read-eval-print-loop` window. If an eventspace is provided, closing the window performs no shut-down actions on eventspace.

When *redirect-ports?* is true, the following parameters are initialized in the created eventspace's handler thread:

- `current-output-port` — writes to the frame
- `current-error-port` — writes to the frame
- `current-input-port` — always returns `eof`

The keymap for the read-eval-print loop's editor is initialized by calling the current keymap initializer procedure, which is determined by the `current-text-keymap-initializer` parameter.

```
(graphical-system-type) → symbol?
```

Returns a symbol indicating the platform native GUI layer on which `racket/gui` is running. The current possible values are as follows:

- `'win32` (Windows)
- `'cocoa` (Mac OS)
- `'gtk2` — GTK+ version 2
- `'gtk3` — GTK+ version 3

Added in version 1.15 of package `gui-lib`.

```
(textual-read-eval-print-loop) → void?
```

Similar to `read-eval-print-loop`, except that evaluation uses a newly created eventspace like `graphical-read-eval-print-loop`.

The `current-prompt-read` parameter is used in the current thread to read input. The result is queued for evaluation and printing in the created eventspace's handler thread, which uses `current-eval` and `current-print`. After printing completes for an interaction result, the next expression in read in the original thread, and so on.

If an `exn:break` exception is raised in the original thread during reading, it aborts the current call to `(current-read)` and a new one is started. If an `exn:break` exception is raised in the original thread while waiting for an interaction to complete, a break is sent (via `break-thread`) to the created eventspace's handler thread.

```
(get-current-mouse-state)
 → (is-a?/c point%)
   (listof (or/c 'left 'middle 'right
                 'shift 'control 'alt 'meta 'caps))
```

Returns the current location of the mouse in screen coordinates, and returns a list of symbols for mouse buttons and modifier keys that are currently pressed.

On Mac OS 10.5 and earlier, mouse-button information is not available, so the second result includes only symbols for modifier keys.

```
(hide-cursor-until-moved) → void?
```

Hides the cursor until the user moves the mouse or clicks the mouse button. (For some platforms, the cursor is not hidden if it is over a window in a different eventspace or application.)

```
(is-busy?) → boolean?
```

Returns `#t` if a busy cursor has been installed with `begin-busy-cursor` and not removed with `end-busy-cursor`.

```
(label->plain-label label) → string?
  label : string?
```

Strips shortcut ampersands from *label*, removes parenthesized ampersand–character combinations along with any surrounding space, and removes anything after a tab. Overall, it returns the label as it would appear on a button on a platform without support for mnemonics.

```
(make-gl-bitmap width height config) → (is-a?/c bitmap%)
  width : exact-positive-integer?
  height : exact-positive-integer?
  config : (is-a?/c gl-config%)
```

Creates a bitmap that supports both normal `dc<%>` drawing an OpenGL drawing through a context returned by `get-gl-context` in `dc<%>`.

For `dc<%>` drawing, an OpenGL-supporting bitmap draws like a bitmap from `make-screen-bitmap` on some platforms, while it draws like a bitmap instantiated directly from `bitmap%` on other platforms.

Be aware that on Unix systems, GLX may choose indirect rendering for OpenGL drawing to bitmaps, which can limit its features to OpenGL 1.4 or below.

```
(make-gui-empty-namespace) → namespace?
```

Like `make-base-empty-namespace`, but with `racket/class` and `racket/gui/base` also attached to the result namespace.

```
(make-gui-namespace) → namespace?
```

Like `make-base-namespace`, but with `racket/class` and `racket/gui/base` also required into the top-level environment of the result namespace.

```
(make-screen-bitmap width height) → (is-a?/c bitmap%)
  width : exact-positive-integer?
  height : exact-positive-integer?
```

Creates a bitmap that draws in a way that is the same as drawing to a canvas in its default configuration.

In particular, on Mac OS when the main monitor is in Retina display mode, a drawing unit corresponds to two pixels, and the bitmap internally contains four times as many pixels as requested by *width* and *height*. On Windows, the backing scale is similarly increased by adjusting the operating-system text scale. See also `get-display-backing-scale`.

See also §1.8 "Portability and Bitmap Variants".

```
(play-sound filename async?) → boolean?
  filename : path-string?
  async? : any/c
```

Plays a sound file. If *async?* is false, the function does not return until the sound completes. Otherwise, it returns immediately. The result is `#t` if the sound plays successfully, `#f` otherwise.

On Windows, MCI is used to play sounds, so file formats such as `".wav"` and `".mp3"` should be supported.

On Mac OS, Quicktime is used to play sounds; most sound formats (`".wav"`, `".aiff"`, `".mp3"`) are supported in recent versions of Quicktime. To play `".wav"` files, Quicktime 3.0 (compatible with OS 7.5 and up) is required.

On Unix, the function invokes an external sound-playing program—looking by default for a few known programs (`paplay`, `aplay`, `play`, `esdplay`, `sndfile-play`, `audioplay`). A play command can be defined through the `'GRacket:playcmd` preference preference (see §10 "Preferences"). The preference can hold a program name, or a format string containing a single `~a` where the filename should be substituted—and used as a shell command. (Don't use `~s`, since the string that is used with the format string will be properly quoted and wrapped in double quotes.) A plain command name is usually better, since execution is faster. The command's output is discarded, unless it returns an error code, in which case the last part of the error output is shown.

Changed in version 1.22 of package `gui-lib`: On Windows, added support for multiple sounds at once and file format such as `".mp3"`.

```
(position-integer? v) → boolean?
  v : any/c
```

Equivalent to `(integer-in -1000000 1000000)`.

```
(positive-dimension-integer? v) → boolean?
  v : any/c
```

Equivalent to `(integer-in 1 1000000)`.

```
(register-collecting-blit  canvas
                           x
                           y
                           w
                           h
                           on
                           off
                          [on-x
                           on-y
                           off-x
                           off-y]) → void?
  canvas : (is-a?/c canvas%)
  x : position-integer?
  y : position-integer?
  w : dimension-integer?
  h : dimension-integer?
  on : (is-a?/c bitmap%)
  off : (is-a?/c bitmap%)
  on-x : real? = 0
  on-y : real? = 0
  off-x : real? = 0
  off-y : real? = 0
```

Registers a “blit” to occur when garbage collection starts and ends. When garbage collection starts, *on* is drawn at location *x* and *y* within *canvas*, if *canvas* is shown. When garbage collection ends, the drawing is reverted. On some platforms, the drawing is reverted by drawing the *off* bitmap and on some platforms the drawing is reverted automatically, without a need for the *off* bitmap.

The background behind *on* may or may not be the usual contents of the *canvas*, so *on* should be a solid image. Neither the canvas’s scale nor its scroll position is applied when drawing the bitmaps. Only the portion of *on* within *w* and *h* pixels is used; if *on-x* and *on-y* are specified, they specify an offset within the bitmap that is used for drawing; similarly *off-x* and *off-y* specify an offset within *off*.

The blit is automatically unregistered if *canvas* becomes invisible and inaccessible. Multiple registrations can be installed for the same *canvas*.

See also unregister-collecting-blit.

```
(unregister-collecting-blit canvas) → void?
  canvas : (is-a?/c canvas%)
```

Unregisters all blit requests installed for *canvas* with register-collecting-blit.

```
(send-message-to-window x y message) → any/c
  x : position-integer?
  y : position-integer?
  message : any/c
```

Finds the frontmost top-level window at (*x*, *y*) in global coordinates. If a window is there, this function calls the window's `on-message` method, providing *message* as the method's argument; the result of the function call is the result returned by the method. If no Racket window is at the given coordinates, or if it is covered by a non-Racket window at (*x*, *y*), `#f` is returned.

```
(spacing-integer? v) → boolean?
  v : any/c
```

Equivalent to `(integer-in 0 1000)`.

```
(system-position-ok-before-cancel?) → boolean?
```

Returns `#t` on Windows—indicating that a dialog with OK and Cancel buttons should place the OK button on to left of the Cancel button—and returns `#f` on Mac OS and Unix.

```
the-clipboard : (is-a?/c clipboard<%>)
```

See `clipboard<%>`.

```
the-x-selection-clipboard : (is-a?/c clipboard<%>)
```

See `clipboard<%>`.

```
(label-string? v) → boolean?
  v : any/c
```

Returns `#t` if *v* is a string whose length is less than or equal to `200`.

This predicate is typically used as the contract for strings that appear in GUI objects. In some cases, such as the label in a `button%` or `menu-item%` object, the character `&` is treated specially to indicate that the following character is used in keyboard navigation. See `set-label` in `labelled-menu-item<%>` for one such example. In other cases, such as the label on a `frame%`, `&` is not treated specially.

```
(key-code-symbol? v) → boolean?
  v : any/c
```

Returns `#t` if the argument is a symbol that can be returned by `key-event%`'s method `get-key-code`.

5 Editors

The editor toolbox provides a foundation for two common kinds of applications:

- *Programs that need a sophisticated text editor* — The simple text field control is inadequate for text-intensive applications. Many programs need editors that can handle multiple fonts and non-text items.
- *Programs that need a canvas with dragable objects* — The drawing toolbox provides a generic drawing surface for plotting lines and boxes, but many applications need an interactive canvas, where the user can drag and resize individual objects.

Both kinds of applications need an extensible editor that can handle text, images, programmer-defined items, and even embedded editors. The difference between them is the layout of items. The editor toolbox therefore provides two kinds of editors via two classes:

- `text%` — in a *text editor*, items are automatically positioned in a paragraph flow.
- `pasteboard%` — in a *pasteboard editor*, items are explicitly positioned and dragable.

This editor architecture addresses the full range of real-world issues for an editor—including cut-and-paste, extensible file formats, and layered text styles—while supporting a high level of extensibility. Unfortunately, the system is fairly complex as a result, and using the editor classes effectively requires a solid understanding of the structure and terminology of the editor toolbox. Nevertheless, enough applications fit one (or both) of the descriptions above to justify the depth and complexity of the toolbox and the learning investment required to use it.

A brief example illustrates how editors work. To start, an editor needs an `editor-canvas%` to display its contents. Then, we can create a text editor and install it into the canvas:

```
(define f (new frame% [label "Simple Edit"]
                      [width 200]
                      [height 200]))
(define c (new editor-canvas% [parent f]))
(define t (new text%))
(send c set-editor t)
(send f show #t)
```

At this point, the editor is fully functional: the user can type text into the editor, but no cut-and-paste or undo operations are available. We can support all of the standard operations on an editor via the menu bar:

```
(define mb (new menu-bar% [parent f]))
```

```
(define m-edit (new menu% [label "Edit"] [parent mb]))
(define m-font (new menu% [label "Font"] [parent mb]))
(append-editor-operation-menu-items m-edit #f)
(append-editor-font-menu-items m-font)
(send t set-max-undo-history 100)
```

Now, the standard cut-and-paste operations work and so does undo, and the user can even set font styles. The editor is created with no undo history stack, `set-max-undo-history` is used to set a non-zero stack, so undo operations can be recorded. The user can also insert an embedded editor by selecting Insert Text from the Edit menu; after selecting the menu item, a box appears in the editor with the caret inside. Typing with the caret in the box stretches the box as text is added, and font operations apply wherever the caret is active. Text on the outside of the box is rearranged as the box changes sizes. Note that the box itself can be copied and pasted.

The content of an editor is made up of *snips*. An embedded editor is a single snip from the embedding editor's point-of-view. To encode immediate text, a snip can be a single character, but more often a snip is a sequence of adjacent characters on the same line. The `find-snip` method extracts a snip from a text editor:

```
(send t find-snip 0 'after)
```

The above expression returns the first snip in the editor, which may be a string snip (for immediate text) or an editor snip (for an embedded editor).

An editor is not permanently attached to any display. We can take the text editor out of our canvas and put a pasteboard editor in the canvas, instead:

```
(define pb (new pasteboard%))
(send c set-editor pb)
```

With the pasteboard editor installed, the user can no longer type characters directly into the editor (because a pasteboard does not support directly entered text). However, the user can cut text from elsewhere and paste it into pasteboard, or select one of the Insert menu items in the Edit menu. Snips are clearly identifiable in a pasteboard editor (unlike a text editor) because each snip is separately dragable.

We can insert the old text editor (which we recently removed from the canvas) as an embedded editor in the pasteboard by explicitly creating an editor snip:

```
(define s (make-object editor-snip% t)) ; t is the old text editor
(send pb insert s)
```

An individual snip cannot be inserted into different editors at the same time, or inserted multiple times in the same editor:

```
(send pb insert s) ; no effect
```

However, we can make a deep copy of the snip and insert the copy into the pasteboard:

```
(send pb insert (send s copy))
```

Applications that use the editor classes typically derive new versions of the `text%` and `pasteboard%` classes. For example, to implement an append-only editor (which allows insertions only at the end and never allows deletions), derive a new class from `text%` and override the `can-insert?` and `can-delete?` methods:

```
(define append-only-text%
  (class text%
    (inherit last-position)
    (define/augment (can-insert? s l) (= s (last-position)))
    (define/augment (can-delete? s l) #f)
    (super-new)))
```

5.1 Editor Structure and Terminology

The editor toolbox supports extensible and nestable editors by decomposing an editor assembly into three functional parts:

- The *editor* itself stores the state of the text or pasteboard and handles most events and editing operations. The `editor<%>` interface defines the core editor functionality, but editors are created as instances of `text%` or `pasteboard%`.
- A *snip* is a segment of information within the editor. Each snip can contain a sequence of characters, a picture, or an interactive object (such as an embedded editor). In a text editor, snips are constrained to fit on a single line and generally contain data of a single type. The `snip%` class implements a basic snip and serves as the base for implementing new snips; see §5.4 “Implementing New Snips”. Other snip classes include `string-snip%` for managing text, `image-snip%` for managing pictures, and `editor-snip%` for managing embedded editors.
- A *display* presents the editor on the screen. The display lets the user scroll around an editor or change editors. Most displays are instances of the `editor-canvas%` class, but the `editor-snip%` class also acts as a display for embedded editors.

These three parts are illustrated by a simple word processor. The editor corresponds to the text document. The editor object receives keyboard and mouse commands for editing the text. The text itself is distributed among snips. Each character could be a separate snip, or multiple characters on a single line could be grouped together into a snip. The display

roughly corresponds to the window in which the text is displayed. While the editor manages the arrangement of the text as it is displayed into a window, the display determines which window to draw into and which part of the editor to display.

Each selectable entity in an editor is an *item*. In a pasteboard, all selection and dragging operations work on snips, so there is a one-to-one correspondence between snips and items. In an editor, one snip contains one or more consecutive items, and every item belongs to some snip. For example, in a simple text editor, each character is an item, but multiple adjacent characters may be grouped into a single snip. The number of items in a snip is the snip's *count*.

Each place where the insertion point can appear in a text editor is a *position*. A text editor with n items contains $n+1$ positions: one position before each item, and one position after the last item.

The order of snips within a pasteboard determines each snip's drawing plane. When two snips overlap within the pasteboard, the snip that is earlier in the order is in front of the other snip (i.e., the former is drawn after the latter, such that the former snip may cover part of the latter snip).

When an editor is drawn into a display, each snip and position has a *location*. The location of a position or snip is specified in coordinates relative to the top-left corner of the editor. Locations in an editor are only meaningful when the editor is displayed.

5.1.1 Characters and Graphemes

An item corresponds to a Racket character in an editor with text. Some things that a user would perceive as a character are composed of multiple Racket characters, however, such as a pirate-flag emoji (which uses a four-character encoding) or "e" plus an accent modifier (which also has a single character representation, but might be represented through those two characters). A *grapheme* is an approximation to a user-perceived character as defined by the Unicode grapheme-cluster specification. Racket provides support for graphemes though functions like `string-grapheme-count` and `char-grapheme-step`.

Working with graphemes in a text editor requires extra care. Methods like `grapheme-position` in `text%` and `position-grapheme` in `text%` convert between item and grapheme indices, but most operations are based in item positions, and they are generally not constrained to preserve grapheme-cluster sequences. A grapheme cluster that is within a single snip will render as a single grapheme, but a grapheme cluster that spans a snip boundary will be rendered as two partial graphemes. The `insert` in `text%` method takes optional arguments to trigger the detection of grapheme sequences that would span the existing and inserted content and ensure that the sequences are kept together.

A small number of `text%` methods are grapheme-sensitive by default: `delete`, `insert` of a character, and `move-position`.

5.1.2 Administrators

Two extra layers of administration manage the display-editor and editor-snip connections. An editor never communicates directly with a display; instead, it always communicates with an *editor administrator*, an instance of the `editor-admin%` class, which relays information to the display. Similarly, a snip communicates with a *snip administrator*, an instance of the `snip-admin%` class.

The administrative layers make the editor hierarchy flexible without forcing every part of an editor assembly to contain the functionality of several parts. For example, a text editor can be a single item within another editor; without administrators, the `text%` class would also have to contain all the functionality of a display (for the containing editor) and a snip (for the embedded editor). Using administrators, an editor class can serve as both a containing and an embedded editor without directly implementing the display and snip functionality.

A snip belongs to at most one editor via a single administrator. An editor also has only one administrator at a time. However, the administrator that connects the editor to the standard display (i.e., an editor canvas) can work with other such administrators. In particular, the administrator of an `editor-canvas%` (each one has its own administrator) can work with other `editor-canvas%` administrators, allowing an editor to be displayed in multiple `editor-canvas%` windows at the same time.

When an editor is displayed by multiple canvases, one of the canvases' administrators is used as the editor's primary administrator. To handle user and update events for other canvases, the editor's administrator is temporarily changed and then restored through the editor's `set-admin` method. The return value of the editor's `get-admin` method thus depends on the context of the call.

5.1.3 Styles

A *style*, an instance of the `style<%>` interface, parameterizes high-level display information that is common to all snip classes. This includes the font, color, and alignment for drawing the item. A single style is attached to each snip.

Styles are hierarchical: each style is defined in terms of another style. There is a single *root style*, named `"Basic"`, from which all other styles in an editor are derived. The difference between a base style and each of its derived style is encoded in a *style delta* (or simply *delta*). A delta encodes changes such as

- change the font family to *X*;
- enlarge the font by adding *Y* to the point size;
- toggle the boldness of the font; or

- change everything to match the style description *Z*.

Style objects are never created separately; rather, they are always created through a *style list*, an instance of the `style-list%` class. A style list manages the styles, servicing external requests to find a particular style, and it manages the hierarchical relationship between styles. A global style list is available, `the-style-list`, but new style lists can be created for managing separate style hierarchies. For example, each editor will typically have its own style list.

Each new style is defined in one of two ways:

- A *derived style* is defined in terms of a base style and a delta. Every style (except for the root style) has a base style, even if it does not depend on the base style in any way (i.e., the delta describes a fixed style rather than extensions to an existing style). (This is the usual kind of style inheritance, as found in word processors such as Microsoft Word.)
- A *join style* is defined in terms of two other styles: a base style and a *shift style*. The meaning of a join style is determined by reinterpreting the shift style; in the reinterpretation, the base style is used as the *root* style for the shift style. (This is analogous to multi-level styles, like the paragraph and character styles in FrameMaker. In this analogy, the paragraph style is the base style, and the character style is the shift style. However, FrameMaker allows only those two levels; with join styles support any number of levels.)

Usually, when text is inserted into a text editor, it inherits the style of the preceding snip. If text is inserted into an empty editor, the text is usually assigned a style called `"Standard"`. By default, the `"Standard"` style is unmodified from the root style. The default style name can be changed by overriding `default-style-name`.

The exception to the above is when `change-style` in `text%` is called with the current selection position (when the selection is a position and not a range). In that case, the style is remembered, and if the next editor-modifying action is a text insertion, the inserted text gets the remembered style.

See `get-styles-sticky` in `text%` for more information about the style of inserted text.

5.2 File Format

To allow editor content to be saved to a file, the editor classes implement a special file format called *WXME*. (The format is used when cutting and pasting between applications or eventspaces, too). The file format is not documented, except that it begins `WXME01`⟨*digit*⟩⟨*digit*⟩ `##` . Otherwise, the `load-file` and `save-file` methods define the

format internally. The file format is the same for text and pasteboard editors. When a pasteboard saves its content to a file, it saves the snips from front to back, and also includes extra location information. The wxme library provides utilities for manipulating WXME files.

Editor data is read and written using editor-stream-in% and editor-stream-out% objects. Editor information can only be read from or written to one stream at a time. To write one or more editors to a stream, first call the function write-editor-global-header to write initialization data into an output stream. When all editors are written to the stream, call write-editor-global-footer. Similarly, reading editors from a stream is initialized with read-editor-global-header and finalized with read-editor-global-footer. Optionally, to support streams that span versions of Racket, use write-editor-version and read-editor-version before the header operations.

The editor file data format can be embedded within another file, and it can be extended with new kinds of data. The editor file format can be extended in two ways: with snip- or content-specific data, and with editor-specific global data. These are described in the remainder of this section.

5.2.1 Encoding Snips

The generalized notion of a snip allows new snip types to be defined and immediately used in any editor class. Also, when two applications support the same kinds of snips, snip data can easily be cut and pasted between them, and the same data files will be readable by each program. This interoperability is due to a consistent encoding mechanism that is built into the snip system.

Graceful and extensible encoding of snips requires that two issues are addressed:

- The encoding function for a snip can be associated with the snip itself. To convert a snip from an encoded representation (e.g., as bytes in a file) to a memory object, a decoding function must be provided for each type of snip. Furthermore, a list of such decoders must be available to the high-level decoding process. This decoding mapping is defined by associating a *snip class* object to every snip. A snip class is an instance of the snip-class% class.

- Some editors may require additional information to be stored about a snip; this information is orthogonal to the type-specific information stored by the snip itself. For example, a pasteboard needs to remember a snip's location, while a text editor does not need this information. If data is being cut and pasted from one pasteboard to another, then information about relative locations needs to be maintained, but this information should not inhibit pasting into an editor. Extra data is associated with a snip through *editor data* objects, which are instances of the editor-data% class; decoding requires that each editor data object has an *editor data class*, which is an instance of the editor-data-class% class.

Snip classes, snip data, and snip data classes solve problems related to encoding and decoding snips. In an application that has no need for saving files or cut-and-paste, these issues can be safely ignored.

Snip Classes

Each snip can be associated to a snip class. This "class" is not a class description in the programmer's language; it is an object which provides a way to create new snips of the appropriate type from an encoded snip specification.

Snip class objects can be added to the eventspace-specific *snip class list*, which is returned by `get-the-snip-class-list`. When a snip is encoded, the snip's class name is associated with the encoding; when the snip needs to be decoded, then the snip class list is searched by name to find the snip's class. The snip class will then provide a decoding function that can create a new snip from the encoding.

If a snip class's name is of the form `"((lib ...) (lib ...))"`, then the snip class implementation can be loaded on demand. The name is parsed using `read`; if the result has the form `((lib` *`string`* `...) (lib` *`string`* `...))`, then the first element used with `dynamic-require` along with `'snip-class`. If the `dynamic-require` result is a `snip-class%` object, then it is inserted into the current eventspace's snip class list, and loading or saving continues using the new class.

The second `lib` form in `"((lib ...) (lib ...))"` supplies a reader for a text-only version of the snip. See §9.1 "Snip Class Mapping" for more information on how such snip-classes work (and generally see the `wxme` library).

A snip class's name can also be just `"(lib ...)"`, which is used like the first part of the two-`lib` form. However, this form provides no information for the text-only `wxme` reader.

For an example snip implementation and its associated snip-class implementation, see §5.4 "Implementing New Snips".

Editor Data

While a snip belongs to an editor, the editor may store extra information about a snip in some specialized way. When the snip is to be encoded, this extra information needs to be put into an editor data object so that the extra information can be encoded as well. In a text editor, extra information can be associated with ranges of items, as well as snips.

Just as a snip must be associated with a snip class to be decoded (see §5.2.1.1 "Snip Classes"), an editor data object needs an editor data class for decoding. Every editor data class object can be added to the eventspace-specific *editor data class list*, returned by `get-the-editor-data-class-list`. Alternatively, like snip classes (see §5.2.1.1 "Snip Classes"), editor data class names can use the form `"((lib ...) (lib ...))"` to enable on-demand loading. The corresponding module should export an `editor-data-class%` object named `'editor-data-class`.

To store and load information about a snip or region in an editor:

- derive new classes from editor-data% and editor-data-class%.
- derive a new class from the text% or pasteboard% class, and override the get-snip-data and set-snip-data methods and/or the get-region-data and set-region-data methods.

  Note: the get-region-data and set-region-data methods are called for cut-and-paste encoding, but not for file-saving encoding; see §5.2.2 "Global Data: Headers and Footers" for information on extending the file format.

5.2.2 Global Data: Headers and Footers

The editor file format provides for adding extra global data in special header and footer sections. To save and load special header and/or footer records:

- Pick a name for each header/footer record. This name should not conflict with any other header/footer record name in use, and no one else should use these names. All names beginning with "wx" are reserved for internal use. By tagging extra header and footer records with a unique name, the file can be safely loaded in an installation that does not support the records.
- Derive a new class from the text% or pasteboard% class, and override the write-headers-to-file, write-footers-to-file, read-header-from-file and/or read-footer-from-file methods.

When an editor is saved, the methods write-headers-to-file and write-footers-to-file are invoked; at this time, the derived text% or pasteboard% object has a chance to save records. To write a header/footer record, first invoke the begin-write-header-footer-to-file method, at which point the record name is provided. Once the record is written, call end-write-header-footer-to-file.

When an editor is loaded and a header/footer record is encountered, the read-header-from-file or read-footer-from-file method is invoked, with the record name as the argument. If the name matches a known record type, then the data can be loaded.

See also write-headers-to-file and read-header-from-file.

5.3 End of Line Ambiguity

Because an editor can force a line break even when there is no newline item, a position alone does not always specify a location for the caret. Consider the last position of a line that is

soft-broken (i.e., no newline is present): there is no item between the last item of the line and the first item of the next line, so two locations (one end-of-line and one start-of-line) map to the same position.

For this reason, position-setting and position-getting methods often have an extra argument. In the case of a position-setting method, the argument specifies whether the caret should be drawn at the left or right side of the page (in the event that the location is doubly defined); `#t` means that the caret should be drawn on the right side. Similarly, methods which calculate a position from a location will take an extra boxed boolean; the box is filled with `#t` if the position is ambiguous and it came from a right-side location, or `#f` otherwise.

5.4 Implementing New Snips

To support new kinds of content within an editor, derive a subclass of `snip%` to implement a new kind of snip. In deriving a new snip implementation, the following methods of `snip%` must be overridden to create a useful snip:

- `get-extent`
- `draw`
- `copy`
- `resize` if the snip can be resized by the user
- `partial-offset` if the snip can contain more than one item
- `split` if the snip can contain more than one item
- `size-cache-invalid` if the snip caches the result to `get-extent`
- `get-text` (not required)
- `find-scroll-step`, `get-num-scroll-steps`, and `get-scroll-step-offset` if the snip can contain more than one scroll position
- `set-unmodified` if the snip's internal state can be modified by the user, and call `modified` in the snip's administrator when the state changes the first time

If a snip can contain more than one item, then the snip's count must be maintained as well.

To define a class of snips that can be saved or cut-and-pasted (see also §5.2.1.1 "Snip Classes"):

- Create an instance of `snip-class%`, implementing the `read` method. Export the `snip-class%` instance as `snip-class` from a module, and use a classname of the form `"(lib ...)"` as described in §5.2.1.1 "Snip Classes".

- For each instance of the snip class, set the snip's class object with set-snipclass.
- Override the copy method.
- Override the write method.

In deriving a new snip-class% class:

- Set the classname using set-classname.
- Set the version using set-version.
- Install the class into the list returned by get-the-snip-class-list using the add method. Note that if the same name is inserted into the same class list multiple times, all but the first insertion is ignored.

To define a class of snips that read specially with open-input-text-editor:

- Make your snip% class implement readable-snip<%>.
- Implement the read-special method.

As an example, the following module implements a snip that draws a circle. Clicking on the snip causes the circle to grow. To enable copying an instance of the snip from one program/eventspace to another, the module should be "main.rkt" a "circle-snip" directory that is installed as a "circle-snip" package. The snip also has a wxme reader implementation following it that must be installed as the file "wxme-circle-snip.rkt" in the "circle-snip" directory.

```
#lang racket/base
(require racket/class
         racket/snip
         racket/format)

(provide circle-snip%
         (rename-out [circle-snip-class snip-class]))

(define circle-snip%
  (class snip%
    (inherit set-snipclass
             get-flags set-flags
             get-admin)
    (init-field [size 20.0])

    (super-new)
```

```
      (set-snipclass circle-snip-class)
      (send (get-the-snip-class-list) add circle-snip-class)
      (set-flags (cons 'handles-events (get-flags)))

      (define/override (get-extent dc x y
                                   [w #f]
                                   [h #f]
                                   [descent #f]
                                   [space #f]
                                   [lspace #f]
                                   [rspace #f])
        (define (maybe-set-box! b v) (when b (set-box! b v)))
        (maybe-set-box! w (+ 2.0 size))
        (maybe-set-box! h (+ 2.0 size))
        (maybe-set-box! descent 1.0)
        (maybe-set-box! space 1.0)
        (maybe-set-box! lspace 1.0)
        (maybe-set-box! rspace 1.0))

      (define/override (draw dc x y left top right bottom dx dy draw-
caret)
        (send dc draw-ellipse (+ x 1.0) (+ y 1.0) size size))

      (define/override (copy)
        (new circle-snip% [size size]))

      (define/override (write f)
        (send f put size))

      (define/override (on-event dc x y editorx editory e)
        (when (send e button-down?)
          (set! size (+ 1.0 size))
          (define admin (get-admin))
          (when admin
            (send admin resized this #t))))))

  (define circle-snip-class%
    (class snip-class%
      (inherit set-classname)

      (super-new)
      (set-classname (~s '((lib "main.rkt" "circle-snip")
                           (lib "wxme-circle-snip.rkt" "circle-
snip"))))

      (define/override (read f)
```

```
      (define size-b (box 0.0))
      (send f get size-b)
      (new circle-snip% [size (unbox size-b)])))))

(define circle-snip-class (new circle-snip-class%))
```

This is the "wxme-circle-snip.rkt" file:

```
#lang racket/base
(require racket/class
         racket/format
         wxme
         pict)

(provide reader)

(define circle-reader%
  (class* object% (snip-reader<%>)
    (define/public (read-header version stream) (void))
    (define/public (read-snip text-only? version stream)
      (define size (send stream read-inexact "circle-snip"))
      (cond
        [text-only?
         (string->bytes/utf-8 (~s `(circle ,size)))]
        [else
         (new circle-readable [size size])]))
    (super-new)))

(define circle-readable
  (class* object% (readable<%>)
    (init-field size)
    (define/public (read-special source line column position)
      ;; construct a syntax object holding a 3d value that
      ;; is a circle from the pict library with an appropriate
      ;; source location
      (datum->syntax #f
                     (circle size)
                     (vector source line column position 1)
                     #f))
    (super-new)))

(define reader (new circle-reader%))
```

5.5 Flattened Text

In plain text editors, there is a simple correlation between positions and characters. In an `editor<%>` object, this is not true much of the time, but it is still sometimes useful to just "get the text" of an editor.

Text can be extracted from an editor in either of two forms:

- *Simple text*, where there is one character per item. Items that are characters are mapped to themselves, and all other items are mapped to a period. Line breaks are represented by newline characters (ASCII 10).
- *Flattened text*, where each item can map to an arbitrary string. Items that are characters are still mapped to themselves, but more complicated items can be represented with a useful string determined by the item's snip. Newlines are mapped to platform-specific character sequences (linefeed on Unix and Mac OS, and linefeed–carriage return on Windows). This form is called "flattened" because the editor's items have been reduced to a linear sequence of characters.

5.6 Caret Ownership

Within a frame, only one object can contain the keyboard focus. This property must be maintained when a frame contains multiple editors in multiple displays, and when a single editor contains other editors as items.

When an editor has the keyboard focus, it will usually display the current selection or a line indicating the insertion point; the line is called the *caret*.

When an editor contains other editors, it keeps track of caret ownership among the contained sub-editors. When the caret is taken away from the main editor, it will revoke caret ownership from the appropriate sub-editor.

When an editor or snip is drawn, an argument to the drawing method specifies whether the caret should be drawn with the data or whether a selection spans the data. This argument can be any of:

- `'no-caret` — The caret should not be drawn at all.
- `'show-inactive-caret` — The caret should be drawn as inactive; items may be identified as the local current selection, but the keyboard focus is elsewhere.
- `'show-caret` — The caret should be drawn to show keyboard focus ownership.
- `(cons start end)` — The caret is owned by an enclosing region, and its selection spans the current editor or snip; in the case of the snip, the selection spans elements *start* through *end* positions within the snip.

The 'show-inactive-caret display mode is useful for showing selection ranges in text editors that do not have the focus. This 'show-inactive-caret mode is distinct from 'no-caret mode; when editors are embedded, only the locally active editor shows its selection.

5.7 Cut and Paste Time Stamps

Methods of editor<%> that use the clipboard — including copy, cut, paste, and do-edit-operation — consume a time stamp argument. This time stamp is generally extracted from the mouse-event% or key-event% object that triggered the clipboard action. Unix uses the time stamp to synchronize clipboard operations among the clipboard clients.

All instances of event% include a time stamp, which can be obtained using get-time-stamp.

If the time stamp is 0, it defaults to the current time. Using 0 as the time stamp almost always works fine, but it is considered bad manners on Unix.

5.8 Clickbacks

Clickbacks in a text% editor facilitate the creation of simple interactive objects, such as hypertext. A clickback is defined by associating a callback function with a range of items in the editor. When a user clicks on the items in that range, the callback function is invoked. For example, a hypertext clickback would associate a range to a callback function that changes the selection range in the editor.

By default, the callback function is invoked when the user releases the mouse button. The set-clickback method accepts an optional argument that causes the callback function to be invoked on the button press, instead. This behavior is useful, for example, for a clickback that creates a popup menu.

Note that there is no attempt to save clickback information when a file is saved, since a clickback will have an arbitrary procedure associated with it.

5.9 Internal Editor Locks

Instances of editor<%> have three levels of internal locking:

- write locking — When an editor is internally locked for writing, the abstract content of the editor cannot be changed (e.g., insertion attempts fail silently). However, snips in a text editor can still be split and merged, and the text editor can be changed in

ways that affect the flow of lines. The `locked-for-write?` method reports whether an editor is currently locked for writing.

- flow locking — When a text editor is internally locked for reflowing, it is locked for writing, the snip content of the editor cannot change, the location of a snip cannot be computed if it is not already known (see `locations-computed?` in `editor<%>`), and the editor cannot be drawn to a display. A request for uncomputed location information during a flow lock produces undefined results. The `locked-for-flow?` method reports whether an editor is currently locked for flowing.
- read locking — When an editor is internally locked for reading, no operations can be performed on the editor (e.g., a request for the current selection position returns an undefined value). This extreme state is used only during callbacks to its snips for setting the snip's administrator, splitting the snip, or merging snips. The `locked-for-read?` method reports whether an editor is currently locked for reading.

The internal lock for an editor is *not* affected by calls to `lock`.

Methods that report location-independent information about an editor never trigger a lock. A method that reports location information may trigger a flow lock or write lock if the relevant information has not been computed since the last modification to the editor (see `locations-computed?` in `editor<%>`). A method that modifies the editor in any way, even setting the selection position, can trigger a read lock, flow lock, or write lock.

5.10 Editors and Threads

An editor is not tied to any particular thread or eventspace, except to the degree that it is displayed in a canvas (which has an eventspace). Concurrent access of an editor is always safe in the weak sense that the editor will not become corrupted. However, because editor access can trigger locks, concurrent access can produce contract failures or unexpected results.

An editor supports certain concurrent patterns reliably. One relevant pattern is updating an editor in one thread while the editor is displayed in a canvas that is managed by a different (handler) thread. To ensure that canvas refreshes are not performed while the editor is locked for flowing, and to ensure that refreshes do not prevent editor modifications, the following are guaranteed:

- When an editor's `refresh` method is called during an *edit sequence* (which is started by `begin-edit-sequence` and ended with `end-edit-sequence`), the requested refresh region is recorded, but the refresh is not performed. Instead, the refresh is delayed until the end of the edit sequence.
- Attempting to start an edit sequence while a refresh is in progress blocks until the refresh is complete.

- The `on-display-size-when-ready` method calls `on-display-size` only when the editor is not being refreshed and only when an edit sequence is not in progress. In the first case, the `on-display-size` call is delegated to the refreshing thread to be called after the refresh completes. In the second case, the `on-display-size` call is delegated to the edit-sequence thread, to be called when the edit sequence is complete.

Thus, disabling an `editor-canvas%` object (using `enable`) is sufficient to ensure that a background thread can modify an editor displayed by the canvas, as long as all modifications are in edit sequences. The background modifications will impair canvas refreshes minimally and temporarily, and refreshes will not impair modifications in the background thread.

A second supported pattern is reading an editor in a background thread while the editor may be manipulated in other threads. Since no location-independent reads introduce locks, such reads in the background thread will not impair other threads. However, other threads may interfere with the background thread, causing it to receive erroneous or out-of-date content information. This one-sided guarantee is useful if the background thread's work can be discarded when the editor is modified.

6 Snip and Style Classes

```
(require racket/snip)
```
package: snip-lib

The racket/snip collection provides the core snip and style classes *without* depending on racket/gui/base. This separation enables libraries that can cooperate with an editor while also working in contexts that do not have a GUI.

Snips and Administrators:

```
snip%                    readable-snip<%>
 |- string-snip%
 |    |- tab-snip%
 |- image-snip%
 |- editor-snip% (not provided by racket/snip)
snip-admin%
```

Snip Lists:

```
snip-class%
snip-class-list<%>
```

Styles:

```
style<%>          style-delta%       add-color<%>
style-list%                          mult-color<%>
```

Alphabetical:

6.1 add-color<%>

```
add-color<%> : interface?
```

An add-color<%> object is used to additively change the RGB values of a color% object. An add-color<%> object only exists within a style-delta% object.

See also get-foreground-add and get-background-add.

```
(send an-add-color get r g b [a]) → void?
  r : (box/c (integer-in -1000 1000))
  g : (box/c (integer-in -1000 1000))
  b : (box/c (integer-in -1000 1000))
  a : (or/c (box/c real?) #f) = #f
```

Gets all of the additive values.

The *r* box is filled with the additive value for the red component of the color. The *g* box is filled with the additive value for the green component of the color. The *b* box is filled with the additive value for the blue component of the color. The a box is filled with the additive value for the alpha component of the color, unless a is #f.

Changed in version 1.63 of package snip-lib: Added the a optional argument.

```
(send an-add-color get-a) → real?
```

Gets the additive value for the alpha component of the color.

Added in version 1.63 of package snip-lib.

```
(send an-add-color get-b) → (integer-in -1000 1000)
```

Gets the additive value for the blue component of the color.

```
(send an-add-color get-g) → (integer-in -1000 1000)
```

Gets the additive value for the green component of the color.

```
(send an-add-color get-r) → (integer-in -1000 1000)
```

Gets the additive value for the red component of the color.

```
(send an-add-color set r g b [a]) → void?
  r : (integer-in -1000 1000)
  g : (integer-in -1000 1000)
  b : (integer-in -1000 1000)
  a : real? = 0.0
```

Sets all of the additive values.

Changed in version 1.63 of package snip-lib: Added the a optional argument.

```
(send an-add-color set-a v) → void?
  v : real?
```

Sets the additive value for the alpha component of the color.

Added in version 1.63 of package snip-lib.

```
(send an-add-color set-b v) → void?
  v : (integer-in -1000 1000)
```

Sets the additive value for the blue component of the color.

```
(send an-add-color set-g v) → void?
  v : (integer-in -1000 1000)
```

Sets the additive value for the green component of the color.

```
(send an-add-color set-r v) → void?
  v : (integer-in -1000 1000)
```

Sets the additive value for the red component of the color.

6.2 image-snip%

```
image-snip% : class?
  superclass: snip%
```

An image-snip% is a snip that can display bitmap images (usually loaded from a file). When the image file cannot be found, a box containing an "X" is drawn.

```
(make-object image-snip% [file
                          kind
                          relative-path?
                          inline?
                          backing-scale])
 → (is-a?/c image-snip%)
  file : (or/c path-string? input-port? #f) = #f
  kind : (or/c 'unknown 'unknown/mask 'unknown/alpha = 'unknown
               'gif 'gif/mask 'gif/alpha
               'jpeg 'png 'png/mask 'png/alpha
               'xbm 'xpm 'bmp 'pict)
  relative-path? : any/c = #f
  inline? : any/c = #t
  backing-scale : (>/c 0.0) = 1.0
(make-object image-snip% bitmap [mask]) → (is-a?/c image-snip%)
  bitmap : (is-a?/c bitmap%)
  mask : (or/c (is-a?/c bitmap%) #f) = #f
```

Creates an image snip, loading the image *file* if specified (see also load-file), or using the given *bitmap*.

Changed in version 1.1 of package snip-lib: Added the *backing-scale* argument.

```
(send an-image-snip equal-hash-code-of hash-code)
 → exact-integer?
  hash-code : (any/c . -> . exact-integer?)
```

Returns an integer that can be used as a equal?-based hash code for *an-image-snip* (using the same notion of equal? as other-equal-to?).

See also equal<%>.

```
(send an-image-snip equal-secondary-hash-code-of hash-code)
 → exact-integer?
  hash-code : (any/c . -> . exact-integer?)
```

Returns an integer that can be used as a equal?-based secondary hash code for *an-image-snip* (using the same notion of equal? as other-equal-to?).

See also equal<%>.

```
(send an-image-snip get-bitmap) → (or/c (is-a?/c bitmap%) #f)
```

Returns the bitmap that is displayed by the snip, whether set through set-bitmap or load-file. If no bitmap is displayed, the result is #f.

```
(send an-image-snip get-bitmap-mask)
 → (or/c (is-a?/c bitmap%) #f)
```

Returns the mask bitmap that is used for displaying by the snip, if one was installed with set-bitmap. If no mask is used, the result is #f.

```
(send an-image-snip get-filename [relative-path])
 → (or/c path-string? #f)
  relative-path : (or/c (box/c any/c) #f) = #f
```

Returns the name of the currently loaded, non-inlined file, or #f if a file is not loaded or if a file was loaded with inlining (the default).

The *relative-path* box is filled with #t if the loaded file's path is relative to the owning editor's path, unless *relative-path* is #f.

```
(send an-image-snip get-filetype)
 → (or/c 'unknown 'unknown/mask 'unknown/alpha
         'gif 'gif/mask 'gif/alpha
         'jpeg 'png 'png/mask 'png/alpha
         'xbm 'xpm 'bmp 'pict)
```

Returns the kind used to load the currently loaded, non-inlined file, or `'unknown` if a file is not loaded or if a file was loaded with inlining (the default).

```
(send an-image-snip load-file  file
                               [kind
                                relative-path?
                                inline?
                                backing-scale]) → void?
  file : (or/c path-string? input-port? #f)
  kind : (or/c 'unknown 'unknown/mask 'unknown/alpha = 'unknown
               'gif 'gif/mask 'gif/alpha
               'jpeg 'png 'png/mask 'png/alpha
               'xbm 'xpm 'bmp 'pict)
  relative-path? : any/c = #f
  inline? : any/c = #t
  backing-scale : (>/c 0.0) = 1.0
```

Loads the file by passing *file* and *kind* to `load-file` in `bitmap%`. If a bitmap had previously been specified with `set-bitmap`, that bitmap (and mask) will no longer be used. If *file* is `#f`, then the current image is cleared.

When `'unknown/mask`, `'gif/mask`, or `'png/mask` is specified and the loaded bitmap object includes a mask (see `get-loaded-mask`), the mask is used for drawing the bitmap (see `draw-bitmap`). The `'unknown/alpha`, `'gif/alpha`, or `'png/alpha` variants are recommended, however.

If *relative-path?* is not `#f` and *file* is a relative path, then the file will be read using the path of the owning editor's filename. If the image is not inlined, it will be saved as a relative pathname.

If *inline?* is not `#f`, the image data will be saved directly to the file or clipboard when the image is saved or copied (preserving the bitmap's mask, if any). The source filename and kind is no longer relevant.

Changed in version 1.1 of package `snip-lib`: Added the *backing-scale* argument.

```
(send an-image-snip other-equal-to? snip
                                    equal?) → boolean?
```

```
  snip : (is-a?/c snip%)
  equal? : (any/c any/c . -> . boolean?)
```

Returns #t if *an-image-snip* and *snip* both have bitmaps and the bitmaps are the same. If either has a mask bitmap with the same dimensions as the main bitmap, then the masks must be the same (or if only one mask is present, it must correspond to a solid mask).

The given *equal?* function (for recursive comparisons) is not used.

```
(send an-image-snip resize w h) → boolean?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Overrides resize in snip%.

The bitmap will be cropped to fit in the given dimensions.

```
(send an-image-snip set-bitmap bm [mask]) → void?
  bm : (is-a?/c bitmap%)
  mask : (or/c (is-a?/c bitmap%) #f) = #f
```

Sets the bitmap that is displayed by the snip.

An optional *mask* is used when drawing the bitmap (see draw-bitmap), but supplying the mask directly is deprecated. If no mask is supplied but the bitmap's get-loaded-mask method produces a bitmap of the same dimensions, it is used as the mask; furthermore, such a mask is saved with the snip when it is saved to a file or copied (whereas a directly supplied mask is not saved). Typically, however, *bm* instead should have an alpha channel instead of a separate mask bitmap.

```
(send an-image-snip set-offset dx dy) → void?
  dx : real?
  dy : real?
```

Sets a graphical offset for the bitmap within the image snip.

6.3 mult-color<%>

```
mult-color<%> : interface?
```

A mult-color<%> object is used to scale the RGB values of a color% object. A mult-color<%> object exist only within a style-delta% object.

See also get-foreground-mult and get-background-mult.

```
(send a-mult-color get r g b [a]) → void?
  r : (box/c real?)
  g : (box/c real?)
  b : (box/c real?)
  a : (or/c (box/c real?) #f) = #f
```

Gets all of the scaling values.

The r box is filled with the scaling value for the red component of the color. The g box is filled with the scaling value for the green component of the color. The b box is filled with the scaling value for the blue component of the color. The a box is filled with the scaling value for the alpha component of the color, unless a is #f.

Changed in version 1.63 of package snip-lib: Added the a optional argument.

```
(send a-mult-color get-a) → real?
```

Gets the multiplicative scaling value for the alpha component of the color.

Added in version 1.63 of package snip-lib.

```
(send a-mult-color get-b) → real?
```

Gets the multiplicative scaling value for the blue component of the color.

```
(send a-mult-color get-g) → real?
```

Gets the multiplicative scaling value for the green component of the color.

```
(send a-mult-color get-r) → real?
```

Gets the multiplicative scaling value for the red component of the color.

```
(send a-mult-color set r g b [a]) → void?
  r : real?
  g : real?
  b : real?
  a : real? = 1.0
```

Sets all of the scaling values.

Changed in version 1.63 of package `snip-lib`: Added the `a` optional argument.

```
(send a-mult-color set-a v) → void?
  v : real?
```

Sets the multiplicative scaling value for the alpha component of the color.

Added in version 1.63 of package `snip-lib`.

```
(send a-mult-color set-b v) → void?
  v : real?
```

Sets the multiplicative scaling value for the blue component of the color.

```
(send a-mult-color set-g v) → void?
  v : real?
```

Sets the multiplicative scaling value for the green component of the color.

```
(send a-mult-color set-r v) → void?
  v : real?
```

Sets the additive value for the red component of the color.

6.4 readable-snip<%>

```
readable-snip<%> : interface?
```

A `readable-snip<%>` object is treated specially by the port generated by `open-input-text-editor`: When a `readable-snip<%>` object is encountered for the input stream, its `read-special` method is called to generate the read result for the snip, which is returned from the port as a "special" value in the sense of `read-char-or-special`.

Since `read` and `read-syntax` build on `read-char-or-special`, a snip can implement `readable-snip<%>` so that it produces a whole S-expression or some other kind of value when `read` is used on a stream containing the snip.

```
(send a-readable-snip read-special source
                                  line
                                  column
                                  position) → any/c
  source : any/c
  line : (or/c exact-nonnegative-integer? #f)
  column : (or/c exact-nonnegative-integer? #f)
  position : (or/c exact-nonnegative-integer? #f)
```

The arguments are the same as the arguments to a procedure returned by a custom input port's *read-in*; see §13.1.9 "Custom Ports" for details. The result is also the same as the result from a *read-in*-produced procedure.

6.5 snip%

```
snip% : class?
  superclass: object%
  extends: equal<%>
```

A direct instance of snip% is uninteresting. Useful snips are defined by instantiating derived subclasses, but the snip% class defines the basic functionality. See §5.4 "Implementing New Snips" for more information about deriving a new snip class.

```
(new snip%) → (is-a?/c snip%)
```

Creates a plain snip of length 1 with the "Basic" style of the-style-list.

```
(send a-snip adjust-cursor dc
                           x
                           y
                           editorx
                           editory
                           event)
 → (or/c (is-a?/c cursor%) #f)
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  editorx : real?
  editory : real?
  event : (is-a?/c mouse-event%)
```

Specification: Called to determine the cursor image used when the cursor is moved over the

snip in an editor. If #f is returned, a default cursor is selected by the editor. (See adjust-cursor in editor<%> for more information.)

Default implementation: Returns #f.

```
(send a-snip blink-caret dc x y) → void?
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
```

Tells the snip to blink the selection caret. This method is called periodically when the snip's editor's display has the keyboard focus, and the snip has the editor-local focus.

The drawing context and snip's locations in drawing context coordinates are provided.

```
(send a-snip can-do-edit-operation?  op
                                     [recursive?]) → boolean?
  op : (or/c 'undo 'redo 'clear 'cut 'copy
             'paste 'kill 'select-all
             'insert-text-box 'insert-pasteboard-box
             'insert-image)
  recursive? : any/c = #t
```

See can-do-edit-operation? in editor<%>.

Called when the snip's editor's method is called, *recursive?* is not #f, and this snip owns the caret.

```
(send a-snip copy) → (is-a?/c snip%)
```

Creates and returns a copy of this snip. The copy method is responsible for copying this snip's style (as returned by get-style) to the new snip.

```
(send a-snip do-edit-operation  op
                                [recursive?
                                 time])      → void?
  op : (or/c 'undo 'redo 'clear 'cut 'copy
             'paste 'kill 'select-all
             'insert-text-box 'insert-pasteboard-box
             'insert-image)
  recursive? : any/c = #t
  time : exact-integer? = 0
```

See do-edit-operation in editor<%>.

Called when the snip's editor's method is called, *recursive?* is not #f, and this snip owns the caret.

```
(send a-snip draw dc
                  x
                  y
                  left
                  top
                  right
                  bottom
                  dx
                  dy
                  draw-caret) → void?
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  left : real?
  top : real?
  right : real?
  bottom : real?
  dx : real?
  dy : real?
  draw-caret : (or/c 'no-caret 'show-inactive-caret 'show-caret
                     (cons/c exact-nonnegative-integer?
                             exact-nonnegative-integer?))
```

Specification: Called (by an editor) to draw the snip into the given drawing context with the snip's top left corner at location (*x*, *y*) in DC coordinates.

The arguments *left*, *top*, *right*, and *bottom* define a clipping region (in DC coordinates) that the snip can use to optimize drawing, but it can also ignore these arguments.

The *dx* and *dy* argument provide numbers that can be subtracted from *x* and *y* to obtain the snip's location in editor coordinates (as opposed to DC coordinates, which are used for drawing).

See §5.6 "Caret Ownership" for information about *draw-caret*. When *draw-caret* is a pair, refrain from drawing a background for the selected region, and if (get-highlight-text-color) returns a color (instead of #f), use that color for drawing selected text and other selected foreground elements.

Before this method is called, the font, text color, and pen color for the snip's style will have been set in the drawing context. (The drawing context is *not* so configured for get-extent or partial-offset.) The draw method must not make any other assumptions about the state of the drawing context, except that the clipping region is already set to something appropriate. Before draw returns, it must restore any drawing context settings that it changes.

See also on-paint in editor<%>.

The snip's editor is usually internally locked for writing and reflowing when this method is called (see also §5.9 "Internal Editor Locks"), and it is normally in a refresh (see §5.10 "Editors and Threads").

Default implementation: Draws nothing.

```
(send a-snip equal-to? snip equal?) → boolean?
  snip : (is-a?/c snip%)
  equal? : (-> any/c any/c boolean?)
```

Specification: See equal<%>.

Default implementation: Calls the other-equal-to? method of *snip* (to simulate multi-method dispatch) in case *snip* provides a more specific equivalence comparison.

```
(send a-snip other-equal-to? that equal?) → boolean?
  that : (is-a?/c snip%)
  equal? : (-> any/c any/c boolean?)
```

Default implementation: Returns (eq? a-snip that).

```
(send a-snip equal-hash-code-of hash-code) → exact-integer?
  hash-code : (any/c . -> . exact-integer?)
```

Specification: See equal<%>.

Default implementation: Returns (eq-hash-code a-snip).

```
(send a-snip equal-secondary-hash-code-of hash-code)
 → exact-integer?
  hash-code : (any/c . -> . exact-integer?)
```

Specification: See equal<%>.

Default implementation: Returns 1.

```
(send a-snip find-scroll-step y) → exact-nonnegative-integer?
  y : real?
```

Specification: If a snip contains more than one vertical scroll step (see get-num-scroll-steps) then this method is called to find a scroll step offset for a given y-offset into the snip.

Default implementation: Returns 0.

```
(send a-snip get-admin) → (or/c (is-a?/c snip-admin%) #f)
```

Returns the administrator for this snip. (The administrator can be #f even if the snip is owned but not visible in the editor.)

```
(send a-snip get-count) → exact-nonnegative-integer?
```

Returns the snip's count (i.e., number of items within the snip).

```
(send a-snip get-grapheme-count) → exact-nonnegative-integer?
```

Returns the number of graphemes in the snip, which is usually the same result as get-count, but can be smaller with multiple consecutive items form a grapheme.

Added in version 1.4 of package `snip-lib`.

```
(send a-snip grapheme-position n) → exact-nonnegative-integer?
  n : exact-nonnegative-integer?
```

Returns the number of items in the snip that form the first *n* graphemes; or, equivalently, converts from an grapheme-based position to a item-based position.

When get-count is the same as get-grapheme-count, this method returns *n*.

Added in version 1.4 of package `snip-lib`.

```
(send a-snip get-extent  dc
                         x
                         y
                        [w
                         h
                         descent
                         space
                         lspace
                         rspace]) → void?
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  w : (or/c (box/c (and/c real? (not/c negative?))) #f) = #f
  h : (or/c (box/c (and/c real? (not/c negative?))) #f) = #f
```

```
descent : (or/c (box/c (and/c real? (not/c negative?))) #f)
        = #f
space : (or/c (box/c (and/c real? (not/c negative?))) #f) = #f
lspace : (or/c (box/c (and/c real? (not/c negative?))) #f)
       = #f
rspace : (or/c (box/c (and/c real? (not/c negative?))) #f)
       = #f
```

Specification: Calculates the snip's width, height, descent (amount of height which is drawn below the baseline), space (amount of height which is "filler" space at the top), and horizontal spaces (amount of width which is "filler" space at the left and right). Those values are returned by filling the `w`, `h`, `descent`, `space`, `lspace`, and `rspace` boxes.

This method is called by the snip's administrator; it is not normally called directly by others. To get the extent of a snip, use `get-snip-location` in `editor<%>` .

A drawing context is provided for the purpose of finding font sizes, but no drawing should occur. The `get-extent` and `partial-offset` methods must not make any assumptions about the state of the drawing context, except that it is scaled properly. In particular, the font for the snip's style is not automatically set in the drawing context before the method is called. (Many snips cache their size information, so automatically setting the font would be wasteful.) If `get-extent` or `partial-offset` changes the drawing context's setting, it must restore them before returning. However, the methods should not need to change the drawing context; only font settings can affect measurement results from a device context, and `get-text-extent` in `dc<%>` accepts a `font%` argument for sizing that overrides that device context's current font.

The snip's left and top locations are provided as `x` and `y` in editor coordinates, in case the snip's size depends on its location; the `x` and `y` arguments are usually ignored. In a text editor, the `y`-coordinate is the *line's* top location; the snip's actual top location is potentially undetermined until its height is known.

If a snip caches the result size for future replies, it should invalidate its cached size when `size-cache-invalid` is called (especially if the snip's size depends on any device context properties).

If a snip's size changes after receiving a call to `get-extent` and before receiving a call to `size-cache-invalid`, then the snip must notify its administrator of the size change, so that the administrator can recompute its derived size information. Notify the administrator of a size change by call its `resized` method.

The snip's editor is usually internally locked for writing and reflowing when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Fills in all boxes with `0.0`.

```
(send a-snip get-flags) → (listof symbol?)
```

Returns flags defining the behavior of the snip, a list of the following symbols:

- `'is-text` — this is a text snip derived from `string-snip%`; do not set this flag
- `'can-append` — this snip can be merged with another snip of the same type
- `'invisible` — an *invisible* snip that the user doesn't see, such as a newline
- `'hard-newline` — a newline must follow the snip
- `'newline` — a newline currently follows the snip; only an owning editor should set this flag
- `'handles-events` — this snip can handle keyboard and mouse events when it has the keyboard focus
- `'handles-all-mouse-events` — this snip can handle mouse events that touch the snip or that immediately follow an event that touches the snip, even if the snip does not have the keyboard focus (see also `on-goodbye-event`)
- `'handles-between-events` — this snip handles mouse events that are between items in the snip (instead of defaulting to treating mouse clicks as setting the position or other event handling that happens at the `text%` or `pasteboard%` level)
- `'width-depends-on-x` — this snip's display width depends on the snip's x-location within the editor; e.g.: tab
- `'height-depends-on-y` — this snip's display height depends on the snip's y-location within the editor
- `'width-depends-on-y` — this snip's display width depends on the snip's y-location within the editor
- `'height-depends-on-x` — this snip's display height depends on the snip's x-location within the editor
- `'uses-editor-path` — this snip uses its editor's pathname and should be notified when the name changes; notification is given as a redundant call to `set-admin`

```
(send a-snip get-num-scroll-steps)
 → exact-nonnegative-integer?
```

Specification: Returns the number of horizontal scroll steps within the snip. For most snips, this is `1`. Embedded editor snips use this method so that scrolling in the owning editor will step through the lines in the embedded editor.

Default implementation: Returns `1`.

```
(send a-snip get-scroll-step-offset offset)
 → (and/c real? (not/c negative?))
  offset : exact-nonnegative-integer?
```

Specification: If a snip contains more than one vertical scroll step (see `get-num-scroll-steps`) then this method is called to find the y-offset into the snip for a given scroll offset.

Default implementation: Returns `0.0`.

```
(send a-snip get-snipclass) → (or/c #f (is-a?/c snip-class%))
```

Returns the snip's class, which is used for file saving and cut-and-paste.

Since this method returns the snip class stored by `set-snipclass`, it is not meant to be overridden.

```
(send a-snip get-style) → (is-a?/c style<%>)
```

Returns the snip's style. See also `set-style`.

```
(send a-snip get-text offset num [flattened?]) → string?
  offset : exact-nonnegative-integer?
  num : exact-nonnegative-integer?
  flattened? : any/c = #f
```

Specification: Returns the text for this snip starting with the position *offset* within the snip, and continuing for a total length of *num* items. If *offset* is greater than the snip's count, then `""` is returned. If *num* is greater than the snip's count minus the offset, then text from the offset to the end of the snip is returned.

If *flattened?* is not `#f`, then flattened text is returned. See §5.5 "Flattened Text" for a discussion of flattened vs. non-flattened text.

Default implementation: Returns `""`.

```
(send a-snip get-text! buffer
                       offset
                       num
                       buffer-offset) → void?
  buffer : (and/c string? (not/c immutable?))
  offset : exact-nonnegative-integer?
  num : exact-nonnegative-integer?
  buffer-offset : exact-nonnegative-integer?
```

Specification: Like `get-text` in non-flattened mode, except that the characters are put into the given mutable string, instead of returned in a newly allocated string.

The *buffer* string is filled starting at position *buffer-offset*. The *buffer* string must be at least *num*+*buffer-offset* characters long.

Default implementation: Calls `get-text`, except in the case of a `string-snip%`, in which case *buffer* is filled directly.

```
(send a-snip is-owned?) → boolean?
```

Returns `#t` if this snip has an owner, `#f` otherwise. Note that a snip may be owned by an editor if it was inserted and then deleted from the editor, if it's still in the editor's undo history.

```
(send a-snip match? snip) → boolean?
  snip : (is-a?/c snip%)
```

Specification: Return `#t` if *a-snip* "matches" *snip*, `#f` otherwise.

Default implementation: Returns `#t` if the *snip* and *a-snip* are from the same class and have the same length.

```
(send a-snip merge-with prev) → (or/c (is-a?/c snip%) #f)
  prev : (is-a?/c snip%)
```

Specification: Merges *a-snip* with *prev*, returning `#f` if the snips cannot be merged or a new merged snip otherwise. This method will only be called if both snips are from the same class and both have the `'can-append` flag.

If the returned snip does not have the expected count, its count is forcibly modified. If the returned snip is already owned by another administrator, a surrogate snip is created.

The snip's editor is usually internally locked for reading when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Returns `#f`.

```
(send a-snip next) → (or/c (is-a?/c snip%) #f)
```

Returns the next snip in the editor owning this snip, or `#f` if this is the last snip.

In a text editor, the next snip is the snip at the position following this snip's (last) position. In a pasteboard, the next snip is the one immediately behind this snip. (See §5.1 "Editor Structure and Terminology" for information about snip order in pasteboards.)

```
(send a-snip on-char dc
                    x
                    y
                    editorx
                    editory
                    event)  → void?
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  editorx : real?
  editory : real?
  event : (is-a?/c key-event%)
```

Specification: Called to handle keyboard events when this snip has the keyboard focus and can handle events. The drawing context is provided, as well as the snip's location in display coordinates (the event uses display coordinates), and the snip's location in editor coordinates.

The *x* and *y* arguments are the snip's location in display coordinates. The *editorx* and *editory* arguments are the snip's location in editor coordinates. To get *event*'s x location in snip coordinates, subtract *x* from `(send event get-x)`.

See also `'handles-events` in `get-flags`.

Default implementation: Does nothing.

```
(send a-snip on-event dc
                    x
                    y
                    editorx
                    editory
                    event)  → void?
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  editorx : real?
  editory : real?
  event : (is-a?/c mouse-event%)
```

Specification: Called to handle mouse events on the snip when this snip can handle events and when the snip has the keyboard focus. See `on-char` for information about the arguments.

The *x* and *y* arguments are the snip's location in display coordinates. The *editorx* and

editory arguments are the snip's location in editor coordinates. To get *event*'s x location in snip coordinates, subtract *x* from (send *event* get-x).

See also 'handles-events in get-flags.

Default implementation: Does nothing.

```
(send a-snip on-goodbye-event dc
                              x
                              y
                              editorx
                              editory
                              event)  → void?
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  editorx : real?
  editory : real?
  event : (is-a?/c mouse-event%)
```

Specification: Called to handle an event that is really aimed at another snip in order to give this snip a chance to clean up as the mouse moves away. The arguments are the same as on-event.

This method is called only when the snip has the 'handles-all-mouse-events flag set (see get-flags and set-flags).

Default implementation: Calls this object's *on-event* method

Added in version 1.1 of package snip-lib.

```
(send a-snip own-caret own-it?) → void?
  own-it? : any/c
```

Specification: Notifies the snip that it is or is not allowed to display the caret (indicating ownership of keyboard focus) in some display. This method is *not* called to request that the caret is actually shown or hidden; the draw method is called for all display requests.

The *own-it?* argument is #t if the snip owns the keyboard focus or #f otherwise.

Default implementation: Does nothing.

```
(send a-snip position-grapheme n) → exact-nonnegative-integer?
  n : exact-nonnegative-integer?
```

Returns the number of graphemes within the snip formed by the first *n* items; or, equivalently, converts from an item-based position to a grapheme-based position.

When get-count is the same as get-grapheme-count, this method returns *n*.

Added in version 1.4 of package `snip-lib`.

```
(send a-snip partial-offset dc x y len) → real?
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  len : exact-nonnegative-integer?
```

Specification: Calculates a partial width for the snip, starting from the first snip item and continuing for *len* items. The drawing context and snip's locations in editor coordinates are provided. See also `get-extent`.

The snip's editor is usually internally locked for writing and reflowing when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Returns `0.0`.

```
(send a-snip previous) → (or/c (is-a?/c snip%) #f)
```

Returns the previous snip in the editor owning this snip, or `#f` if this is the first snip.

```
(send a-snip release-from-owner) → boolean?
```

Specification: Asks the snip to try to release itself from its owner. If the snip is not owned or the release is successful, then `#t` is returned. Otherwise, `#f` is returned and the snip remains owned. See also `is-owned?`.

Use this method for moving a snip from one editor to another. This method notifies the snip's owning editor that someone else really wants control of the snip. It is not necessary to use this method for "cleaning up" a snip when it is deleted from an editor.

Default implementation: Requests a low-level release from the snip's owning administrator.

```
(send a-snip resize w h) → boolean?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Specification: Resizes the snip. The snip can refuse to be resized by returning `#f`. Otherwise, the snip will resize (it must call its administrator's `resized` method) and return `#t`.

See also on-interactive-resize in pasteboard%.

Default implementation: Returns #f.

```
(send a-snip set-admin admin) → void?
  admin : (or/c (is-a?/c snip-admin%) #f)
```

Sets the snip's administrator. Only an administrator should call this method.

The default method sets the internal state of a snip to record its administrator. It will not modify this state if the snip is already owned by an administrator and the administrator has not blessed the transition. If the administrator state of a snip is not modified as expected during a sensitive call to this method by an instance of text% or pasteboard%, the internal state may be forcibly modified (if the new administrator was #f) or a surrogate snip may be created (if the snip was expected to receive a new administrator).

The snip's (new) editor is usually internally locked for reading when this method is called (see also §5.9 "Internal Editor Locks").

```
(send a-snip set-count c) → void?
  c : (integer-in 1 100000)
```

Specification: Sets the snip's count (i.e., the number of items within the snip) to (max 1 c). The snip's grapheme count is set to be equal to its character count.

The snip's count may be changed by the system (in extreme cases to maintain consistency) without calling this method or set-char-and-grapheme-count.

Default implementation: Sets the snip's count and notifies the snip's administrator that the snip's size has changed.

```
(send a-snip set-char-and-grapheme-count char-c
                                        grapheme-c) → void?
  char-c : exact-nonnegative-integer?
  grapheme-c : exact-nonnegative-integer?
```

Specification: Sets the snip's count to (max 1 char-c) and its grapheme count to (max 1 grapheme-c).

The snip's count may be changed by the system (in extreme cases to maintain consistency) without calling this method or set-count.

Default implementation: Sets the snip's count and notifies the snip's administrator that the snip's size has changed.

Added in version 1.4 of package `snip-lib`.

```
(send a-snip set-flags flags) → void?
  flags : (listof symbol?)
```

Specification: Sets the snip's flags. See `get-flags`.

Default implementation: Sets the snip flags and notifies the snip's editor that its flags have changed.

```
(send a-snip set-snipclass class) → void?
  class : (is-a?/c snip-class%)
```

Sets the snip's class, used for file saving and cut-and-paste.

This method stores the snip class internally; other editor objects may access the snip class directly, instead of through the `get-snipclass` method.

```
(send a-snip set-style style) → void?
  style : (is-a?/c style<%>)
```

Sets the snip's style if it is not owned by any editor. See also `get-style` and `is-owned?`.

The snip's style may be changed by the system without calling this method.

```
(send a-snip set-unmodified) → void?
```

Specification: Called by the snip's administrator to notify the snip that its changed have been saved. The next time snip's internal state is modified by the user, it should call `modified` to report the state change (but only on the first change after this method is called, or the first change after the snip acquires a new administrator).

Default implementation: Does nothing.

```
(send a-snip size-cache-invalid) → void?
```

Specification: Called to notify the snip that it may need to recalculate its display arguments (width, height, etc.) when it is next asked, because the style or location of the snip has changed.

The snip's (new) editor is usually internally locked for reflowing when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Does nothing.

```
(send a-snip split position first second) → void?
  position : exact-nonnegative-integer?
  first : (box/c (is-a?/c snip%))
  second : (box/c (is-a?/c snip%))
```

Specification: Splits the snip into two snips. This is called when a snip has more than one item and something is inserted between two items.

The arguments are a relative position integer and two boxes. The position integer specifies how many items should be given to the new first snip; the rest go to the new second snip. The two boxes must be filled with two new snips. (The old snip is no longer used, so it can be recycled as a new snip.)

If the returned snips do not have the expected counts, their counts are forcibly modified. If either returned snip is already owned by another administrator, a surrogate snip is created.

The snip's editor is usually internally locked for reading when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Creates a new `snip%` instance with *`position`* elements, and modifies `a-snip` to decrement its count by *`position`*. The nest snip is installed into *`first`* and `a-snip` is installed into *`second`*.

```
(send a-snip write f) → void?
  f : (is-a?/c editor-stream-out%)
```

Writes the snip to the given stream. (Snip reading is handled by the snip class.) Style information about the snip (i.e., the content of `get-style`) will be saved and restored automatically.

6.6 snip-admin%

```
snip-admin% : class?
  superclass: object%
```

See §5.1.2 "Administrators" for information about the role of administrators. The `snip-admin%` class is never instantiated directly. It is not even instantiated through derived classes by most programmers; each `text%` or `pasteboard%` object creates its own administrator. However, it may be useful to derive a new instance of this class to display snips in a new context. Also, it may be useful to call the methods of an existing administrator from an owned snip.

To create a new snip-admin% class, all methods described here must be overridden. They are all invoked by the administrator's snip.

Because a snip-admin% object typically owns more than one snip, many methods require a snip% object as an argument.

```
(new snip-admin%) → (is-a?/c snip-admin%)
```

Creates a (useless) editor administrator.

```
(send a-snip-admin get-dc) → (or/c (is-a?/c dc<%>) #f)
```

Gets a drawing context suitable for determining display size information. If the snip is not displayed, #f is returned.

```
(send a-snip-admin get-editor)
 → (or/c (is-a?/c text%) (is-a?/c pasteboard%))
```

Returns the editor that this administrator reports to (directly or indirectly).

```
(send a-snip-admin get-view x y w h [snip]) → void?
  x : (or/c (box/c real?) #f)
  y : (or/c (box/c real?) #f)
  w : (or/c (box/c (and/c real? (not/c negative?))) #f)
  h : (or/c (box/c (and/c real? (not/c negative?))) #f)
  snip : (or/c (is-a?/c snip%) #f) = #f
```

Specification: Gets the location and size of the visible region of a snip in snip coordinates. The result is undefined if the given snip is not managed by this administrator.

If *snip* is not #f, the current visible region of the snip is installed in the boxes *x*, *y*, *w*, and *h*. The *x* and *y* values are relative to the snip's top-left corner. The *w* and *h* values may be larger than the snip itself.

If *snip* is #f, the total visible region of the snip's top-level display is returned in editor coordinates. Using #f for *snip* is analogous to using #t for full? in get-view in editor-admin%.

If no snip is specified, then the location and size of the snip's editor are returned, instead, in editor coordinates.

See also get-view in editor-admin%.

Default implementation: Fills all boxes with 0.0.

```
(send a-snip-admin get-view-size w h) → void?
  w : (or/c (box/c (and/c real? (not/c negative?))) #f)
  h : (or/c (box/c (and/c real? (not/c negative?))) #f)
```

Specification: Gets the visible size of the administrator's display region.

If the display is an editor canvas, see also `reflow-container`.

Default implementation: Fills all boxes with `0.0`.

```
(send a-snip-admin modified snip modified?) → void?
  snip : (is-a?/c snip%)
  modified? : any/c
```

Specification: Called by a snip to report that its modification state has changed to either modified or unmodified.

Default implementation: Does nothing.

```
(send a-snip-admin needs-update snip
                                localx
                                localy
                                w
                                h)      → void?
  snip : (is-a?/c snip%)
  localx : real?
  localy : real?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Specification: Called by the snip to request that the snip's display needs to be updated. The administrator determines when to actually update the snip; the snip's `draw` method is eventually called.

The *localx*, *localy*, *w*, and *h* arguments specify a region of the snip to be refreshed (in snip coordinates).

No update occurs if the given snip is not managed by this administrator.

Default implementation: Does nothing.

```
(send a-snip-admin popup-menu menu snip x y) → boolean?
  menu : (is-a?/c popup-menu%)
```

```
  snip : (is-a?/c snip%)
  x : real?
  y : real?
```

Specification: Opens a popup menu in the display for this snip's editor. The result is `#t` if the popup succeeds, `#f` otherwise (independent of whether the user selects an item in the popup menu).

The menu is placed at *x* and *y* in *snip* coordinates.

While the menu is popped up, its target is set to the top-level editor in the display for this snip's editor. See `get-popup-target` for more information.

Default implementation: Returns `#f`.

```
(send a-snip-admin recounted snip refresh?) → void?
  snip : (is-a?/c snip%)
  refresh? : any/c
```

Specification: Called by a snip to notify the administrator that the specified snip has changed its count. The snip generally needs to be updated after changing its count, but the snip decides whether the update should occur immediately.

If *refresh?* is not `#f`, then the snip is requesting to be updated immediately. Otherwise, `needs-update` must eventually be called as well.

The method call is ignored if the given snip is not managed by this administrator.

Default implementation: Does nothing.

```
(send a-snip-admin release-snip snip) → boolean?
  snip : (is-a?/c snip%)
```

Specification: Requests that the specified snip be released. If this administrator is not the snip's owner or if the snip cannot be released, then `#f` is returned. Otherwise, `#t` is returned and the snip is no longer owned.

See also `release-snip` in `editor<%>` .

The result is `#f` if the given snip is not managed by this administrator.

Default implementation: Returns `#f`.

```
(send a-snip-admin resized snip refresh?) → void?
```

```
snip : (is-a?/c snip%)
refresh? : any/c
```

Specification: Called by a snip to notify the administrator that the specified snip has changed its display size. The snip generally needs to be updated after a resize, but the snip decides whether the update should occur immediately.

If *refresh?* is not #f, then the snip is requesting to be updated immediately, as if calling needs-update. Otherwise, needs-update must eventually be called as well.

The method call is ignored if the given snip is not managed by this administrator.

Default implementation: Does nothing.

```
(send a-snip-admin scroll-to  snip
                              localx
                              localy
                              w
                              h
                              refresh?
                             [bias])    → boolean?
  snip : (is-a?/c snip%)
  localx : real?
  localy : real?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
  refresh? : any/c
  bias : (or/c 'start 'end 'none) = 'none
```

Specification: Called by the snip to request scrolling so that the given region is visible. The snip generally needs to be updated after a scroll, but the snip decides whether the update should occur immediately.

The *localx*, *localy*, *w*, and *h* arguments specify a region of the snip to be made visible by the scroll (in snip coordinates).

If *refresh?* is not #f, then the editor is requesting to be updated immediately.

The *bias* argument is one of:

- 'start — if the range doesn't fit in the visible area, show the top-left region
- 'none — no special scrolling instructions

- `'end` — if the range doesn't fit in the visible area, show the bottom-right region

The result is `#t` if the editor is scrolled, `#f` otherwise.

The method call is ignored (and the result is `#f`) if the given snip is not managed by this administrator.

Default implementation: Returns `#f`.

```
(send a-snip-admin set-caret-owner snip
                                   domain) → void?
  snip : (is-a?/c snip%)
  domain : (or/c 'immediate 'display 'global)
```

Specification: Requests that the keyboard focus is assigned to the specified snip. If the request is granted, the `own-caret` method of the snip is called.

See `set-caret-owner` for information about the possible values of *domain*.

The method call is ignored if the given snip is not managed by this administrator.

Default implementation: Does nothing.

```
(send a-snip-admin update-cursor) → void?
```

Specification: Queues an update for the cursor in the display for this snip's editor. The actual cursor used will be determined by calling the snip's `adjust-cursor` method as appropriate.

Default implementation: Does nothing.

```
(send a-snip-admin get-line-spacing)
 → (and/c real? (not/c negative?))
```

Specification: Returns the spacing inserted by the snip's editor between each line. *Default implementation:* Returns `0.0`

```
(send a-snip-admin get-selected-text-color)
 → (or/c (is-a?/c color%) #f)
```

Specification: Returns the color that is used to draw selected text or `#f` if selected text is drawn with its usual color. *Default implementation:* Returns `#f`.

```
(send a-snip-admin call-with-busy-cursor thunk) → any
  thunk : (-> any)
```

Specification: Calls *thunk* while changing the cursor to a watch cursor for all windows in the current eventspace.

Default implementation: Does nothing.

```
(send a-snip-admin get-tabs [length
                             tab-width
                             in-units]) → (listof real?)
  length : (or/c (box/c exact-nonnegative-integer?) #f) = #f
  tab-width : (or/c (box/c real?) #f) = #f
  in-units : (or/c (box/c any/c) #f) = #f
```

Specification: Returns the current tab-position array as a list.

The *length* box is filled with the length of the tab array (and therefore the returned list), unless *length* is `#f`. The *tab-width* box is filled with the width used for tabs past the end of the tab array, unless *tab-width* is `#f`. The *in-units* box is filled with `#t` if the tabs are specified in canvas units or `#f` if they are specified in space-widths, unless *in-units* is `#f`.

Default implementation: Returns `null`.

6.7 snip-class%

```
snip-class% : class?
  superclass: object%
```

Useful snip classes are defined by instantiating derived subclasses of `snip-class%`. A class derived from `snip-class%` serves as a kind of "meta-class" for snips; each snip is associated with an instance of `snip-class%` as its snip class. See §5.4 "Implementing New Snips" for more information about deriving a new snip class.

```
(new snip-class%) → (is-a?/c snip-class%)
```

Creates a (useless) snip class.

```
(send a-snip-class get-classname) → string?
```

Returns the class's name, a string uniquely designating this snip class. For example, the standard text snip classname is `"wxtext"`. Names beginning with `wx` are reserved.

A snip class name should usually have the form `"((lib ...)\n(lib ...))"` to enable on-demand loading of the class. See §5.2.1.1 “Snip Classes” for details.

```
(send a-snip-class get-version) → exact-integer?
```

Returns the version of this snip class. When attempting to load a file containing a snip with the same class name but a different version, the user is warned.

```
(send a-snip-class read f) → (or/c (is-a?/c snip%) #f)
  f : (is-a?/c editor-stream-in%)
```

Specification: Reads a snip from a given stream, returning a newly created snip as the result or `#f` if there is an error.

Default implementation: Returns `#f`.

```
(send a-snip-class read-header f) → boolean?
  f : (is-a?/c editor-stream-in%)
```

Specification: Called to read header information that may be useful for every snip read in this class. This method is only called once per editor read session, and only if the stream contains header information for this class.

The return value is `#f` if a read error occurs or anything else otherwise.

See also `write-header`.

Default implementation: Returns `#t`.

```
(send a-snip-class reading-version stream) → exact-integer?
  stream : (is-a?/c editor-stream-in%)
```

Returns the version number specified for this snip class for snips currently being read from the given stream.

```
(send a-snip-class set-classname name) → void?
  name : string?
```

Sets the class’s name. See also `get-classname`.

```
(send a-snip-class set-version v) → void?
  v : exact-integer?
```

Sets the version of this class. See get-version.

```
(send a-snip-class write-header stream) → boolean?
  stream : (is-a?/c editor-stream-out%)
```

Specification: Called to write header information that may be useful for every snip written for this class. This method is only called once per editor write session, and only if the editor contains snips in this class.

When reading the snips back in, read-header will only be called if write-header writes some data to the stream.

The return value is #f if a write error occurs or anything else otherwise.

Default implementation: Returns #t.

6.8 snip-class-list<%>

```
snip-class-list<%> : interface?
```

Each eventspace has its own instance of snip-class-list<%>, obtained with (get-the-snip-class-list). New instances cannot be created directly. Each instance keeps a list of snip classes. This list is needed for loading snips from a file. See also §5.2.1.1 "Snip Classes".

```
(send a-snip-class-list add snipclass) → void?
  snipclass : (is-a?/c snip-class%)
```

Adds a snip class to the list. If a class with the same name already exists in the list, this one will not be added.

```
(send a-snip-class-list find name)
 → (or/c (is-a?/c snip-class%) #f)
  name : string?
```

Finds a snip class from the list with the given name, returning #f if none is found.

```
(send a-snip-class-list find-position class)
 → exact-nonnegative-integer?
  class : (is-a?/c snip-class%)
```

Returns an index into the list for the specified class.

```
(send a-snip-class-list nth n)
 → (or/c (is-a?/c snip-class%) #f)
  n : exact-nonnegative-integer?
```

Returns the `n`th class in the list, or `#f` if the list has `n` classes or less.

```
(send a-snip-class-list number) → exact-nonnegative-integer?
```

Returns the number of snip classes in the list.

6.9 string-snip%

```
string-snip% : class?
  superclass: snip%
```

An instance of `string-snip%` is created automatically when text is inserted into a text editor. See also `on-new-string-snip` in `text%`.

```
(make-object string-snip% [allocsize]) → (is-a?/c string-snip%)
  allocsize : exact-nonnegative-integer? = 0
(make-object string-snip% s) → (is-a?/c string-snip%)
  s : string?
```

Creates a string snip whose initial content is `s`, if supplied, empty otherwise. In the latter case, the optional `allocsize` argument is a hint about how much storage space for text should be initially allocated by the snip.

```
(send a-string-snip insert s len [pos]) → void?
  s : string?
  len : exact-nonnegative-integer?
  pos : exact-nonnegative-integer? = 0
```

Inserts `s` (with length `len`) into the snip at relative position `pos` within the snip.

```
(send a-string-snip read len f) → void?
  len : exact-nonnegative-integer?
  f : (is-a?/c editor-stream-in%)
```

Reads the snip's data from the given stream.

The *len* argument specifies the maximum length of the text to be read. (When a text snip is written to a file, the very first field is the length of the text contained in the snip.) This method is usually invoked by the text snip class's `read` method.

6.10 `style<%>`

```
style<%> : interface?
```

A `style<%>` object encapsulates drawing information (font, color, alignment, etc.) in a hierarchical manner. A `style<%>` object always exists within the context of a `style-list%` object and is never created except by a `style-list%` object.

See also §5.1.3 "Styles".

```
(send a-style get-alignment) → (or/c 'top 'center 'bottom)
```

Returns the style's alignment: `'top`, `'center`, or `'bottom`.

```
(send a-style get-background) → (is-a?/c color%)
```

Returns the style's background color.

```
(send a-style get-base-style) → (or/c (is-a?/c style<%>) #f)
```

Returns the style's base style. See §5.1.3 "Styles" for more information. The return value is `#f` only for the basic style in the list.

```
(send a-style get-delta delta) → void?
  delta : (is-a?/c style-delta%)
```

Mutates *delta*, changing it to match the style's delta, if the style is not a join style. See §5.1.3 "Styles" for more information.

```
(send a-style get-face) → (or/c string? #f)
```

Returns the style's face name. See `font%`.

```
(send a-style get-family)
 → (or/c 'default 'decorative 'roman 'script
         'swiss 'modern 'symbol 'system)
```

Returns the style's font family. See font%.

```
(send a-style get-font) → (is-a?/c font%)
```

Returns the style's font information.

```
(send a-style get-foreground) → (is-a?/c color%)
```

Returns the style's foreground color.

```
(send a-style get-name) → (or/c string? #f)
```

Returns the style's name, or #f if it is unnamed. Style names are only set through the style's style-list% object.

```
(send a-style get-shift-style) → (is-a?/c style<%>)
```

Returns the style's shift style if it is a join style. Otherwise, the root style is returned. See §5.1.3 "Styles" for more information.

```
(send a-style get-size) → byte?
```

Returns the style's font size.

```
(send a-style get-size-in-pixels) → boolean?
```

Returns #t if the style size is in pixels, instead of points, or #f otherwise.

```
(send a-style get-smoothing)
 → (or/c 'default 'partly-smoothed 'smoothed 'unsmoothed)
```

Returns the style's font smoothing. See font%.

```
(send a-style get-style) → (or/c 'normal 'italic 'slant)
```

Returns the style's font style. See font%.

```
(send a-style get-text-descent dc)
 → (and/c real? (not/c negative?))
  dc : (is-a?/c dc<%>)
```

Returns the descent of text using this style in a given DC.

```
(send a-style get-text-height dc)
 → (and/c real? (not/c negative?))
  dc : (is-a?/c dc<%>)
```

Returns the height of text using this style in a given DC.

```
(send a-style get-text-space dc)
 → (and/c real? (not/c negative?))
  dc : (is-a?/c dc<%>)
```

Returns the vertical spacing for text using this style in a given DC.

```
(send a-style get-text-width dc)
 → (and/c real? (not/c negative?))
  dc : (is-a?/c dc<%>)
```

Returns the width of a space character using this style in a given DC.

```
(send a-style get-transparent-text-backing) → boolean?
```

Returns `#t` if text is drawn without erasing the text background or `#f` otherwise.

```
(send a-style get-underlined) → boolean?
```

Returns `#t` if the style is underlined or `#f` otherwise.

```
(send a-style get-weight) → (or/c 'normal 'bold 'light)
```

Returns the style's font weight. See `font%`.

```
(send a-style is-join?) → boolean?
```

Returns #t if the style is a join style or #f otherwise. See §5.1.3 “Styles” for more information.

```
(send a-style set-base-style base-style) → void?
  base-style : (is-a?/c style<%>)
```

Sets the style’s base style and recomputes the style’s font, etc. See §5.1.3 “Styles” for more information.

```
(send a-style set-delta delta) → void?
  delta : (is-a?/c style-delta%)
```

Sets the style’s delta (if it is not a join style) and recomputes the style’s font, etc. See §5.1.3 “Styles” for more information.

```
(send a-style set-shift-style style) → void?
  style : (is-a?/c style<%>)
```

Sets the style’s shift style (if it is a join style) and recomputes the style’s font, etc. See §5.1.3 “Styles” for more information.

```
(send a-style switch-to dc old-style) → void?
  dc : (is-a?/c dc<%>)
  old-style : (or/c (is-a?/c style<%>) #f)
```

Sets the font, pen color, etc. of the given drawing context. If oldstyle is not #f, only differences between the given style and this one are applied to the drawing context.

6.11 style-delta%

```
style-delta% : class?
  superclass: object%
```

A style-delta% object encapsulates a style change. The changes expressible by a delta include:

- changing the font family
- changing the font face

- changing the font size to a new value
- enlarging the font by an additive amount
- enlarging the font by a multiplicative amount, etc.
- changing the font style (normal, *italic*, or *slant*)
- toggling the font style
- changing the font to *italic* if it is currently *slant*, etc.
- changing the font weight, etc.
- changing the underline, etc.
- changing the vertical alignment, etc.
- changing the foreground color
- dimming or brightening the foreground color, etc.
- changing the background color, etc.
- changing text backing transparency

The `set-delta` method is convenient for most style delta settings; it takes a high-level delta specification and sets the internal delta information.

To take full advantage of a style delta, it is necessary to understand the internal on/off settings that can be manipulated through methods such as `set-weight-on`. For example, the font weight change is specified through the `weight-on` and `weight-off` internal settings. Roughly, `weight-on` turns on a weight setting when it is not present and `weight-off` turns off a weight setting when it is present. These two interact precisely in the following way:

- If both `weight-on` and `weight-off` are set to `'base`, then the font weight is not changed.
- If `weight-on` is not `'base`, then the weight is set to `weight-on`.
- If `weight-off` is not `'base`, then the weight will be set back to `'normal` when the base style has the weight `weight-off`.
- If both `weight-on` and `weight-off` are set to the same value, then the weight is toggled with respect to that value: if the base style has the weight `weight-on`, then weight is changed to `'normal`; if the base style has a different weight, it is changed to `weight-on`.
- If both `weight-on` and `weight-off` are set, but to different values, then the weight is changed to `weight-on` only when the base style has the weight `weight-off`.

Font styles, smoothing, underlining, and alignment work in an analogous manner.

The possible values for `alignment-on` and `alignment-off` are:

- `'base`
- `'top`
- `'center`
- `'bottom`

The possible values for `style-on` and `style-off` are:

- `'base`
- `'normal`
- `'italic`
- `'slant`

The possible values for `smoothing-on` and `smoothing-off` are:

- `'base`
- `'default`
- `'partly-smoothed`
- `'smoothed`
- `'unsmoothed`

The possible values for `underlined-on` and `underlined-off` are:

- `#f` (acts like `'base`)
- `#t`

The possible values for `size-in-pixels-on` and `size-in-pixels-off` are:

- `#f` (acts like `'base`)
- `#t`

The possible values for `transparent-text-backing-on` and `transparent-text-backing-off` are:

- `#f` (acts like `'base`)
- `#t`

The possible values for `weight-on` and `weight-off` are:

- `'base`
- `'normal`
- `'bold`
- `'light`

The family and face settings in a style delta are interdependent:

- When a delta's face is `#f` and its family is `'base`, then neither the face nor family are modified by the delta.
- When a delta's face is a string and its family is `'base`, then only face is modified by the delta.
- When a delta's family is not `'base`, then both the face and family are modified by the delta. If the delta's face is `#f`, then applying the delta sets a style's face to `#f`, so that the family setting prevails in choosing a font.

```
(make-object style-delta% [change-command])
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-nothing
                         'change-normal
                         'change-toggle-underline
                         'change-toggle-size-in-pixels
                         'change-normal-color
                         'change-bold)
                 = 'change-nothing
(make-object style-delta% change-command v)
```

```
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-family
                         'change-style
                         'change-toggle-style
                         'change-weight
                         'change-toggle-weight
                         'change-smoothing
                         'change-toggle-smoothing
                         'change-alignment)
  v : symbol
(make-object style-delta% change-command v)
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-size
                         'change-bigger
                         'change-smaller)
  v : exact-integer?
(make-object style-delta% change-command v)
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-underline
                         'change-size-in-pixels)
  v : any/c
```

The initialization arguments are passed on to set-delta.

```
(send a-style-delta collapse delta) → boolean?
  delta : (is-a?/c style-delta%)
```

Tries to collapse into a single delta the changes that would be made by applying this delta after a given delta. If the return value is #f, then it is impossible to perform the collapse. Otherwise, the return value is #t and this delta will contain the collapsed change specification.

```
(send a-style-delta copy delta) → void?
  delta : (is-a?/c style-delta%)
```

Copies the given style delta's settings into this one.

```
(send a-style-delta equal? delta) → boolean?
  delta : (is-a?/c style-delta%)
```

Returns #t if the given delta is equivalent to this one in all contexts or #f otherwise.

```
(send a-style-delta get-alignment-off)
 → (or/c 'base 'top 'center 'bottom)
```

See style-delta%.

```
(send a-style-delta get-alignment-on)
 → (or/c 'base 'top 'center 'bottom)
```

See style-delta%.

```
(send a-style-delta get-background-add)
 → (is-a?/c add-color<%>)
```

Gets the object additive color shift for the background (applied after the multiplicative factor). Call this add-color<%> object's methods to change the style delta's additive background color shift.

```
(send a-style-delta get-background-mult)
 → (is-a?/c mult-color<%>)
```

Gets the multiplicative color shift for the background (applied before the additive factor). Call this mult-color<%> object's methods to change the style delta's multiplicative background color shift.

```
(send a-style-delta get-face) → (or/c string? #f)
```

Gets the delta's font face string. If this string is #f and the family is 'base when the delta is applied to a style, the style's face and family are not changed. However, if the face string is #f and the family is not 'base, then the style's face is changed to #f.

See also get-family.

```
(send a-style-delta get-family)
 → (or/c 'base 'default 'decorative 'roman 'script
         'swiss 'modern 'symbol 'system)
```

Returns the delta's font family. The possible values are

- 'base — no change to family
- 'default
- 'decorative

- 'roman
- 'script
- 'swiss
- 'modern (fixed width)
- 'symbol (Greek letters)
- 'system (used to draw control labels)

See also get-face.

```
(send a-style-delta get-foreground-add)
 → (is-a?/c add-color<%>)
```

Gets the additive color shift for the foreground (applied after the multiplicative factor). Call this add-color<%> object's methods to change the style delta's additive foreground color shift.

```
(send a-style-delta get-foreground-mult)
 → (is-a?/c mult-color<%>)
```

Gets the multiplicative color shift for the foreground (applied before the additive factor). Call this mult-color<%> object's methods to change the style delta's multiplicative foreground color shift.

```
(send a-style-delta get-size-add) → byte?
```

Gets the additive font size shift (applied after the multiplicative factor).

```
(send a-style-delta get-size-in-pixels-off) → boolean?
```

See style-delta%.

```
(send a-style-delta get-size-in-pixels-on) → boolean?
```

See style-delta%.

```
(send a-style-delta get-size-mult) → real?
```

Gets the multiplicative font size shift (applied before the additive factor).

```
(send a-style-delta get-smoothing-off)
 → (or/c 'base 'default 'partly-smoothed 'smoothed 'unsmoothed)
```

See style-delta%.

```
(send a-style-delta get-smoothing-on)
 → (or/c 'base 'default 'partly-smoothed 'smoothed 'unsmoothed)
```

See style-delta%.

```
(send a-style-delta get-style-off)
 → (or/c 'base 'normal 'italic 'slant)
```

See style-delta%.

```
(send a-style-delta get-style-on)
 → (or/c 'base 'normal 'italic 'slant)
```

See style-delta%.

```
(send a-style-delta get-transparent-text-backing-off)
 → boolean?
```

See style-delta%.

```
(send a-style-delta get-transparent-text-backing-on)
 → boolean?
```

See style-delta%.

```
(send a-style-delta get-underlined-off) → boolean?
```

See style-delta%.

```
(send a-style-delta get-underlined-on) → boolean?
```

See style-delta%.

```
(send a-style-delta get-weight-off)
 → (or/c 'base 'normal 'bold 'light)
```

See style-delta%.

```
(send a-style-delta get-weight-on)
 → (or/c 'base 'normal 'bold 'light)
```

See style-delta%.

```
(send a-style-delta set-alignment-off v) → void?
  v : (or/c 'base 'top 'center 'bottom)
```

See style-delta%.

```
(send a-style-delta set-alignment-on v) → void?
  v : (or/c 'base 'top 'center 'bottom)
```

See style-delta%.

```
(send a-style-delta set-delta [change-command])
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-nothing
                         'change-normal
                         'change-toggle-underline
                         'change-toggle-size-in-pixels
                         'change-normal-color
                         'change-bold)
                 = 'change-nothing
(send a-style-delta set-delta change-command
                              param)
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-family
                         'change-style
                         'change-toggle-style
                         'change-weight
                         'change-toggle-weight
                         'change-smoothing
                         'change-toggle-smoothing
                         'change-alignment)
```

```
  param : symbol?
(send a-style-delta set-delta change-command
                                param)
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-size
                         'change-bigger
                         'change-smaller)
  param : byte?
(send a-style-delta set-delta change-command
                                on?)
 → (is-a?/c style-delta%)
  change-command : (or/c 'change-underline
                         'change-size-in-pixels)
  on? : any/c
```

Configures the delta with high-level specifications. The return value is the delta itself.

Except for `'change-nothing` and `'change-normal`, the command only changes part of the delta. Thus, applying `'change-bold` and then `'change-italic` sets the delta for both the style and weight change.

The *change-command* argument specifies how the delta is changed; the possible values are:

- `'change-nothing` — reset all changes
- `'change-normal` — turn off all styles and resizings
- `'change-toggle-underline` — underline regions that are currently not underlined, and vice versa
- `'change-toggle-size-in-pixels` — interpret sizes in pixels for regions that are currently interpreted in points, and vice versa
- `'change-normal-color` — change the foreground and background to black and white, respectively
- `'change-italic` — change the style of the font to *italic*
- `'change-bold` — change the weight of the font to **bold**
- `'change-family` — change the font family (*param* is a family; see `font%`); see also `get-family`
- `'change-style` — change the style of the font (*param* is a style; see `font%`)
- `'change-toggle-style` — toggle the style of the font (*param* is a style; see `font%`)

- 'change-weight — change the weight of the font (*param* is a weight; see font%)
- 'change-toggle-weight — toggle the weight of the font (*param* is a weight; see font%)
- 'change-smoothing — change the smoothing of the font (*param* is a smoothing; see font%)
- 'change-toggle-smoothing — toggle the smoothing of the font (*param* is a smoothing; see font%)
- 'change-alignment — change the alignment (*param* is an alignment; see style-delta%)
- 'change-size — change the size to an absolute value (*param* is a size)
- 'change-bigger — make the text larger (*param* is an additive amount)
- 'change-smaller — make the text smaller (*param* is an additive amount)
- 'change-underline — set the underline status to either underlined or plain
- 'change-size-in-pixels — set the size interpretation to pixels or points

```
(send a-style-delta set-delta-background name)
 → (is-a?/c style-delta%)
  name : string?
(send a-style-delta set-delta-background color)
 → (is-a?/c style-delta%)
  color : (is-a?/c color%)
```

Makes the delta encode a background color change to match the absolute color given; that is, it sets the multiplicative factors to 0.0 in the result of get-background-mult, and it sets the additive values in the result of get-background-add to the specified color's values. In addition, it also disables transparent text backing by setting transparent-text-backing-on to #f and transparent-text-backing-off to #t. The return value of the method is the delta itself.

For the case that a string color name is supplied, see color-database<%>.

```
(send a-style-delta set-delta-face  name
                                    [family])
 → (is-a?/c style-delta%)
  name : string?
  family : (or/c 'base 'default 'decorative 'roman
                 'script 'swiss 'modern 'symbol 'system)
         = 'default
```

Like set-face, but sets the family at the same time.

The return value is a-style-delta.

```
(send a-style-delta set-delta-foreground name)
 → (is-a?/c style-delta%)
  name : string?
(send a-style-delta set-delta-foreground color)
 → (is-a?/c style-delta%)
  color : (is-a?/c color%)
```

Makes the delta encode a foreground color change to match the absolute color given; that is, it sets the multiplicative factors to 0.0 in the result of get-foreground-mult, and it sets the additive values in the result of get-foreground-add to the specified color's values. The return value of the method is the delta itself.

For the case that a string color name is supplied, see color-database<%>.

```
(send a-style-delta set-face v) → void?
  v : (or/c string? #f)
```

See get-face. See also set-delta-face.

```
(send a-style-delta set-family v) → void?
  v : (or/c 'base 'default 'decorative 'roman 'script
            'swiss 'modern 'symbol 'system)
```

Sets the delta's font family. See get-family.

```
(send a-style-delta set-size-add v) → void?
  v : byte?
```

Sets the additive font size shift (applied after the multiplicative factor).

```
(send a-style-delta set-size-in-pixels-off v) → void?
  v : any/c
```

See style-delta%.

```
(send a-style-delta set-size-in-pixels-on v) → void?
  v : any/c
```

See style-delta%.

```
(send a-style-delta set-size-mult v) → void?
  v : real?
```

Sets the multiplicative font size shift (applied before the additive factor).

```
(send a-style-delta set-smoothing-off v) → void?
  v : (or/c 'base 'default 'partly-smoothed
            'smoothed 'unsmoothed)
```

See style-delta%.

```
(send a-style-delta set-smoothing-on v) → void?
  v : (or/c 'base 'default 'partly-smoothed
            'smoothed 'unsmoothed)
```

See style-delta%.

```
(send a-style-delta set-style-off v) → void?
  v : (or/c 'base 'normal 'italic 'slant)
```

See style-delta%.

```
(send a-style-delta set-style-on v) → void?
  v : (or/c 'base 'normal 'italic 'slant)
```

See style-delta%.

```
(send a-style-delta set-transparent-text-backing-off v) → void?
  v : any/c
```

See style-delta%.

```
(send a-style-delta set-transparent-text-backing-on v) → void?
  v : any/c
```

See style-delta%.

```
(send a-style-delta set-underlined-off v) → void?
  v : any/c
```

See style-delta%.

```
(send a-style-delta set-underlined-on v) → void?
  v : any/c
```

See style-delta%.

```
(send a-style-delta set-weight-off v) → void?
  v : (or/c 'base 'normal 'bold 'light)
```

See style-delta%.

```
(send a-style-delta set-weight-on v) → void?
  v : (or/c 'base 'normal 'bold 'light)
```

See style-delta%.

6.12 style-list%

```
style-list% : class?
  superclass: object%
```

A style-list% object contains a set of style<%> objects and maintains the hierarchical relationships between them. A style<%> object can only be created through the methods of a style-list% object. There is a global style list object, the-style-list, but any number of independent lists can be created for separate style hierarchies. Each editor creates its own private style list.

See §5.1.3 “Styles” for more information.

```
(new style-list%) → (is-a?/c style-list%)
```

The root style, named "Basic", is automatically created.

```
(send a-style-list basic-style) → (is-a?/c style<%>)
```

This method is final, so it cannot be overridden.

Returns the root style. Each style list has its own root style.

See also §10 “Preferences” for information about the 'GRacket:default-font-size preference.

```
(send a-style-list convert style) → (is-a?/c style<%>)
  style : (is-a?/c style<%>)
```

Converts *style*, which can be from another style list, to a style in this list. If *style* is already in this list, then *style* is returned. If *style* is named and a style by that name is already in this list, then the existing named style is returned. Otherwise, the style is converted by converting its base style (and shift style if *style* is a join style) and then creating a new style in this list.

```
(send a-style-list find-named-style name)
 → (or/c (is-a?/c style<%>) #f)
  name : string?
```

Finds a style by name. If no such style can be found, #f is returned.

```
(send a-style-list find-or-create-join-style base-style
                                             shift-style)
 → (is-a?/c style<%>)
  base-style : (is-a?/c style<%>)
  shift-style : (is-a?/c style<%>)
```

Creates a new join style, or finds an appropriate existing one. The returned style is always unnamed. See §5.1.3 “Styles” for more information.

The *base-style* argument must be a style within this style list.

```
(send a-style-list find-or-create-style base-style
                                        delta)
 → (is-a?/c style<%>)
  base-style : (is-a?/c style<%>)
  delta : (is-a?/c style-delta%)
```

Creates a new derived style, or finds an appropriate existing one. The returned style is always unnamed. See §5.1.3 “Styles” for more information.

The *base-style* argument must be a style within this style list. If *base-style* is not a join style, if it has no name, and if its delta can be collapsed with *delta* (see collapse in style-delta%), then the collapsed delta is used in place of *delta*, and the base style of *base-style* is used in place of *base-style*; this collapsing and substitution of base styles is performed recursively.

```
(send a-style-list forget-notification key) → void?
  key : any/c
```

See notify-on-change.

The *key* argument is the value returned by notify-on-change.

```
(send a-style-list index-to-style i)
 → (or/c (is-a?/c style<%>) #f)
  i : exact-nonnegative-integer?
```

Returns the style associated with the given index, or #f for a bad index. See also style-to-index.

```
(send a-style-list new-named-style name
                                    like-style)
 → (is-a?/c style<%>)
  name : string?
  like-style : (is-a?/c style<%>)
```

Creates a new named style, unless the name is already being used.

If *name* is already being used, then *like-style* is ignored and the old style associated to the name is returned. Otherwise, a new style is created for *name* with the same characteristics (i.e., the same base style and same style delta or shift style) as *like-style*.

The *like-style* style must be in this style list, otherwise the named style is derived from the basic style with an empty style delta.

```
(send a-style-list notify-on-change f) → any/c
  f : ((or/c (is-a?/c style<%>) #f) . -> . any)
```

Attaches a callback *f* to the style list. The callback *f* is invoked whenever a style is modified.

Often, a change in one style will trigger a change in several other derived styles; to allow clients to handle all the changes in a batch, #f is passed to *f* as the changing style after a set of styles has been processed.

The return value from notify-on-change is an opaque key to be used with forget-notification.

The callback *f* replaces any callback for which it is equal?, which helps avoid redundant notifications in case of redundant registrations. The callback *f* is retained only weakly (in the sense of make-weak-box), but it is retained as long as any value that *f* impersonates is reachable; for example, if *f* represents a function with a contract applied, then *f* is retained for notification as long as the original (pre-contract) function is reachable. The callback *f* is also retained as long as the opaque key produced by notify-on-change is reachable.

(send *a-style-list* begin-style-change-sequence) → void?

Bracket changes to styles contained in a style-list% with begin-style-change-sequence and end-style-change-sequence to avoid extra work during the style changes.

Call to begin-style-change-sequence and end-style-change-sequence can be nested arbitrarily; changes to styles are not propagated to the editor<%>s that use this style-list% until the last call to end-style-change-sequence and redundant calls are skipped at that point.

Added in version 1.5 of package snip-lib.

(send *a-style-list* end-style-change-sequence) → void?

Call to match calls to begin-style-change-sequence.

Added in version 1.5 of package snip-lib.

(send *a-style-list* number) → exact-nonnegative-integer?

Returns the number of styles in the list.

```
(send a-style-list replace-named-style name
                                       like-style)
 → (is-a?/c style<%>)
  name : string?
  like-style : (is-a?/c style<%>)
```

Like new-named-style, except that if the name is already mapped to a style, the existing mapping is replaced.

```
(send a-style-list style-to-index style)
 → (or/c exact-nonnegative-integer? #f)
  style : (is-a?/c style<%>)
```

Returns the index for a particular style. The index for a style's base style (and shift style, if it is a join style) is guaranteed to be lower than the style's own index. (As a result, the root style's index is always 0.) A style's index can change whenever a new style is added to the list, or the base style or shift style of another style is changed.

If the given style is not in this list, #f is returned.

6.13 tab-snip%

```
tab-snip% : class?
  superclass: string-snip%
```

An instance of tab-snip% is created automatically when a tab is inserted into an editor.

```
(new tab-snip%) → (is-a?/c tab-snip%)
```

Creates a snip for a single tab, though the tab is initially empty.

Normally, a single tab is inserted into a tab-snip% object using the insert method.

The tab's content is not drawn, through it is used when determining the size of a single character in editors where tabbing is determined by the character width (see set-tabs); if the content is a single tab character (the normal case), then the average character width of snip's font is used as the tab's width.

7 Editor Classes

Editors:

```
editor<%>
 |- text%
 |- pasteboard%
```

Editor Snips:

```
snip%
 |- editor-snip%
```

Displays, Administrators, and Mappings:

```
editor-canvas%

editor-admin%                       snip-admin%
 |- editor-snip-editor-admin<%>

editor-wordbreak-map%    keymap%
```

Streams for Saving and Cut-and-Paste:

```
editor-data%
editor-data-class%
editor-data-class-list<%>

editor-stream-in%                 editor-stream-out%
editor-stream-in-base%            editor-stream-out-base%
 |- editor-stream-in-bytes-base%   |- editor-stream-out-bytes-base%
```

Alphabetical:

7.1 editor<%>

```
editor<%> : interface?
```

The editor<%> interface is implemented by text% and pasteboard%.

```
(send an-editor add-canvas canvas) → void?
  canvas : (is-a?/c editor-canvas%)
```

Adds a canvas to this editor's list of displaying canvases. (See get-canvases.)

Normally, this method is called only by set-editor in editor-canvas%.

```
(send an-editor add-undo undoer) → void?
  undoer : (-> any)
```

Adds an undoer procedure to the editor's undo stack. If an undo is currently being performed, the undoer is added to the editor's redo stack. The undoer is called by the system when it is undoing (or redoing) changes to an editor, and when this undoer is the first item on the undo (or redo) stack.

Editor instances are created with no undo stack, so no undo operations will be recorded unless set-max-undo-history is used to change the size of the undo stack.

The system automatically installs undo records to undo built-in editor operations, such as inserts, deletes, and font changes. Install an undoer only when it is necessary to maintain state or handle operations that are not built-in. For example, in a program where the user can assign labels to snips in a pasteboard, the program should install an undoer to revert a label change. Thus, when a user changes a snip's label and then selects Undo (from a standard menu bar), the snip's label will revert as expected. In contrast, there is no need to install an undoer when the user moves a snip by dragging it, because the system installs an appropriate undoer automatically.

After an undoer returns, the undoer is popped off the editor's undo (or redo) stack; if the return value is true, then the next undoer is also executed as part of the same undo (or redo) step. The undoer should return true if the action being undone was originally performed as part of a begin-edit-sequence and end-edit-sequence sequence. The return value should also be true if the undone action was implicitly part of a sequence. To extend the previous example, if a label change is paired with a move to realign the snip, then the label-change undoer should be added to the editor *after* the call to move, and it should return #t when it is called. As a result, the move will be undone immediately after the label change is undone. (If the opposite order is needed, use begin-edit-sequence and end-edit-sequence to create an explicit sequence.)

The system adds undoers to an editor (in response to other method calls) without calling this method.

```
(send an-editor adjust-cursor event)
 → (or/c (is-a?/c cursor%) #f)
  event : (is-a?/c mouse-event%)
```

Specification: Gets a cursor to be used in the editor's display. If the return value is #f, a default cursor is used.

See also set-cursor.

Default implementation: If an overriding cursor has been installed with `set-cursor`, then the installed cursor is returned.

Otherwise, if the event is a dragging event, a snip in the editor has the focus, and the snip's `adjust-cursor` method returns a cursor, that cursor is returned.

Otherwise, if the cursor is over a snip and the snip's `adjust-cursor` method returns a cursor, that cursor is returned.

Otherwise, if a cursor has been installed with `set-cursor`, then the installed cursor is returned.

Otherwise, if the cursor is over a clickback region in an editor, an arrow cursor is returned.

Finally, if none of the above cases apply, a default cursor is returned. For a text editor, the default cursor is an I-beam. For a pasteboard editor, the default cursor is an arrow.

```
(send an-editor after-edit-sequence) → void?
```

Refine this method with `augment`.

Specification: Called after a top-level edit sequence completes (involving unnested `begin-edit-sequence` and `end-edit-sequence`).

See also `on-edit-sequence`.

Default implementation: Does nothing.

```
(send an-editor after-load-file success?) → void?
  success? : any/c
```

Refine this method with `augment`.

Specification: Called just after the editor is loaded from a file or during the exception escape when an attempt to load fails. The *success?* argument indicates whether the load succeeded.

See also `can-load-file?` and `on-load-file`.

Default implementation: Does nothing.

```
(send an-editor after-save-file success?) → void?
  success? : any/c
```

Refine this method with `augment`.

Specification: Called just after the editor is saved to a file or during the exception escape when a save fails. The *success?* argument indicates whether the save succeeded.

See also can-save-file? and on-save-file.

Default implementation: Does nothing.

```
(send an-editor after-scroll-to) → void?
```

Specification: Called when the editor has just scrolled, but the entire display may not have been refreshed. (If the editor scrolls but the entire window is redrawn, this method may not be called.)

See also get-scroll-via-copy.

Default implementation: Does nothing.

```
(send an-editor auto-wrap) → boolean?
(send an-editor auto-wrap auto-wrap?) → void?
  auto-wrap? : any/c
```

Enables or disables automatically calling set-max-width in response to on-display-size, or gets the state of auto-wrapping. For text editors, this has the effect of wrapping the editor's contents to fit in a canvas displaying the editor (the widest one if multiple canvases display the editor). For pasteboard editors, "auto-wrapping" merely truncates the area of the pasteboard to match its canvas display.

When the wrapping mode is changed, the on-display-size method is called immediately to update the editor's maximum width.

Auto-wrapping is initially disabled.

```
(send an-editor begin-edit-sequence [undoable?
                                     interrupt-streak?]) → void?
  undoable? : any/c = #t
  interrupt-streak? : any/c = #t
```

Specification: The begin-edit-sequence and end-edit-sequence methods are used to bracket a set of editor modifications so that the results are all displayed at once. The commands may be nested arbitrarily deeply. Using these functions can greatly speed up displaying the changes.

When an editor contains other editors, using begin-edit-sequence and end-edit-sequence on the main editor brackets some changes to the sub-editors as well, but it is not as effective when a sub-editor changes as calling begin-edit-sequence and end-edit-sequence for the sub-editor.

See also refresh-delayed? and in-edit-sequence?, and see §5.10 “Editors and Threads” for information about edit sequences and refresh requests.

If the *undoable?* flag is #f, then the changes made in the sequence cannot be reversed through the undo method. See below for more information on undo. The *undoable?* flag is only effective for the outermost begin-edit-sequence when nested sequences are used. Note that, for a text% object, the character-inserting version of insert interferes with sequence-based undo groupings.

If the *interrupt-streak?* flag is #f and the sequence is outermost, then special actions before and after the sequence count as consecutive actions. For example, kills just before and after the sequence are appended in the clipboard.

Undo details: The behavior of *undoable?* as #f is implemented by not adding entries to an undo log. For example, suppose that an a is inserted into the editor, a b is inserted, and then an un-undoable edit sequence begins, and the a is colored red, and then the edit sequence ends. An undo will remove the b, leaving the a colored red.

As another example, in the following interaction, undo removes the a instead of the b:

```
> (define t (new text%))
> (begin
    (send t set-max-undo-history 'forever)
    (send t insert "a")
    (send t insert "b")
    (send t begin-edit-sequence #f #f)
    (send t insert "c" 0 0)
    (send t end-edit-sequence)
    (send t get-text))
"cab"
> (begin
    (send t undo)
    (send t get-text))
"cb"
```

Default implementation: Starts a sequence.

```
(send an-editor begin-write-header-footer-to-file f
                                                  name
                                                  buffer)
 → void?
  f : (is-a?/c editor-stream-out%)
  name : string?
  buffer : (box/c exact-integer?)
```

This method must be called before writing any special header data to a stream. See §5.2

"File Format" and write-headers-to-file for more information.

The *name* string must be a unique name that can be used by a header reader to recognize the data. This method will store a value in *buffer* that should be passed on to end-write-header-footer-to-file.

```
(send an-editor blink-caret) → void?
```

Specification: Tells the editor to blink the selection caret. This method is called periodically when the editor's display has the keyboard focus.

Default implementation: Propagates the request to any snip with the editor-local focus.

```
(send an-editor can-do-edit-operation? op
                                       [recursive?]) → boolean?
  op : (or/c 'undo 'redo 'clear 'cut 'copy 'paste
             'kill 'select-all 'insert-text-box
             'insert-pasteboard-box 'insert-image)
  recursive? : any/c = #t
```

Specification: Checks whether a generic edit command would succeed for the editor. This check is especially useful for enabling and disabling menus on demand. See do-edit-operation for information about the *op* and *recursive?* arguments.

Default implementation: Allows the operation depending on the selection, whether the editor is locked, etc.

```
(send an-editor can-load-file? filename
                               format)  → boolean?
  filename : path?
  format : (or/c 'guess 'same 'copy 'standard
                 'text 'text-force-cr)
```

Refine this method with augment.

Specification: Called just before the editor is loaded from a file. If the return value is #f, the file is not loaded. See also on-load-file and after-load-file.

The *filename* argument is the name the file will be loaded from. See load-file for information about *format*.

Note that the *filename* argument cannot be a string; it must be a path value.

Default implementation: Returns #t.

```
(send an-editor can-save-file? filename
                               format)  → boolean?
  filename : path?
  format : (or/c 'guess 'same 'copy 'standard
                 'text 'text-force-cr)
```

Refine this method with `augment`.

Specification: Called just before the editor is saved to a file. If the return value is `#f`, the file is not saved. See also `on-save-file` and `after-save-file`.

The *`filename`* argument is the name the file will be saved to. See `load-file` for information about *`format`*.

Note that the *`filename`* argument cannot be a string; it must be a path value.

Default implementation: Returns `#t`.

```
(send an-editor clear) → void?
```

Deletes the currently selected items.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use `on-delete` in `text%` or `on-delete` in `pasteboard%` to monitor content deletions changes.

```
(send an-editor clear-undos) → void?
```

Destroys the undo history of the editor.

```
(send an-editor copy [extend? time]) → void?
  extend? : any/c = #f
  time : exact-integer? = 0
```

Copies items into the clipboard. If *`extend?`* is not `#f`, the old clipboard contents are appended.

The system may execute a copy (in response to other method calls) without calling this method. To extend or re-implement copying, override the `do-copy` in `text%` or `do-copy` in `pasteboard%` method of an editor.

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *`time`* argument. If *`time`* is outside the platform-specific range of times, an `exn:fail:contract` exception is raised.

```
(send an-editor copy-self)
 → (or/c (is-a?/c text%) (is-a?/c pasteboard%))
```

Creates a new editor with the same properties as this one. After an editor is created (either a `text%` or `pasteboard%` instance, as appropriate), the new editor is passed to `copy-self-to`.

```
(send an-editor copy-self-to dest) → void?
  dest : (or/c (is-a?/c text%) (is-a?/c pasteboard%))
```

Copies the properties of *an-editor* to *dest*.

Each snip in *an-editor* is copied and inserted into *dest*. In addition, *an-editor*'s filename, maximum undo history setting, keymap, interactive caret threshold, and overwrite-styles-on-load settings are installed into *dest*. Finally, *an-editor*'s style list is copied and the copy is installed as the style list for *dest*.

```
(send an-editor cut [extend? time]) → void?
  extend? : any/c = #f
  time : exact-integer? = 0
```

Copies and then deletes the currently selected items. If *extend?* is not `#f`, the old clipboard contents are appended.

The system may execute a cut (in response to other method calls) without calling this method. To extend or re-implement the copying portion of the cut, override the `do-copy` in `text%` or `do-copy` in `pasteboard%` method of an editor. To monitor deletions in an editor, override `on-delete` in `text%` or `on-delete` in `pasteboard%`.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an `exn:fail:contract` exception is raised.

```
(send an-editor dc-location-to-editor-location x
                                               y) → real? real?
  x : real?
  y : real?
```

Converts the given coordinates from top-level display coordinates (usually canvas coordinates) to editor location coordinates. The same calculation is performed by `global-to-local`.

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`).

See also editor-location-to-dc-location.

```
(send an-editor default-style-name) → string?
```

Returns the name of a style to be used for newly inserted text, etc. The default is "Standard".

```
(send an-editor do-edit-operation  op
                                   [recursive?
                                    time])      → void?
  op : (or/c 'undo 'redo 'clear 'cut 'copy 'paste
             'kill 'select-all 'insert-text-box
             'insert-pasteboard-box 'insert-image)
  recursive? : any/c = #t
  time : exact-integer? = 0
```

Performs a generic edit command. The *op* argument must be a valid edit command, one of:

- 'undo — undoes the last operation
- 'redo — undoes the last undo
- 'clear — deletes the current selection
- 'cut — cuts
- 'copy — copies
- 'paste — pastes
- 'kill — cuts to the end of the current line, or cuts a newline if there is only whitespace between the selection and end of line
- 'select-all — selects everything in the editor
- 'insert-text-box — inserts a text editor as an item in this editor; see also on-new-box .
- 'insert-pasteboard-box — inserts a pasteboard editor as an item in this editor; see also on-new-box .
- 'insert-image — gets a filename from the user and inserts the image as an item in this editor; see also on-new-image-snip .

If *recursive?* is not #f, then the command is passed on to any active snips of this editor (i.e., snips which own the caret).

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send an-editor editor-location-to-dc-location x
                                               y) → real? real?
  x : real?
  y : real?
```

Converts the given coordinates from editor location coordinates to top-level display coordinates (usually canvas coordinates). The same calculation is performed by `local-to-global`.

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`).

See also `dc-location-to-editor-location`.

```
(send an-editor enable-sha1) → void?
```

Once this method has been called, any future calls to `load-file` or `save-file` will compute the sha1 (see §13.11 "Cryptographic Hashing") of the file that is loaded or saved.

Once the sha1 computation has been enabled, it cannot be disabled.

See also `is-sha1-enabled?`, `get-file-sha1`, and `update-sha1?`.

Added in version 1.50 of package `gui-lib`.

```
(send an-editor end-edit-sequence) → void?
```

See `begin-edit-sequence`.

```
(send an-editor end-write-header-footer-to-file f
                                                buffer-value)
 → void?
  f : (is-a?/c editor-stream-out%)
  buffer-value : exact-integer?
```

This method must be called after writing any special header data to a stream. The *buffer-value* argument must be the value put in the `buffer` argument box by `begin-write-header-footer-to-file`.

See §5.2 "File Format" and `write-headers-to-file` for more information.

```
(send an-editor find-first-snip) → (or/c (is-a?/c snip%) #f)
```

Returns the first snip in the editor, or #f if the editor is empty. To get all of the snips in the editor, use the next in snip% on the resulting snip.

The first snip in a text editor is the one at position 0. The first snip in a pasteboard is the frontmost snip. (See §5.1 "Editor Structure and Terminology" for information about snip order in pasteboards.)

```
(send an-editor find-scroll-line location)
 → exact-nonnegative-integer?
  location : real?
```

Maps a vertical location within the editor to a vertical scroll position.

For text% objects: Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?). The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when get-admin returns an administrator (not #f).

```
(send an-editor get-active-canvas)
 → (or/c (is-a?/c editor-canvas%) #f)
```

If the editor is displayed in a canvas, this method returns the canvas that most recently had the keyboard focus (while the editor was displayed). If no such canvas exists, #f is returned.

```
(send an-editor get-admin) → (or/c (is-a?/c editor-admin%) #f)
```

Returns the editor-admin% object currently managing this editor or #f if the editor is not displayed.

```
(send an-editor get-canvas)
 → (or/c (is-a?/c editor-canvas%) #f)
```

If get-active-canvas returns a canvas, that canvas is also returned by this method. Otherwise, if get-canvases returns a non-empty list, the first canvas in the list is returned, otherwise #f is returned.

```
(send an-editor get-canvases)
 → (listof (is-a?/c editor-canvas%))
```

Returns a list of canvases displaying the editor. An editor may be displayed in multiple canvases and no other kind of display, or one instance of another kind of display and no canvases. If the editor is not displayed or the editor's current display is not a canvas, null is returned.

```
(send an-editor get-file-creator-and-type)
 → (or/c #f (and/c bytes? #rx#"^....$"))
   (or/c #f (and/c bytes? #rx#"^....$"))
```

Gets the file type and creator used by `save-file`. See also `set-file-creator-and-type` and `file-creator-and-type`.

The first result is the creator; if it is `#f`, then the default is used: `#"mReD"`. The second result is the type; if it is `#f`, then the default is used. The default is `#"TEXT"` if the file is being saved in text format and `#"WXME"` if it is being saved in WXME foramt. See `load-file` for more information.

Added in version 1.49 of package `gui-lib`.

```
(send an-editor get-dc) → (or/c (is-a?/c dc<%>) #f)
```

Typically used (indirectly) by snip objects belonging to the editor. Returns a destination drawing context which is suitable for determining display sizing information, or `#f` if the editor is not displayed.

```
(send an-editor get-descent) → (and/c real? (not/c negative?))
```

Returns the font descent for the editor. This method is primarily used when an editor is an item within another editor. For a text editor, the reported descent includes the editor's bottom padding (see `set-padding`).

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`). For `text%` objects, calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see `refresh-delayed?`).

```
(send an-editor get-extent w h) → void?
  w : (or/c (box/c (and/c real? (not/c negative?))) #f)
  h : (or/c (box/c (and/c real? (not/c negative?))) #f)
```

Gets the current extent of the editor's graphical representation. The `w` box is filled with the editor's width, unless `w` is `#f`. The `h` box is filled with the editor's height, unless `h` is `#f`. For a text editor, the reported extent includes the editor's padding (see `set-padding`).

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`). For

text% objects, calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send an-editor get-file directory) → (or/c path-string? #f)
  directory : (or/c path? #f)
```

Specification: Called when the user must be queried for a filename to load an editor. A starting-directory path is passed in, but is may be #f to indicate that any directory is fine.

Note that the *directory* argument cannot be a string; it must be a path value or #f.

Default implementation: Calls the global get-file procedure.

If the editor is displayed in a single canvas, then the canvas's top-level frame is used as the parent for the file dialog. Otherwise, the file dialog will have no parent.

```
(send an-editor get-file-sha1) → (or/c bytes? #f)
```

Returns the sha1 (see §13.11 "Cryptographic Hashing") of the most recently loaded or saved file in this editor (but see update-sha1?), unless enable-sha1 was never called or no file has been loaded or saved since it was called, in which case this method returns #f.

This method's result will change only after save-file or load-file are called, and can be monitored via after-save-file and after-load-file.

See also is-sha1-enabled?.

Added in version 1.50 of package gui-lib.

```
(send an-editor get-filename [temp]) → (or/c path-string? #f)
  temp : (or/c (box/c any/c) #f) = #f
```

Returns the path name of the last file saved from or loaded into this editor, #f if the editor has no filename.

The *temp* box is filled with #t if the filename is temporary or #f otherwise.

```
(send an-editor get-flattened-text) → string?
```

Returns the contents of the editor in text form. See §5.5 "Flattened Text" for a discussion of flattened vs. non-flattened text.

```
(send an-editor get-focus-snip) → (or/c (is-a?/c snip%) #f)
```

Returns the snip within the editor that gets the keyboard focus when the editor has the focus, or `#f` if the editor does not delegate the focus.

The returned snip might be an `editor-snip%` object. In that case, the embedded editor might delegate the focus to one of its own snips. However, the `get-focus-snip` method returns only the `editor-snip%` object, because it is the focus-owning snip within the immediate editor.

See also `set-caret-owner`.

```
(send an-editor get-inactive-caret-threshold)
 → (or/c 'no-caret 'show-inactive-caret 'show-caret)
```

Returns the threshold for painting an inactive selection. This threshold is compared with the `draw-caret` argument to `refresh` and if the argument is as least as large as the threshold (but larger than `'show-caret`), the selection is drawn as inactive.

See also `set-inactive-caret-threshold` and §5.6 “Caret Ownership”.

```
(send an-editor get-keymap) → (or/c (is-a?/c keymap%) #f)
```

Returns the main keymap currently used by the editor.

```
(send an-editor get-load-overwrites-styles) → boolean?
```

Reports whether named styles in the current style list are replaced by `load-file` when the loaded file contains style specifications.

See also `set-load-overwrites-styles`.

```
(send an-editor get-max-height)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the maximum display height for the contents of the editor; zero or `'none` indicates that there is no maximum.

```
(send an-editor get-max-undo-history)
 → (or/c (integer-in 0 100000) 'forever)
```

Returns the maximum number of undoables that will be remembered by the editor. Note that undoables are counted by insertion, deletion, etc. events, not by the number of times that `undo` can be called; a single `undo` call often reverses multiple events at a time (such as when the user types a stream of characters at once).

When an editor is in preserve-all-history mode (see `set-undo-preserves-all-history`), then any non-`0` value is treated the same as `'forever`.

```
(send an-editor get-max-view-size) → real? real?
```

Returns the maximum visible area into which the editor is currently being displayed, according to the editor's administrators. If the editor has only one display, the result is the same as for `get-view-size`. Otherwise, the maximum width and height of all the editor's displaying canvases is returned.

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`).

If the display is an editor canvas, see also `reflow-container`.

```
(send an-editor get-max-width)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the maximum display width for the contents of the editor; zero or `'none` indicates that there is no maximum. In a text editor, zero of `'none` disables automatic line breaking.

```
(send an-editor get-min-height)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the minimum display height for the contents of the editor; zero or `'none` indicates that there is no minimum.

```
(send an-editor get-min-width)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the minimum display width for the contents of the editor; zero or `'none` indicates that there is no minimum.

```
(send an-editor get-paste-text-only) → boolean?
```

If the result is `#t`, then the editor accepts only plain-text data from the clipboard. If the result is `#f`, the editor accepts both text and snip data from the clipboard.

```
(send an-editor get-snip-data thesnip)
 → (or/c (is-a?/c editor-data%) #f)
  thesnip : (is-a?/c snip%)
```

Specification: Gets extra data associated with a snip (e.g., location information in a pasteboard) or returns `#f` is there is no information. See §5.2.1.2 "Editor Data" for more information.

Default implementation: Returns `#f`.

```
(send an-editor get-snip-location  thesnip
                                  [x
                                   y
                                   bottom-right?]) → boolean?
  thesnip : (is-a?/c snip%)
  x : (or/c (box/c real?) #f) = #f
  y : (or/c (box/c real?) #f) = #f
  bottom-right? : any/c = #f
```

Gets the location of the given snip. If the snip is found in the editor, `#t` is returned; otherwise, `#f` is returned.

The *x* box is filled with the x-coordinate of the snip's location, unless *x* is `#f`. The *y* box is filled with the y-coordinate of the snip's location, unless *y* is `#f`.

If *bottom-right?* is not `#f`, the values in the *x* and *y* boxes are for the snip's bottom right corner instead of its top-left corner.

Obtaining the location of the bottom-right corner may trigger delayed size calculations (including snips other than the one whose location was requested).

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`). As a special case, however, a `pasteboard%` object always reports valid answers when *bottom-right?* is `#f`. For `text%` objects, calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see `refresh-delayed?`).

```
(send an-editor get-space) → (and/c real? (not/c negative?))
```

Returns the maximum font space for the editor. This method is primarily used when an editor is an item within another editor. For a text editor, the reported space includes the editor's top padding (see `set-padding`).

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when get-admin returns an administrator (not #f). For text% objects, calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send an-editor get-style-list) → (is-a?/c style-list%)
```

Returns the style list currently in use by the editor.

```
(send an-editor get-view-size w h) → void?
  w : (or/c (box/c (and/c real? (not/c negative?))) #f)
  h : (or/c (box/c (and/c real? (not/c negative?))) #f)
```

Returns the visible area into which the editor is currently being displayed (according to the editor’s administrator). See also get-view .

The w box is filled with the visible area width, unless w is #f. The h box is filled with the visible area height, unless h is #f.

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when get-admin returns an administrator (not #f).

If the display is an editor canvas, see also reflow-container.

```
(send an-editor global-to-local x y) → void?
  x : (or/c (box/c real?) #f)
  y : (or/c (box/c real?) #f)
```

Converts the given coordinates from top-level display coordinates (usually canvas coordinates) to editor location coordinates. The same calculation is performed by dc-location-to-editor-location.

The x box is filled with the translated x-coordinate of the value initially in x, unless x is #f. The y box is filled with the translated x-coordinate of the value initially in y, unless y is #f.

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when get-admin returns an administrator (not #f).

See also local-to-global.

```
(send an-editor in-edit-sequence?) → boolean?
```

This method is final, so it cannot be overridden.

Returns #t if updating on this editor is currently delayed because begin-edit-sequence has been called for this editor.

See also refresh-delayed?.

```
(send an-editor insert snip) → void?
  snip : (is-a?/c snip%)
```

Inserts data into the editor. A snip cannot be inserted into multiple editors or multiple times within a single editor.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use on-insert in text% or on-insert in pasteboard% to monitor content additions changes.

```
(send an-editor insert-box [type]) → void?
  type : (or/c 'text 'pasteboard) = 'text
```

Inserts a box (a sub-editor) into the editor by calling on-new-box, then passing along type and inserts the resulting snip into the editor.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use on-insert in text% or on-insert in pasteboard% to monitor content additions changes.

```
(send an-editor insert-file  filename
                            [format
                             show-errors?]) → boolean?
  filename : path-string?
  format : (or/c 'guess 'same 'copy 'standard = 'guess
                 'text 'text-force-cr)
  show-errors? : any/c = #t
```

Inserts the content of a file or port into the editor (at the current selection position in text% editors). The result is #t; if an error occurs, an exception is raised.

For information on format, see load-file. The show-errors? argument is no longer used.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use on-insert in text% or on-insert in pasteboard% to monitor content additions changes.

```
(send an-editor insert-image [filename
                              type
                              relative-path?
                              inline?])       → void?
  filename : (or/c path-string? #f) = #f
  type : (or/c 'unknown 'unknown/mask 'unknown/alpha
               'gif 'gif/mask 'gif/alpha
               'jpeg 'png 'png/mask 'png/alpha
               'xbm 'xpm 'bmp 'pict)
       = 'unknown/alpha
  relative-path? : any/c = #f
  inline? : any/c = #t
```

Inserts an image into the editor.

If *filename* is #f, then the user is queried for a filename. The kind must one of the symbols that can be passed to load-file.

After the filename has been determined, an image is created by calling on-new-image-snip. See also image-snip%.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use on-insert in text% or on-insert in pasteboard% to monitor content additions changes.

```
(send an-editor insert-port  port
                             [format
                              replace-styles?])
 → (or/c 'standard 'text 'text-force-cr)
  port : input-port?
  format : (or/c 'guess 'same 'copy 'standard = 'guess
                 'text 'text-force-cr)
  replace-styles? : any/c = #t
```

Inserts the content of a port into the editor (at the current selection position in text% editors) without wrapping the insert operations as an edit sequence. The result is the actual format of the loaded content (which is different from the given format type if the given format is 'guess, 'same, or 'copy).

The *port* must support position setting with file-position.

For information on *format*, see load-file.

if *replace-styles?* is true, then styles in the current style list are replaced by style specifications in *port*'s stream.

See also insert-file.

```
(send an-editor invalidate-bitmap-cache [x
                                         y
                                         width
                                         height]) → void?
  x : real? = 0.0
  y : real? = 0.0
  width : (or/c (and/c real? (not/c negative?)) 'end 'display-end)
        = 'end
  height : (or/c (and/c real? (not/c negative?)) 'end 'display-end)
         = 'end
```

When on-paint is overridden, call this method when the state of on-paint's drawing changes.

The *x*, *y*, *width*, and *height* arguments specify the area that needs repainting in editor coordinates. If *width*/*height* is 'end, then the total height/width of the editor (as reported by get-extent) is used. Note that the editor's size can be smaller than the visible region of its display. If *width*/*height* is 'display-end, then the largest height/width of the editor's views (as reported by get-max-view) is used. If *width*/*height* is not 'display-end, then the given *width*/*height* is constrained to the editor's size.

The default implementation triggers a redraw of the editor, either immediately or at the end of the current edit sequence (if any) started by begin-edit-sequence.

See also size-cache-invalid.

```
(send an-editor is-locked?) → boolean?
```

Returns #t if the editor is currently locked, #f otherwise. See lock for more information.

```
(send an-editor is-modified?) → boolean?
```

Returns #t if the editor has been modified since the last save or load (or the last call to set-modified with #f), #f otherwise.

```
(send an-editor is-printing?) → boolean?
```

Returns #t if the editor is currently being printed through the print method, #f otherwise.

```
(send an-editor is-sha1-enabled?) → boolean
```

Returns #t when this editor will track the sha1 (see §13.11 “Cryptographic Hashing”) of the contents of the file on disk and #f otherwise.

If enable-sha1 has not been called, this method returns #f or, in other words, the computation of the sha1 is disabled by default.

See also get-file-sha1 and update-sha1?.

Added in version 1.50 of package gui-lib.

```
(send an-editor kill [time]) → void?
  time : exact-integer? = 0
```

In a text editor, cuts to the end of the current line, or cuts a newline if there is only whitespace between the selection and end of line. Multiple consecutive kills are appended. In a pasteboard editor, cuts the current selection.

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

See also cut.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use on-delete in text% or on-delete in pasteboard% to monitor content deletions changes.

```
(send an-editor load-file [filename
                           format
                           show-errors?]) → boolean?
  filename : (or/c path-string? #f) = #f
  format : (or/c 'guess 'same 'copy 'standard = 'guess
                 'text 'text-force-cr)
  show-errors? : any/c = #t
```

Loads a file into the editor and returns #t. If an error occurs, an exception is raised.

If *filename* is #f, then the internally stored filename will be used; if *filename* is "" or if the internal name is unset or temporary, then the user will be prompted for a name.

The possible values for *format* are listed below. A single set of *format* values are used for loading and saving files:

- 'guess — guess the format based on extension and/or contents; when saving a file, this is the same as 'standard

- 'same — read in whatever format was last loaded or saved
- 'standard — read/write a standard file (binary format)
- 'copy — write using whatever format was last loaded or saved, but do not change the modification flag or remember *filename* (saving only)
- 'text — read/write a text file (text% only); file writing uses the platform's text-mode conventions (e.g., newlines as return–linefeed combinations on Windows) when not specifically disabled via use-file-text-mode
- 'text-force-cr — read/write a text file (text% only); when writing, change automatic newlines (from word-wrapping) into real carriage returns

In a text% instance, the format returned from get-file-format is always one of 'standard, 'text, or 'text-force-cr.

The *show-errors?* argument is no longer used.

The filename used to load the file can be retrieved with get-filename. For a text% instance, the format can be retrieved with get-file-format. However, if an error occurs while loading the file, the filename is set to #f.

See also on-load-file, after-load-file, can-load-file?, and set-load-overwrites-styles.

```
(send an-editor local-to-global x y) → void?
  x : (or/c (box/c real?) #f)
  y : (or/c (box/c real?) #f)
```

Converts the given coordinates from editor location coordinates to top-level display coordinates (usually canvas coordinates). The same calculation is performed by editor-location-to-dc-location.

The *x* box is filled with the translated x-coordinate of the value initially in *x*, unless *x* is #f. The *y* box is filled with the translated x-coordinate of the value initially in *y*, unless *y* is #f.

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when get-admin returns an administrator (not #f).

See also global-to-local.

```
(send an-editor locations-computed?) → boolean?
```

Returns #t if all location information has been computed after recent changes to the editor's content or to its snips, #f otherwise.

Location information is often computed on demand, and `begin-edit-sequence` tends to delay the computation.

When the editor is locked for reflowing, location information cannot be recomputed. See also §5.9 “Internal Editor Locks”.

```
(send an-editor lock lock?) → void?
  lock? : any/c
```

Locks or unlocks the editor for modifications. If an editor is locked, *all* modifications are blocked, not just user modifications.

See also `is-locked?`.

This method does not affect internal locks, as discussed in §5.9 “Internal Editor Locks”.

```
(send an-editor locked-for-flow?) → boolean?
```

This method is final, so it cannot be overridden.

Reports whether the editor is internally locked for flowing. See §5.9 “Internal Editor Locks” for more information.

```
(send an-editor locked-for-read?) → boolean?
```

This method is final, so it cannot be overridden.

Reports whether the editor is internally locked for reading. See §5.9 “Internal Editor Locks” for more information.

```
(send an-editor locked-for-write?) → boolean?
```

This method is final, so it cannot be overridden.

Reports whether the editor is internally locked for writing. See §5.9 “Internal Editor Locks” for more information.

```
(send an-editor needs-update snip
                             localx
                             localy
                             w
                             h)      → void?
  snip : (is-a?/c snip%)
  localx : real?
  localy : real?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Typically called (indirectly) by a snip within the editor to force the editor to be redrawn.

The *localx*, *localy*, width, and height arguments specify the area that needs repainting in the coordinate system of *snip*.

For text% objects, calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send an-editor num-scroll-lines) → exact-nonnegative-integer?
```

Reports the number of scroll positions available within the editor.

For text% objects: Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for line-start-position (which handles specially the case of no display when the editor has a maximum width).

```
(send an-editor on-change) → void?
```

Refine this method with augment.

Specification: Called whenever any change is made to the editor that affects the way the editor is drawn or the values reported for the location/size of some snip in the editor. The on-change method is called just before the editor calls its administrator's needs-update method to refresh the editor's display, and it is also called just before and after printing an editor.

The editor is locked for writing and reflowing during the call to on-change.

Default implementation: Does nothing.

```
(send an-editor on-char event) → void?
  event : (is-a?/c key-event%)
```

Specification: Handles keyboard input to the editor.

Consider overriding on-local-char or on-default-char instead of this method.

Default implementation: Either passes this event on to a caret-owning snip or calls on-local-char. In the latter case, text% first calls hide-cursor-until-moved.

```
(send an-editor on-default-char event) → void?
  event : (is-a?/c key-event%)
```

Specification: Called by on-local-char when the event is *not* handled by a caret-owning snip or by the keymap.

Default implementation: Does nothing.

```
(send an-editor on-default-event event) → void?
  event : (is-a?/c mouse-event%)
```

Specification: Called by on-local-event when the event is *not* handled by a caret-owning snip or by the keymap.

Default implementation: Does nothing. See also on-default-event in text% and on-default-event in pasteboard%.

```
(send an-editor on-display-size) → void?
```

Refine this method with augment.

Specification: This method is called by the editor's display whenever the display's size (as reported by get-view-size) changes, but it is called indirectly through on-display-size-when-ready.

Default implementation: If automatic wrapping is enabled (see auto-wrap) then set-max-width is called with the maximum width of all of the editor's canvases (according to the administrators; call-as-primary-owner in editor-canvas% is used with each canvas to set the administrator and get the view size). If the editor is displayed but not in a canvas, the unique width is obtained from the editor's administrator (there is only one). If the editor is not displayed, the editor's maximum width is not changed.

```
(send an-editor on-display-size-when-ready) → void?
```

Calls on-display-size unless the editor is currently in an edit sequence or currently being refreshed. In the latter cases, the call to on-display-size is delegated to another thread; see §5.10 "Editors and Threads" for more information.

```
(send an-editor on-edit-sequence) → void?
```

Refine this method with augment.

Specification: Called just after a top-level (i.e., unnested) edit sequence starts.

During an edit sequence, all callbacks methods are invoked normally, but it may be appropriate for these callbacks to delay computation during an edit sequence. The callbacks must manage this delay manually. Thus, when overriding other callback methods,

such as on-insert in text%, on-insert in pasteboard%, after-insert in text%, or after-insert in pasteboard%, consider overriding on-edit-sequence and after-edit-sequence as well.

"Top-level edit sequence" refers to an outermost pair of begin-edit-sequence and end-edit-sequence calls. The embedding of an editor within another editor does not affect the timing of calls to on-edit-sequence, even if the embedding editor is in an edit sequence.

Pairings of on-edit-sequence and after-edit-sequence can be nested if an after-edit-sequence starts a new edit sequence, since after-edit-sequence is called after an edit sequence ends. However, on-edit-sequence can never start a new top-level edit sequence (except through an unpaired end-edit-sequence), because it is called after a top-level edit sequence starts.

Default implementation: Does nothing.

```
(send an-editor on-event event) → void?
  event : (is-a?/c mouse-event%)
```

Specification: Handles mouse input to the editor. The event's x and y coordinates are in the display's co-ordinate system; use the administrator's get-dc method to obtain translation arguments (or use dc-location-to-editor-location).

Consider overriding on-local-event or on-default-event instead of this method.

Default implementation: Either passes this event on to a caret-owning snip, selects a new caret-owning snip (text% only) and passes the event on to the selected snip, or calls on-local-event. A new caret-owning snip is selected in a text% object when the click is on an event-handling snip, and not too close to the space between snips (see get-between-threshold).

```
(send an-editor on-focus on?) → void?
  on? : any/c
```

Called when the keyboard focus changes into or out of this editor (and not to/from a snip within the editor) with #t if the focus is being turned on, #f otherwise.

```
(send an-editor on-load-file filename
                             format)  → void?
  filename : path?
  format : (or/c 'guess 'same 'copy 'standard
                 'text 'text-force-cr)
```

Refine this method with augment.

Specification: Called just before the editor is loaded from a file, after calling `can-load-file?` to verify that the load is allowed. See also `after-load-file`.

The *`filename`* argument is the name the file will be loaded from. See `load-file` for information about *`format`*.

Note that the *`filename`* argument cannot be a string; it must be a path value.

Default implementation: Does nothing.

```
(send an-editor on-local-char event) → void?
  event : (is-a?/c key-event%)
```

Specification: Called by `on-char` when the event is *not* handled by a caret-owning snip.

Consider overriding `on-default-char` instead of this method.

Default implementation: Either lets the keymap handle the event or calls `on-default-char`.

```
(send an-editor on-local-event event) → void?
  event : (is-a?/c mouse-event%)
```

Specification: Called by `on-event` when the event is *not* handled by a caret-owning snip.

Consider overriding `on-default-event` instead of this method.

Default implementation: Either lets the keymap handle the event or calls `on-default-event`.

```
(send an-editor on-new-box type) → (is-a?/c snip%)
  type : (or/c 'text 'pasteboard)
```

Specification: Creates and returns a new snip for an embedded editor. This method is called by `insert-box`.

Default implementation: Creates a `editor-snip%` with either a sub-editor from `text%` or sub-pasteboard from `pasteboard%`, depending on whether *`type`* is `'text` or `'pasteboard`. The keymap (see `keymap%`) and style list (see `style-list%`) for of the new sub-editor are set to the keymap and style list of this editor.

```
(send an-editor on-new-image-snip filename
                                  kind
                                  relative-path?
                                  inline?)
```

```
→ (is-a?/c image-snip%)
 filename : path?
 kind : (or/c 'unknown 'unknown/mask 'unknown/alpha
              'gif 'gif/mask 'gif/alpha
              'jpeg 'png 'png/mask 'png/alpha
              'xbm 'xpm 'bmp 'pict)
 relative-path? : any/c
 inline? : any/c
```

Specification: Creates and returns a new instance of `image-snip%` for `insert-image`.

Note that the *filename* argument cannot be a string; it must be a path value.

Default implementation: Returns `(make-object image-snip% filename kind relative-path? inline?)`.

```
(send an-editor on-paint before?
                         dc
                         left
                         top
                         right
                         bottom
                         dx
                         dy
                         draw-caret) → void?
 before? : any/c
 dc : (is-a?/c dc<%>)
 left : real?
 top : real?
 right : real?
 bottom : real?
 dx : real?
 dy : real?
 draw-caret : (or/c 'no-caret 'show-inactive-caret 'show-caret
                    (cons/c exact-nonnegative-integer?
                            exact-nonnegative-integer?))
```

Specification: Provides a way to add arbitrary graphics to an editor's display. This method is called just before and just after every painting of the editor.

The *dx* and *dy* arguments specify the drawing coordinates in *dc* for the editor's top-left corner. That is, to draw at a particular position in editor coordinates, add *dx* and *dy* to get *dc* drawing coordinates.

The *before?* argument is `#t` when the method is called just before painting the contents

of the editor or #f when it is called after painting. The *left*, *top*, *right*, and *bottom* arguments specify which region of the editor is being repainted, in editor coordinates, in case it is useful to optimize for drawing into only that subregion. (Since *left*, *top*, *right*, and *bottom* are in editor coordinates, add *dx* or *dy* to get the corresponding *dc* region.) See §5.6 "Caret Ownership" for information about *draw-caret*.

The on-paint method, together with the snips' draw methods, must be able to draw the entire state of an editor. Never paint directly into an editor's display canvas except from within on-paint or draw. Instead, put all extra drawing code within on-paint and call invalidate-bitmap-cache when part of the display needs to be repainted.

If an on-paint method uses cached location information, then the cached information should be recomputed in response to a call of invalidate-bitmap-cache.

The on-paint method must not make any assumptions about the state of the drawing context (e.g., the current pen), except that the clipping region is already set to something appropriate. Before on-paint returns, it must restore any drawing context settings that it changes.

The editor is internally locked for writing and reflowing during a call to this method (see also §5.9 "Internal Editor Locks"). The on-paint method is called during a refresh; see §5.10 "Editors and Threads".

See also invalidate-bitmap-cache.

Default implementation: Does nothing.

```
(send an-editor on-save-file filename
                             format)  → void?
  filename : path?
  format : (or/c 'guess 'same 'copy 'standard
                 'text 'text-force-cr)
```

Refine this method with augment.

Specification: Called just before the editor is saved to a file, after calling can-save-file? to verify that the save is allowed. See also after-save-file.

The *filename* argument is the name the file will be saved to. See load-file for information about *format*.

Note that the *filename* argument cannot be a string; it must be a path value.

Default implementation: Does nothing.

```
(send an-editor on-scroll-to) → void?
```

Specification: Called when the editor is about to scroll, but the entire display is may not be refreshed. (If the editor scrolls but the entire window is redrawn, this method may not be called.)

See also `get-scroll-via-copy`.

Default implementation: Does nothing.

```
(send an-editor on-snip-modified snip
                                 modified?) → void?
  snip : (is-a?/c snip%)
  modified? : any/c
```

Refine this method with `augment`.

Specification: This method is called whenever a snip within the editor reports that it has been modified (by calling its adminstrator's `modified` method). The method arguments are the snip that reported a modification-state change, and the snip's new modification state.

See also `set-modified`.

Default implementation: If *modified?* is true and the editor was not already modified (i.e., its `is-modified?` method reports `#f`), then the `set-modified` method is called with `#t`. If the editor was already modified, then the internal modify-counter is incremented.

If *modified?* is `#f`, and if the modify-counter is `1`, then the `set-modified` method is called with `#f` (on the assumption that the modify-counter was set to `1` by an earlier call to this method for the same snip).

```
(send an-editor own-caret own?) → void?
  own? : any/c
```

Specification: Tells the editor to display or not display the caret or selection.

The focus state of an editor can be changed by by the system, and such changes do not go through this method; use `on-focus` to monitor focus changes.

Default implementation: Propagates the flag to any snip with the editor-local focus. If no sub-editors are active, the editor assumes the caret ownership.

```
(send an-editor paste [time]) → void?
  time : exact-integer? = 0
```

Pastes the current contents of the clipboard into the editor.

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

The system may execute a paste (in response to other method calls) without calling this method. To extend or re-implement copying, override the do-paste in text% or do-paste in pasteboard% method.

See also get-paste-text-only.

```
(send an-editor paste-x-selection [time]) → void?
  time : exact-integer? = 0
```

Like paste, but on Unix, uses the X11 selection instead of the clipboard.

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

To extend or re-implement copying, override the do-paste-x-selection in text% or do-paste-x-selection in pasteboard% method.

```
(send an-editor print [interactive?
                      fit-on-page?
                      output-mode
                      parent
                      force-ps-page-bbox?
                      as-eps?])            → void?
  interactive? : any/c = #t
  fit-on-page? : any/c = #t
  output-mode : (or/c 'standard 'postscript 'pdf) = 'standard
  parent : (or/c (or/c (is-a?/c frame%) (is-a?/c dialog%)) #f)
         = #f
  force-ps-page-bbox? : any/c = #t
  as-eps? : any/c = #f
```

Prints the editor.

If *interactive?* is true and a PostScript file is created, the is given a dialog for adjusting printing parameters; see also get-ps-setup-from-user. Otherwise, if a PostScript file is created, the settings returned by current-ps-setup are used. (The user may still get a dialog to select an output file name; see post-script-dc% for more details.)

If *fit-on-page?* is a true value, then during printing for a text% editor, the editor’s maximum width is set to the width of the page (less margins) and the autowrapping bitmap is removed.

The *output-mode* setting determines whether the output is generated directly as a PostScript file, generated directly as a PDF file, or generated using the platform-specific standard printing mechanism. The possible values are

- 'standard — print using the platform-standard mechanism (via a printer-dc%)
- 'postscript — print to a PostScript file (via a post-script-dc%)
- 'pdf — print to a PDF file (via a pdf-dc%)

If *parent* is not #f, it is used as the parent window for configuration dialogs (for either PostScript or platform-standard printing). If *parent* is #f and if the editor is displayed in a single canvas, then the canvas's top-level frame is used as the parent for configuration dialogs. Otherwise, configuration dialogs will have no parent.

The *force-ps-page-bbox?* argument is used for PostScript and PDF printing, and is used as the third initialization argument when creating the post-script-dc% or pdf-dc% instance. Unless it is #f, the bounding-box of the resulting PostScript/PDF file is set to the current paper size.

The *as-eps?* argument is used for PostScript and PDF printing, and is used as the fourth initialization argument when creating the post-script-dc% or pdf-dc% instance. Unless it is #f, a resulting PostScript file is identified as Encapsulated PostScript (EPS).

The printing margins are determined by get-editor-margin in the current ps-setup% object (as determined by current-ps-setup), but they are ignored when *as-eps?* is true.

```
(send an-editor print-to-dc dc [page-number]) → void?
  dc : (is-a?/c dc<%>)
  page-number : exact-integer? = -1
```

Prints the editor into the given drawing context. See also print.

If *page-number* is a positive integer, then just the indicated page is printed, where pages are numbered from 1. If *page-number* is 0, then the entire content of the editor is printed on a single page. When *page-number* is negative, then the editor content is split across pages as needed to fit, and the start-page and end-page methods of dc<%> are called for each page.

```
(send an-editor put-file directory
                         default-name) → (or/c path-string? #f)
  directory : (or/c path? #f)
  default-name : (or/c path? #f)
```

Specification: Called when the user must be queried for a filename to save an editor. Starting-directory and default-name paths are passed in, but either may be #f to indicate that any

directory is fine or there is no default name.

Note that the *directory* and filename arguments cannot be strings; each must be a path value.

Default implementation: Calls the global put-file procedure.

If the editor is displayed in a single canvas, then the canvas's top-level frame is used as the parent for the file dialog. Otherwise, the file dialog will have no parent.

```
(send an-editor read-footer-from-file stream
                                      name)  → boolean?
  stream : (is-a?/c editor-stream-in%)
  name : string?
```

See read-header-from-file.

```
(send an-editor read-from-file  stream
                                [overwrite-styles?]) → boolean?
  stream : (is-a?/c editor-stream-in%)
  overwrite-styles? : any/c = #f
```

Reads new contents for the editor from a stream. The return value is #t if there are no errors, #f otherwise.

The stream provides either new mappings for names in the editor's style list, or it indicates that the editor should share a previously-read style list (depending on how style lists were shared when the editor was written to the stream; see also write-to-file).

- In the former case, if the *overwrite-styles?* argument is #f, then each style name in the loaded file that is already in the current style list keeps its current style. Otherwise, existing named styles are overwritten with specifications from the loaded file.
- In the latter case, the editor's style list will be changed to the previously-read list.

Leveraging read-from-file to read from the editor stream requires some ceremony which may not be obvious at first; calls to read-editor-global-header and read-editor-global-footer must bracket any call to read-from-file, and only one stream at a time can be read from using these methods or written to using write-editor-global-header and write-editor-global-footer. See also §5.2 "File Format".

As a complete example consider the following:

```
(define (deserialize-text byte-stream)
```

```
(define editor (new text% [auto-wrap #t]))
(define editor-stream-in-bytes-base
  (make-object editor-stream-in-bytes-base% byte-stream))
(define editor-stream-in
  (make-object editor-stream-in% editor-stream-in-bytes-base))
(read-editor-global-header editor-stream-in)
(send editor read-from-file editor-stream-in)
(read-editor-global-footer editor-stream-in)
editor)
```

```
(send an-editor read-header-from-file stream
                                      name)  → boolean?
  stream : (is-a?/c editor-stream-in%)
  name : string?
```

Called to handle a named header that is found when reading editor data from a stream. The return value is `#t` if there are no errors, `#f` otherwise.

Override this method only to embellish the file format with new header information. Always call the inherited method if the derived reader does not recognize the header.

See also §5.2 “File Format”.

```
(send an-editor redo) → void?
```

Undoes the last undo, if no other changes have been made since. See `undo` for information about Emacs-style undo. If the editor is currently performing an undo or redo, the method call is ignored.

The system may perform a redo without calling this method in response to other method calls. Use methods such as `on-change` to monitor editor content changes.

See also `add-undo`.

```
(send an-editor refresh x
                        y
                        width
                        height
                        draw-caret
                        background) → void?
  x : real?
  y : real?
  width : (and/c real? (not/c negative?))
  height : (and/c real? (not/c negative?))
```

```
draw-caret : (or/c 'no-caret 'show-inactive-caret 'show-caret
                   (cons/c exact-nonnegative-integer?
                           exact-nonnegative-integer?))
background : (or/c (is-a?/c color%) #f)
```

Repaints a region of the editor, generally called by an editor administrator. The *x*, *y*, *width*, and *height* arguments specify the area that needs repainting in editor coordinates. The get-dc method of the editor's administrator (as returned by get-admin) supplies the target dc<%> object and offset for drawing.

See §5.6 "Caret Ownership" for information about *draw-caret*.

The *background* color corresponds to the background of the display; if it is #f, then the display is transparent. An editor should use the given background color as its own background (or not paint the background of *background* is #f).

See §5.10 "Editors and Threads" for information about edit sequences and refresh requests.

```
(send an-editor refresh-delayed?) → boolean?
```

Returns #t if updating on this editor is currently delayed. Updating may be delayed because begin-edit-sequence has been called for this editor, or because the editor has no administrator, or because the editor's administrator returns #t from its refresh-delayed? method. (The administrator might return #t because an enclosing editor's refresh is delayed.)

See also in-edit-sequence?.

```
(send an-editor release-snip snip) → boolean?
  snip : (is-a?/c snip%)
```

Requests that the specified snip be deleted and released from the editor. If this editor is not the snip's owner or if the snip cannot be released, then #f is returned. Otherwise, #t is returned and the snip is no longer owned.

See also release-snip in snip-admin% .

```
(send an-editor remove-canvas canvas) → void?
  canvas : (is-a?/c editor-canvas%)
```

Removes a canvas from this editor's list of displaying canvases. (See get-canvases.)

Normally, this method is called only by set-editor in editor-canvas%.

```
(send an-editor resized snip redraw-now?) → void?
  snip : (is-a?/c snip%)
  redraw-now? : any/c
```

Called (indirectly) by snips within the editor: it forces a recalculation of the display information in which the specified snip has changed its size.

If *redraw-now?* is #f, the editor will require another message to repaint itself. (See also needs-update.)

```
(send an-editor save-file [filename
                           format
                           show-errors?]) → boolean?
  filename : (or/c path-string? #f) = #f
  format : (or/c 'guess 'same 'copy 'standard = 'same
                 'text 'text-force-cr)
  show-errors? : any/c = #t
```

Saves the editor into a file and returns #t. If an error occurs, an exception is raised.

If *filename* is #f, then the internally stored filename will be used; if *filename* is "" or if the internal name is unset or temporary, then the user will be prompted for a name. The possible values for *format* are described at load-file.

The filename and format used to save the file can be retrieved with get-filename unless the *format* is 'copy – see also load-file for more information on the *format* argument.

In a text% instance, the format can be retrieved with get-file-format.

See also on-save-file, after-save-file, and can-save-file?.

On Mac OS, the file's creator and type signature are set; see get-file-creator-and-type for more information.

The *show-errors?* argument is no longer used.

```
(send an-editor save-port  port
                          [format
                           show-errors?]) → boolean?
  port : output-port?
  format : (or/c 'guess 'same 'copy 'standard = 'same
                 'text 'text-force-cr)
  show-errors? : any/c = #t
```

Saves the editor into a port and returns #t. If an error occurs, an exception is raised.

The possible values for *format* are described at load-file.

The *show-errors?* argument is no longer used.

```
(send an-editor scroll-editor-to localx
                                 localy
                                 width
                                 height
                                 refresh?
                                 bias)    → boolean?
  localx : real?
  localy : real?
  width : (and/c real? (not/c negative?))
  height : (and/c real? (not/c negative?))
  refresh? : any/c
  bias : (or/c 'start 'end 'none)
```

Causes the editor to be scrolled so that a given location is visible. If the editor is scrolled, #t is returned, otherwise #f is returned.

This method is normally called indirectly by scroll-to or scroll-to-position in text% to implement scrolling.

The default implementation forwards the request to the scroll-to method of the current administrator, if any (see get-admin). If a text editor has padding (see set-padding), then the padding is added to the given location before forwarding to the administrator. If the editor has no administrator, #f is returned.

```
(send an-editor scroll-line-location pos)
 → (and/c real? (not/c negative?))
  pos : exact-nonnegative-integer?
```

Maps a vertical scroll position to a vertical location within the editor.

For text% objects: Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for line-start-position (which handles specially the case of no display when the editor has a maximum width).

```
(send an-editor scroll-to  snip
                           localx
                           localy
                           width
                           height
                           refresh?
                          [bias])    → boolean?
  snip : (is-a?/c snip%)
  localx : real?
  localy : real?
  width : (and/c real? (not/c negative?))
  height : (and/c real? (not/c negative?))
  refresh? : any/c
  bias : (or/c 'start 'end 'none) = 'none
```

Called (indirectly) by snips within the editor: it causes the editor to be scrolled so that a given location range within a given snip is visible. If the editor is scrolled immediately, `#t` is returned, otherwise `#f` is returned.

If refreshing is delayed (see `refresh-delayed?`), then the scroll request is saved until the delay has ended. The scroll is performed (immediately or later) by calling `scroll-editor-to`.

The *localx*, *localy*, *width*, and *height* arguments specify the area that needs to be visible in *snip*'s coordinate system.

When the specified region cannot fit in the visible area, *bias* indicates which end of the region to display. When *bias* is `'start`, then the top-left of the region is displayed. When *bias* is `'end`, then the bottom-right of the region is displayed. Otherwise, *bias* must be `'none`.

```
(send an-editor select-all) → void?
```

Selects all data in the editor

```
(send an-editor set-active-canvas canvas) → void?
  canvas : (is-a?/c editor-canvas%)
```

Sets the active canvas for this editor. (See `get-active-canvas`.)

Normally, this method is called only by `on-focus` in `editor-canvas%` in an editor canvas that is displaying an editor.

```
(send an-editor set-admin admin) → void?
  admin : (or/c (is-a?/c editor-admin%) #f)
```

Sets the editor's administrator. This method is only called by an administrator.

The administrator of an editor can be changed by by the system, and such changes do not go through this method. A program cannot detect when the administrator changes except by polling get-admin.

```
(send an-editor set-caret-owner  snip
                                 [domain]) → void?
  snip : (or/c (is-a?/c snip%) #f)
  domain : (or/c 'immediate 'display 'global) = 'immediate
```

Attempts to give the keyboard focus to *snip*. If *snip* is #f, then the caret is taken away from any snip in the editor that currently has the caret and restored to this editor.

If the keyboard focus is moved to *snip* and the editor has the real keyboard focus, the own-caret method of the snip will be called.

If #f is provided as the new owner, then the local focus is moved to the editor itself. Otherwise, the local focus is moved to the specified snip.

The domain of focus-setting is one of:

- 'immediate — only set the focus owner within the editor
- 'display — make this editor or the new focus owner get the keyboard focus among the editors in this editor's display (if this is an embedded editor)
- 'global — make this editor or the new focus owner get the keyboard focus among all elements in the editor's frame

The focus state of an editor can be changed by by the system, and such changes do not go through this method; use on-focus to monitor focus changes.

See also get-focus-snip.

```
(send an-editor set-file-creator-and-type creator
                                         type)   → void?
  creator : (or/c #f (and/c bytes? #rx#"^....$"))
  type : (or/c #f (and/c bytes? #rx#"^....$"))
```

Sets the file type and creator used by save-file via a call to file-creator-and-type when the file is written. The arguments (*creator* and *type*) must both either be #f, or bytes? that have exactly four bytes. See also get-file-creator-and-type.

Added in version 1.49 of package gui-lib.

```
(send an-editor set-cursor  cursor
                            [override?]) → void?
  cursor : (or/c (is-a?/c cursor%) #f)
  override? : any/c = #t
```

Sets the custom cursor for the editor to *cursor*. If *override?* is a true value and *cursor* is not #f, then this cursor overrides cursor settings in embedded editors.

If the custom cursor is #f, the current cursor is removed, and a cursor is selected automatically by the editor (depending on whether the cursor is pointing at a clickback). See adjust-cursor for more information about the default selection.

An embedding editor's custom cursor can override the cursor of an embedded editor—even if the embedded editor has the caret—if the cursor is specified as an overriding cursor.

```
(send an-editor set-filename  filename
                              [temporary?]) → void?
  filename : (or/c path-string? #f)
  temporary? : any/c = #f
```

Sets the filename to *filename*. If *filename* is #f or *temporary?* is a true value, then the user will still be prompted for a name on future calls to save-file and load-file.

This method is also called when the filename changes through any method (such as load-file).

```
(send an-editor set-inactive-caret-threshold threshold) → void?
  threshold : (or/c 'no-caret 'show-inactive-caret 'show-caret)
```

Sets the threshold for painting an inactive selection. See get-inactive-caret-threshold for more information.

```
(send an-editor set-keymap [keymap]) → void?
  keymap : (or/c (is-a?/c keymap%) #f) = #f
```

Sets the current keymap for the editor. A #f argument removes all key mapping.

```
(send an-editor set-load-overwrites-styles overwrite?) → void?
  overwrite? : any/c
```

Determines whether named styles in the current style list are replaced by load-file when the loaded file contains style specifications.

See also get-load-overwrites-styles and read-from-file.

```
(send an-editor set-max-height width) → void?
  width : (or/c (and/c real? (not/c negative?)) 'none)
```

Sets the maximum display height for the contents of the editor. A value less or equal to 0 indicates that there is no maximum.

Setting the height is disallowed when the editor is internally locked for reflowing (see also §5.9 “Internal Editor Locks”).

```
(send an-editor set-max-undo-history count) → void?
  count : (or/c exact-nonnegative-integer? 'forever)
```

Sets the maximum number of undoables that will be remembered by the editor. The default is 0, which disables undo. The symbol 'forever is accepted as a synonym for a very large number.

When an editor is in preserve-all-history mode (see set-undo-preserves-all-history), then any non-0 value is treated the same as 'forever.

```
(send an-editor set-max-width width) → void?
  width : (or/c (and/c real? (not/c negative?)) 'none)
```

Sets the maximum display width for the contents of the editor; zero or 'none indicates that there is no maximum. In a text editor, having no maximum disables automatic line breaking, and the minimum (positive) maximum width depends on the width of the autowrap bitmap. The maximum width of a text editor includes its left and right padding (see set-padding) and its autowrap bitmap (see set-autowrap-bitmap).

Setting the width is disallowed when the editor is internally locked for reflowing (see also §5.9 “Internal Editor Locks”).

```
(send an-editor set-min-height width) → void?
  width : (or/c (and/c real? (not/c negative?)) 'none)
```

Sets the minimum display height for the contents of the editor; zero or 'none indicates that there is no minimum.

Setting the height is disallowed when the editor is internally locked for reflowing (see also §5.9 “Internal Editor Locks”).

```
(send an-editor set-min-width width) → void?
  width : (or/c (and/c real? (not/c negative?)) 'none)
```

Sets the minimum display width for the contents of the editor; zero or 'none indicates that there is no minimum.

Setting the width is disallowed when the editor is internally locked for reflowing (see also §5.9 “Internal Editor Locks”).

```
(send an-editor set-modified modified?) → void?
  modified? : any/c
```

Sets the modified state of the editor. Usually, the state is changed automatically after an insertion, deletion, or style change by calling this method. (This method is also called when the modification state changes through *any* method.) This method is usually not called when the state of the flag is not changing.

See also is-modified? and on-snip-modified.

When *modified?* is true, then an internal modify-counter is set to 1.

When *modified?* is #f and the editor’s undo or redo stack contains a system-created undoer that resets the modified state (because the preceding undo or redo action puts the editor back to a state where the modification state was #f), the undoer is disabled.

Regardless of the value of *modified?*, the editor’s adminstrator’s modified method is called.

Finally, if *modified?* is #f and the internal modify-counter is set to 0, then the set-unmodified method is called on every snip within the editor.

```
(send an-editor set-paste-text-only text-only?) → void?
  text-only? : any/c
```

Sets whether the editor accepts only text from the clipboard, or both text and snips. By default, an editor accepts both text and snips.

See also get-paste-text-only.

```
(send an-editor set-snip-data thesnip data) → void?
  thesnip : (is-a?/c snip%)
  data : (is-a?/c editor-data%)
```

Sets extra data associated with the snip (e.g., location information in a pasteboard). See §5.2.1.2 “Editor Data” for more information.

```
(send an-editor set-style-list style-list) → void?
  style-list : (is-a?/c style-list%)
```

Sets the editor's style list. Styles currently in use with the old style list will be "moved" to the new style list. In this "move," if a named style already exists in the new style list, then the new style with the same name will be used in place of the old style.

Setting the style list is disallowed when the editor is internally locked for reflowing (see also §5.9 "Internal Editor Locks").

```
(send an-editor set-undo-preserves-all-history on?) → void?
  on? : any/c
```

When *on?* is true, configures the editor to preserve all editing history, including operations that have been undone, as long as the maximum undo history is non-zero (see set-max-undo-history). Otherwise, operations that are undone (and not redone) before another operation are lost from the editor's history.

The default mode is determined by the 'GRacket:emacs-undo preference preference (see §10 "Preferences").

Added in version 1.1 of package gui-lib.

```
(send an-editor size-cache-invalid) → void?
```

This method is called when the drawing context given to the editor by its administrator changes in a way that makes cached size information (such as the width of a string) invalid.

The default implementation eventually propagates the message to snips, and, more generally, causes location information to be recalculated on demand.

See also invalidate-bitmap-cache.

```
(send an-editor style-has-changed style) → void?
  style : (or/c (is-a?/c style<%>) #f)
```

Notifies the editor that a style in its style list has changed. This method is automatically registered with the editor's style list using notify-on-change in style-list% and automatically deregistered when the style list is removed from the editor.

See notify-on-change in style-list% for more information.

```
(send an-editor undo) → void?
```

Undoes the last editor change, if undos have been enabled by calling set-max-undo-history with a non-zero integer or 'forever.

If the editor is currently performing an undo or redo, the method call is ignored.

The user may enable Emacs-style undo for editors; see §10 “Preferences”. Normally, undo operations add to the redo stack (see redo), and any undoable (non-undo) operation clears the redo stack. With Emacs-style undo, the redo stack is added back to the undo stack, along with the original undos, so that a complete history is kept in the undo stack.

The system may perform an undo without calling this method in response to other method calls. Use methods such as on-change to monitor editor content changes.

See also add-undo.

```
(send an-editor undo-preserves-all-history?) → boolean?
```

Reports whether the editor is in preserve-all-history mode. See set-undo-preserves-all-history for more information.

Added in version 1.1 of package gui-lib.

```
(send an-editor update-sha1? path) → any/c
  path : path-string?
```

Called when updating the file’s sha1 (so only if enable-sha1 has been called); if this method returns #f, then the sha1 is not updated and the result of get-file-sha1 does not change.

See also is-sha1-enabled?.

Added in version 1.50 of package gui-lib.

```
(send an-editor use-file-text-mode) → boolean?
(send an-editor use-file-text-mode on?) → void?
  on? : any/c
```

Gets or sets a boolean that controls if files are saved in 'text or 'binary mode (as in open-input-file’s #:mode argument). This flag is consulted only when the format is 'text or 'text-force-cr. See load-file for information on formats.

The setting is consulted by save-file after on-save-file is called.

Overriding this method is a reliable way to detect changes to the internal boolean.

```
(send an-editor write-footers-to-file stream) → boolean?
  stream : (is-a?/c editor-stream-out%)
```

See write-headers-to-file.

```
(send an-editor write-headers-to-file stream) → boolean?
  stream : (is-a?/c editor-stream-out%)
```

Specification: Called when the editor is being saved to a file. The return value is #t if there are no errors, #f otherwise. Override this method to add custom header data to a file, but always call the inherited method so that it can write its own extra headers.

To write a header item, call begin-write-header-footer-to-file, passing a box for an integer. Then write the header data and end by calling end-write-header-footer-to-file, passing back the integer that was put into the box. Follow this procedure correctly or the file will be corrupted.

Default implementation: Does nothing.

```
(send an-editor write-to-file stream) → boolean?
  stream : (is-a?/c editor-stream-out%)
```

Writes the current editor contents to the given stream. The return value is #t if there are no errors, #f otherwise.

If the editor's style list has already been written to the stream, it is not re-written. Instead, the editor content indicates that the editor shares a previously-written style list. This sharing will be recreated when the stream is later read.

Leveraging write-to-file to write to the editor stream requires some ceremony which may not be obvious at first; calls to write-editor-global-header and write-editor-global-footer must bracket any call to write-to-file, and only one stream at a time can be written to using these methods or read from using read-editor-global-header and read-editor-global-footer. See also §5.2 "File Format".

As a complete example consider the following:

```
(define (serialize-text text)
  (define editor-stream-out-bytes-base
    (new editor-stream-out-bytes-base%))
  (define editor-stream-out
    (make-object editor-stream-out% editor-stream-out-bytes-base))
  (write-editor-global-header editor-stream-out)
  (send text write-to-file editor-stream-out)
  (write-editor-global-footer editor-stream-out)
  (send editor-stream-out-bytes-base get-bytes))
```

7.2 editor-admin%

```
editor-admin% : class?
  superclass: object%
```

See §5.1.2 “Administrators” for information about the role of administrators. The editor-admin% class is never instantiated directly. It is not even instantiated through derived classes by most programmers; each editor-canvas% and editor-snip% object creates its own administrator. However, it may be useful to derive a new instance of this class to display editors in a new context. Also, it may be useful to call the methods of an existing administrator from an owned editor.

To create a new editor-admin% class, all methods described here must be overridden. They are all invoked by the administrator's editor.

```
(new editor-admin%) → (is-a?/c editor-admin%)
```

Creates a (useless) editor administrator.

```
(send an-editor-admin get-dc [x y]) → (or/c (is-a?/c dc<%>) #f)
  x : (or/c (box/c real?) #f) = #f
  y : (or/c (box/c real?) #f) = #f
```

Specification: Returns either the drawing context into which the editor is displayed, or the context into which it is currently being drawn. When the editor is not embedded, the returned context is always the drawing content into which the editor is displayed. If the editor is not displayed, #f is returned.

The origin of the drawing context is also returned, translated into the local coordinates of the editor. For an embedded editor, the returned origin is reliable only while the editor is being drawn, or while it receives a mouse or keyboard event.

The *x* box is filled with the x-origin of the DC in editor coordinates, unless *x* is #f. The *y* box is filled with the y-origin of the DC in editor coordinates, unless *y* is #f.

See also editor-location-to-dc-location in editor<%> and dc-location-to-editor-location in editor<%>.

Default implementation: Fills all boxes with 0.0 and returns #f.

```
(send an-editor-admin get-max-view  x
                                    y
                                    w
                                    h
                                   [full?]) → void?
  x : (or/c (box/c real?) #f)
```

```
  y : (or/c (box/c real?) #f)
  w : (or/c (box/c (and/c real? (not/c negative?))) #f)
  h : (or/c (box/c (and/c real? (not/c negative?))) #f)
  full? : any/c = #f
```

Specification: Same as `get-view` unless the editor is visible in multiple standard displays. If the editor has multiple displays, a region is computed that includes the visible region in all displays.

See `get-view`.

Default implementation: Fills all boxes with `0.0`.

```
(send an-editor-admin get-view x y w h [full?]) → void?
  x : (or/c (box/c real?) #f)
  y : (or/c (box/c real?) #f)
  w : (or/c (box/c (and/c real? (not/c negative?))) #f)
  h : (or/c (box/c (and/c real? (not/c negative?))) #f)
  full? : any/c = #f
```

Specification: Gets the visible region of the editor within its display (in editor coordinates), or the overall size of the viewing region in the editor's top-level display (for an embedded editor).

If the display is an editor canvas, see also `reflow-container`. The viewing area within an editor canvas is not the full client area of the canvas, because an editor canvas installs a whitespace border around a displayed editor within the client area.

The calculation of the editor's visible region is based on the current size and scrollbar values of the top-level display. For an editor canvas display, the region reported by `get-view` does not depend on whether the canvas is hidden, obscured by other windows, or moved off the edge of the screen.

The *x* box is filled with the left edge of the visible region in editor coordinates, unless *x* is `#f`. The *y* box is filled with the top edge of the visible region in editor coordinates, unless *y* is `#f`. The *w* box is filled with the width of the visible region, which may be larger than the editor itself, unless *w* is `#f`. The *h* box is filled with the height of the visible region, which may be larger than the editor itself, unless *h* is `#f`.

If an editor is fully visible and *full?* is `#f`, then *x* and *y* will both be filled with `0`.

If *full?* is a true value, then the returned area is the view area of the top-level display for the editor. This result is different only when the editor is embedded in another editor; in that case, the *x* and *y* values may be meaningless, because they are in the coordinate system of the immediate editor within the top-level display.

Default implementation: Fills all boxes with `0.0`.

```
(send an-editor-admin grab-caret [domain]) → void?
  domain : (or/c 'immediate 'display 'global) = 'global
```

Specification: Called by the editor to request the keyboard focus. If the request is granted, then the administered editor's `own-caret` method will be called.

See `set-caret-owner` for information about the possible values of *domain*.

Default implementation: Does nothing.

```
(send an-editor-admin modified modified?) → void?
  modified? : any/c
```

Specification: Called by the editor to report that its modification state has changed to either modified or unmodified.

See also `set-modified` in `editor<%>`.

Default implementation: Does nothing.

```
(send an-editor-admin needs-update localx
                                   localy
                                   w
                                   h)     → void?
  localx : real?
  localy : real?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Specification: Called by the editor to request a refresh to its displayed representation. When the administrator decides that the displayed should be refreshed, it calls the editor's `refresh` method.

The *localx*, *localy*, *w*, and *h* arguments specify a region of the editor to be updated (in editor coordinates).

Default implementation: Does nothing.

```
(send an-editor-admin popup-menu menu x y) → boolean?
  menu : (is-a?/c popup-menu%)
  x : real?
  y : real?
```

Specification:

Pops up the given popup-menu% object at the specified coordinates (in this window's coordinates), and returns after handling an unspecified number of events; the menu may still be popped up when this method returns. If a menu item is selected from the popup-menu, the callback for the menu item is called. (The eventspace for the menu item's callback is the administrator's display's eventspace.)

While the menu is popped up, its target is set to the top-level editor in this administrator's display. See get-popup-target for more information.

The result is #f if this admin is not connected to a canvas or the canvas it is connected to does not have an editor, #t otherwise (independent of whether the user selects an item in the popup menu).

The menu is displayed at *x* and *y* in editor coordinates.

Default implementation: Returns #f.

```
(send an-editor-admin refresh-delayed?) → boolean?
```

Specification: Returns #t if updating on this administrator's display is currently delayed (usually by begin-edit-sequence in editor<%> in an enclosing editor).

Default implementation: Returns #f.

```
(send an-editor-admin resized refresh?) → void?
  refresh? : any/c
```

Specification: Called by the editor to notify its display that the editor's size or scroll count has changed, so the scrollbars need to be adjusted to reflect the new size. The editor generally needs to be updated after a resize, but the editor decides whether the update should occur immediately. If *refresh?* is not #f, then the editor is requesting to be updated immediately.

Default implementation: Does nothing.

```
(send an-editor-admin scroll-to  localx
                                 localy
                                 w
                                 h
                                 [refresh?
                                  bias])    → boolean?
  localx : real?
  localy : real?
  w : (and/c real? (not/c negative?))
```

```
h : (and/c real? (not/c negative?))
refresh? : any/c = #t
bias : (or/c 'start 'end 'none) = 'none
```

Specification: Called by the editor to request scrolling so that the given region is visible. The editor generally needs to be updated after a scroll, but the editor decides whether the update should occur immediately.

The *localx*, *localy*, *w*, and *h* arguments specify a region of the editor to be made visible by the scroll (in editor coordinates).

If *refresh?* is not `#f`, then the editor is requesting to be updated immediately.

The *bias* argument is one of:

- `'start` — if the range doesn't fit in the visible area, show the top-left region
- `'none` — no special scrolling instructions
- `'end` — if the range doesn't fit in the visible area, show the bottom-right region

The return value is `#t` if the display is scrolled, `#f` if not (either because the requested region is already visible, because the display has zero size, or because the editor is currently printing).

If an editor has multiple displays, then if any display currently has the keyboard focus, it is scrolled. Otherwise, the "primary owner" of the editor (see `call-as-primary-owner`) is scrolled.

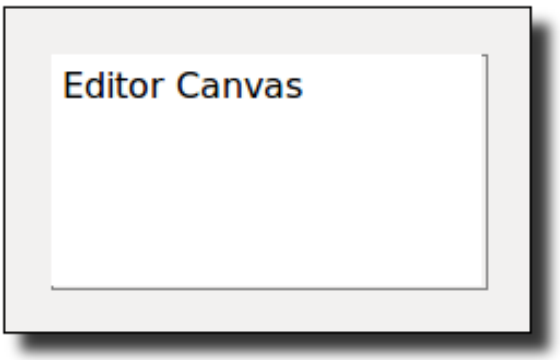
Default implementation: Return `#f`

```
(send an-editor-admin update-cursor) → void?
```

Specification: Queues an update for the cursor in the display for this editor. The actual cursor used will be determined by calling the editor's `adjust-cursor` method.

Default implementation: Does nothing.

7.3 editor-canvas%



editor-canvas% : class?
  superclass: object%
  extends: canvas<%>

An editor-canvas% object manages and displays a text% or pasteboard% object.

```
(new editor-canvas%
     [parent parent]
    [[editor editor]
     [style style]
     [scrolls-per-page scrolls-per-page]
     [label label]
     [wheel-step wheel-step]
     [line-count line-count]
     [horizontal-inset horizontal-inset]
     [vertical-inset vertical-inset]
     [enabled enabled]
     [vert-margin vert-margin]
     [horiz-margin horiz-margin]
     [min-width min-width]
     [min-height min-height]
     [stretchable-width stretchable-width]
     [stretchable-height stretchable-height]])
→ (is-a?/c editor-canvas%)
 parent : (or/c (is-a?/c frame%) (is-a?/c dialog%)
                (is-a?/c panel%) (is-a?/c pane%))
 editor : (or/c (or/c (is-a?/c text%) (is-a?/c pasteboard%)) #f)
        = #f
```

```
style : (listof (or/c 'no-border 'control-border 'combo = null
                      'no-hscroll 'no-vscroll
                      'hide-hscroll 'hide-vscroll
                      'auto-vscroll 'auto-hscroll
                      'resize-corner 'no-focus 'deleted
                      'transparent))
scrolls-per-page : (integer-in 1 10000) = 100
label : (or/c label-string? #f) = #f
wheel-step : (or/c (integer-in 1 10000) #f) = 3
line-count : (or/c (integer-in 1 1000) #f) = #f
horizontal-inset : spacing-integer? = 5
vertical-inset : spacing-integer? = 5
enabled : any/c = #t
vert-margin : spacing-integer? = 0
horiz-margin : spacing-integer? = 0
min-width : (or/c dimension-integer? #f) = #f
min-height : (or/c dimension-integer? #f) = #f
stretchable-width : any/c = #t
stretchable-height : any/c = #t
```

If a canvas is initialized with `#f` for *editor*, install an editor later with `set-editor`.

The *style* list can contain the following flags:

- `'no-border` — omits a border around the canvas
- `'control-border` — gives the canvas a border that is like a `text-field%` control
- `'combo` — gives the canvas a combo button that is like a `combo-field%` control; this style is intended for use with `'control-border`, `'hide-hscroll`, and `'hide-vscroll`
- `'no-hscroll` — disallows horizontal scrolling and hides the horizontal scrollbar
- `'no-vscroll` — disallows vertical scrolling and hides the vertical scrollbar
- `'hide-hscroll` — allows horizontal scrolling, but hides the horizontal scrollbar
- `'hide-vscroll` — allows vertical scrolling, but hides the vertical scrollbar
- `'auto-hscroll` — automatically hides the horizontal scrollbar when unneeded (unless `'no-hscroll` or `'hide-hscroll` is specified)
- `'auto-vscroll` — automatically hides the vertical scrollbar when unneeded (unless `'no-vscroll` or `'hide-vscroll` is specified)
- `'resize-corner` — leaves room for a resize control at the canvas's bottom right when only one scrollbar is visible

- `'no-focus` — prevents the canvas from accepting the keyboard focus when the canvas is clicked or when the `focus` method is called
- `'deleted` — creates the canvas as initially hidden and without affecting *parent*'s geometry; the canvas can be made active later by calling *parent*'s `add-child` method
- `'transparent` — the canvas is "erased" before an update using its parent window's background; see `canvas<%>` for information on the interaction of `'transparent` and offscreen buffering

While vertical scrolling of text editors is based on lines, horizontal scrolling and pasteboard vertical scrolling is based on a fixed number of steps per horizontal page. The *scrolls-per-page* argument sets this value.

If provided, the *wheel-step* argument is passed on to the `wheel-step` method. The default wheel step can be overridden globally though the `'GRacket:wheelStep` preference; see §10 "Preferences".

If *line-count* is not `#f`, it is passed on to the `set-line-count` method.

If *horizontal-inset* is not `5`, it is passed on to the `horizontal-inset` method. Similarly, if *vertical-inset* is not `5`, it is passed on to the `vertical-inset` method.

For information about the *enabled* argument, see `window<%>`. For information about the *horiz-margin* and *vert-margin* arguments, see `subarea<%>`. For information about the *min-width*, *min-height*, *stretchable-width*, and *stretchable-height* arguments, see `area<%>`.

```
(send an-editor-canvas allow-scroll-to-last) → boolean?
(send an-editor-canvas allow-scroll-to-last on?) → void?
  on? : any/c
```

Enables or disables last-line scrolling, or gets the current enable state. If last-line scrolling is enabled, then an editor displayed in this canvas can be scrolled so that the last line of text is at the top of the canvas (or bottom of the canvas when bottom-based scrolling is enabled; see `scroll-with-bottom-base`). By default, an editor can only be scrolled until the last line is at the bottom (or top) of the canvas.

```
(send an-editor-canvas allow-tab-exit) → boolean?
(send an-editor-canvas allow-tab-exit on?) → void?
  on? : any/c
```

Gets or sets whether tab-exit is enabled for the editor canvas. When tab-exit is enabled, the user can move the keyboard focus out of the editor using the Tab and arrow keys, invoke the

default button using the Enter/Return key, or invoke a dialog's close action with Escape. By default, tab-exit is disabled.

When tab-exit is enabled for an editor canvas, Tab and Enter keyboard events are consumed by a frame's default `on-traverse-char` method; in addition, a dialog's default method consumes Escape key events. Otherwise, `on-traverse-char` allows the keyboard events to be propagated to the canvas.

```
(send an-editor-canvas call-as-primary-owner f) → any
  f : (-> any)
```

Calls a thunk and returns the value. While the thunk is being called, if the canvas has an editor, the editor's `get-admin` method returns the administrator for this canvas. This method is only useful when an editor is displayed in multiple canvases.

```
(send an-editor-canvas force-display-focus) → boolean?
(send an-editor-canvas force-display-focus on?) → void?
  on? : any/c
```

Enables or disables force-focus mode. In force-focus mode, the caret or selection of the editor displayed in this canvas is drawn even when the canvas does not have the keyboard focus.

```
(send an-editor-canvas get-editor)
 → (or/c (or/c (is-a?/c text%) (is-a?/c pasteboard%)) #f)
```

Returns the editor currently displayed by this canvas, or `#f` if the canvas does not have an editor.

```
(send an-editor-canvas get-line-count)
 → (or/c (integer-in 1 1000) #f)
```

Returns a line count installed with `set-line-count`, or `#f` if no minimum line count is set.

```
(send an-editor-canvas get-scroll-via-copy) → boolean?
```

Returns `#t` if scrolling triggers a copy of the editor content (and then a refresh of the newly exposed content). Returns `#f` when scrolling triggers a refresh of the entire editor canvas. Defaults to `#f`.

See also `on-scroll-to` and `after-scroll-to`.

```
(send an-editor-canvas horizontal-inset)
 → (integer-in 1 10000)
(send an-editor-canvas horizontal-inset step) → void?
  step : (integer-in 1 10000)
```

Gets or sets the number of pixels within the canvas reserved to the left and right of editor content. The default is 5.

```
(send an-editor-canvas lazy-refresh) → boolean?
(send an-editor-canvas lazy-refresh on?) → void?
  on? : any/c
```

Enables or disables lazy-refresh mode, or gets the current enable state. In lazy-refresh mode, the canvas's refresh method is called when the window needs to be updated, rather than on-paint. By default, an editor-canvas% object is *not* in lazy-refresh mode.

```
(send an-editor-canvas on-char event) → void?
  event : (is-a?/c key-event%)
```

Overrides on-char in canvas<%>.

Handles 'wheel-up and 'wheel-down events by scrolling vertically. Otherwise, passes the event to the canvas's editor, if any, by calling its on-char method.

See also get-editor.

```
(send an-editor-canvas on-event event) → void?
  event : (is-a?/c mouse-event%)
```

Overrides on-event in canvas<%>.

Passes the event to the canvas's editor, if any, by calling its on-event method.

See also get-editor.

```
(send an-editor-canvas on-focus on?) → void?
  on? : any/c
```

Overrides on-focus in window<%>.

Enables or disables the caret in the display's editor, if there is one.

```
(send an-editor-canvas on-paint) → void?
```

Overrides on-paint in canvas<%>.

Repaints the editor, or clears the canvas if no editor is being displayed.

This method is called after clearing the margin around the editor, unless the canvas is created with the 'transparent style, but the editor area is not automatically cleared. In other words, editor-canvas% update by default is like canvas% update with the 'no-autoclear style, except that the margin around the editor area is always cleared.

```
(send an-editor-canvas on-size width
                                height) → void?
  width : dimension-integer?
  height : dimension-integer?
```

Overrides on-size in window<%>.

If the canvas is displaying an editor, its on-display-size method is called.

```
(send an-editor-canvas scroll-to  localx
                                  localy
                                  w
                                  h
                                  refresh?
                                 [bias])   → boolean?
  localx : real?
  localy : real?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
  refresh? : any/c
  bias : (or/c 'start 'end 'none) = 'none
```

Requests scrolling so that the given region in the currently displayed editor is made visible.

The *localx*, *localy*, *w*, and *h* arguments specify a region of the editor to be made visible by the scroll (in editor coordinates).

If *refresh?* is not #f, then the editor is updated immediately after a successful scroll.

The *bias* argument is one of:

- 'start — if the range doesn't fit in the visible area, show the top-left region
- 'none — no special scrolling instructions
- 'end — if the range doesn't fit in the visible area, show the bottom-right region

The return value is #t if the display is scrolled, #f if not (either because the requested region is already visible, because the display has zero size, or because the editor is currently printing).

```
(send an-editor-canvas scroll-with-bottom-base) → boolean?
(send an-editor-canvas scroll-with-bottom-base on?) → void?
  on? : any/c
```

Enables or disables bottom-base scrolling, or gets the current enable state. If bottom-base scrolling is on, then scroll positions are determined by line boundaries aligned with the bottom of the viewable area (rather than with the top of the viewable area). If last-line scrolling is also enabled (see allow-scroll-to-last), then the editor is bottom-aligned in the display area even when the editor does not fill the viewable area.

```
(send an-editor-canvas set-editor  edit
                                   [redraw?]) → void?
  edit : (or/c (or/c (is-a?/c text%) (is-a?/c pasteboard%)) #f)
  redraw? : any/c = #t
```

Sets the editor that is displayed by the canvas, releasing the current editor (if any). If the new editor already has an administrator that is not associated with an editor-canvas%, then the new editor is *not* installed into the canvas.

If *redraw?* is #f, then the editor is not immediately drawn; in this case, something must force a redraw later (e.g., a call to the on-paint method).

If the canvas has a line count installed with set-line-count, the canvas's minimum height is adjusted.

```
(send an-editor-canvas set-line-count count) → void?
  count : (or/c (integer-in 1 1000) #f)
```

Sets the canvas's graphical minimum height to display a particular number of lines of text. The line height is determined by measuring the difference between the top and bottom of a displayed editor's first line. The minimum height is not changed until the canvas gets an editor. When the canvas's editor is changed, the minimum height is recalculated.

If the line count is set to #f, then the canvas's graphical minimum height is restored to its original value.

```
(send an-editor-canvas set-scroll-via-copy scroll-via-copy?)
 → void?
  scroll-via-copy? : any/c
```

Changes the scrolling mode refresh. See also get-scroll-via-copy.

```
(send an-editor-canvas vertical-inset) → (integer-in 1 10000)
(send an-editor-canvas vertical-inset step) → void?
  step : (integer-in 1 10000)
```

Gets or sets the number of pixels within the canvas reserved above and below editor content. The default is 5.

```
(send an-editor-canvas wheel-step)
 → (or/c (integer-in 1 10000) #f)
(send an-editor-canvas wheel-step step) → void?
  step : (or/c (integer-in 1 10000) #f)
```

Gets or sets the number of vertical scroll steps taken for one click of the mouse wheel via a 'wheel-up or 'wheel-down key-event%. A #f value disables special handling for wheel events (i.e., wheel events are passed on to the canvas's editor).

7.4 editor-data%

```
editor-data% : class?
  superclass: object%
```

An editor-data% object contains extra data associated to a snip or region in an editor. See also §5.2.1.2 "Editor Data".

```
(new editor-data%) → (is-a?/c editor-data%)
```

The element returned by get-next is initialized to #f.

```
(send an-editor-data get-dataclass)
 → (or/c (is-a?/c editor-data-class%) #f)
```

Gets the class for this data.

```
(send an-editor-data get-next)
 → (or/c (is-a?/c editor-data%) #f)
```

Gets the next editor data element in a list of editor data elements. A #f terminates the list.

```
(send an-editor-data set-dataclass v) → void?
  v : (is-a?/c editor-data-class%)
```

Sets the class for this data.

```
(send an-editor-data set-next v) → void?
  v : (or/c (is-a?/c editor-data%) #f)
```

Sets the next editor data element in a list of editor data elements. A `#f` terminates the list.

```
(send an-editor-data write f) → boolean?
  f : (is-a?/c editor-stream-out%)
```

Specification: Writes the data to the specified stream, returning `#t` if data is written successfully or `#f` otherwise.

Default implementation: Returns `#f`.

7.5 editor-data-class%

```
editor-data-class% : class?
  superclass: object%
```

An `editor-data-class%` object defines a type for `editor-data%` objects. See also §5.2.1.2 “Editor Data”.

```
(new editor-data-class%) → (is-a?/c editor-data-class%)
```

Creates a (useless) instance.

```
(send an-editor-data-class get-classname) → string?
```

Gets the name of the class. Names starting with `wx` are reserved for internal use.

```
(send an-editor-data-class read f)
 → (or/c (is-a?/c editor-data%) #f)
  f : (is-a?/c editor-stream-in%)
```

Reads a new data object from the given stream, returning `#f` if there is an error.

```
(send an-editor-data-class set-classname v) → void?
  v : string?
```

Sets the name of the class. Names starting with `wx` are reserved for internal use.

An editor data class name should usually have the form `"(lib\n ...)"` to enable on-demand loading of the class; see §5.2.1.2 “Editor Data” for details.

7.6 editor-data-class-list<%>

```
editor-data-class-list<%> : interface?
```

Each eventspace has an instance of `editor-data-class-list<%>`, obtained with `(get-the-editor-data-class-list)`. New instances cannot be created directly. This list keeps a list of editor data classes; this list is needed for loading snips from a file. See also §5.2.1.2 “Editor Data”.

```
(send an-editor-data-class-list add snipclass) → void?
  snipclass : (is-a?/c editor-data-class%)
```

Adds a snip data class to the list. If a class with the same name already exists in the list, this one will not be added.

```
(send an-editor-data-class-list find name)
 → (or/c (is-a?/c snip-class%) #f)
  name : string?
```

Finds a snip data class from the list with the given name, returning `#f` if none can be found.

```
(send an-editor-data-class-list find-position class)
 → exact-nonnegative-integer?
  class : (is-a?/c editor-data-class%)
```

Returns an index into the list for the specified class.

```
(send an-editor-data-class-list nth n)
 → (or/c (is-a?/c editor-data-class%) #f)
  n : exact-nonnegative-integer?
```

Returns the *n*th class in the list (counting from 0), returning #f if the list has *n* or less classes.

```
(send an-editor-data-class-list number)
 → exact-nonnegative-integer?
```

Returns the number of editor data classes in the list.

7.7 editor-snip-editor-admin<%>

```
editor-snip-editor-admin<%> : interface?
```

An instance of this administrator interface is created with each editor-snip% object; new instances cannot be created directly.

```
(send an-editor-snip-editor-admin get-snip)
 → (is-a?/c editor-snip%)
```

Returns the snip that owns this administrator (and displays the editor controlled by the administrator, if any).

7.8 editor-snip%

```
editor-snip% : class?
  superclass: snip%
```

An editor-snip% object is a snip% object that contains and displays an editor<%> object. This snip class is used to insert an editor as a single item within another editor.

```
(new editor-snip%
   [[editor editor]
    [with-border? with-border?]
    [left-margin left-margin]
    [top-margin top-margin]
    [right-margin right-margin]
    [bottom-margin bottom-margin]
    [left-inset left-inset]
    [top-inset top-inset]
    [right-inset right-inset]
    [bottom-inset bottom-inset]
    [min-width min-width]
    [max-width max-width]
    [min-height min-height]
    [max-height max-height]])
→ (is-a?/c editor-snip%)
 editor : (or/c (is-a?/c editor<%>) #f) = #f
 with-border? : any/c = #t
 left-margin : exact-nonnegative-integer? = 5
 top-margin : exact-nonnegative-integer? = 5
 right-margin : exact-nonnegative-integer? = 5
 bottom-margin : exact-nonnegative-integer? = 5
 left-inset : exact-nonnegative-integer? = 1
 top-inset : exact-nonnegative-integer? = 1
 right-inset : exact-nonnegative-integer? = 1
 bottom-inset : exact-nonnegative-integer? = 1
 min-width : (or/c (and/c real? (not/c negative?)) 'none)
           = 'none
 max-width : (or/c (and/c real? (not/c negative?)) 'none)
           = 'none
 min-height : (or/c (and/c real? (not/c negative?)) 'none)
            = 'none
 max-height : (or/c (and/c real? (not/c negative?)) 'none)
            = 'none
```

If *editor* is non-#f, then it will be used as the editor contained by the snip. See also set-editor.

If *with-border?* is not #f, then a border will be drawn around the snip. The editor display will be inset in the snip area by the amounts specified in the -margin arguments. The border will be drawn with an inset specified by the -inset arguments.

See get-inset and get-margin for information about the inset and margin arguments.

```
(send an-editor-snip adjust-cursor dc
                                   x
                                   y
                                   editorx
                                   editory
                                   event)
 → (or/c (is-a?/c cursor%) #f)
  dc : (is-a?/c dc<%>)
  x : real?
  y : real?
  editorx : real?
  editory : real?
  event : (is-a?/c mouse-event%)
```

Overrides `adjust-cursor` in `snip%`.

Gets a cursor from the embedded editor by calling its `adjust-cursor` method.

```
(send an-editor-snip border-visible?) → boolean?
```

Returns `#t` if the snip has a border draw around it, `#f` otherwise.

See also `show-border`.

```
(send an-editor-snip get-align-top-line) → boolean?
```

Reports whether the snip is in align-top-line mode. See `get-extent` for more information.

See also `set-align-top-line`.

```
(send an-editor-snip get-editor)
 → (or/c (or/c (is-a?/c text%) (is-a?/c pasteboard%)) #f)
```

Returns the editor contained by the snip, or `#f` is there is no editor.

```
(send an-editor-snip get-extent  dc
                                 x
                                 y
                                [w
                                 h
                                 descent
                                 space
                                 lspace
                                 rspace]) → void?
```

```
dc : (is-a?/c dc<%>)
x : real?
y : real?
w : (or/c (box/c (and/c real? (not/c negative?))) #f) = #f
h : (or/c (box/c (and/c real? (not/c negative?))) #f) = #f
descent : (or/c (box/c (and/c real? (not/c negative?))) #f)
        = #f
space : (or/c (box/c (and/c real? (not/c negative?))) #f) = #f
lspace : (or/c (box/c (and/c real? (not/c negative?))) #f)
       = #f
rspace : (or/c (box/c (and/c real? (not/c negative?))) #f)
       = #f
```

Overrides `get-extent` in `snip%`.

Calls its editor's `get-extent` method, then adds the editor snip's margins.

The top space always corresponds to the space of the editor's top line, plus the snip's top margin. Normally, the descent corresponds to the descent of the editor's last line plus the snip's bottom margin. However, if the snip is in align-top-line mode (see `set-align-top-line`), the descent corresponds to the descent of the top line, plus the height rest of the editor's lines, plus the snip's bottom margin.

If the editor is a text editor, then `1` is normally subtracted from the editor's width as returned by `get-extent`, because the result looks better for editing. If the snip is in tight-text-fit mode (see `set-tight-text-fit`) then `2` is subtracted from a text editor's width, eliminating the two pixels that the text editor reserves for the blinking caret. In addition, tight-text-fit mode subtracts an amount equal to the line spacing from the editor's height. By default, tight-text-fit mode is disabled.

```
(send an-editor-snip get-inset l t r b) → void?
  l : (box/c exact-nonnegative-integer?)
  t : (box/c exact-nonnegative-integer?)
  r : (box/c exact-nonnegative-integer?)
  b : (box/c exact-nonnegative-integer?)
```

Gets the current border insets for the snip. The inset sets how much space is left between the edge of the snip and the border.

The `l` box is filled with left inset. The `t` box is filled with top inset. The `r` box is filled with right inset. The `b` box is filled with bottom inset.

```
(send an-editor-snip get-margin l t r b) → void?
  l : (box/c exact-nonnegative-integer?)
  t : (box/c exact-nonnegative-integer?)
```

```
  r : (box/c exact-nonnegative-integer?)
  b : (box/c exact-nonnegative-integer?)
```

Gets the current margins for the snip. The margin sets how much space is left between the edge of the editor's contents and the edge of the snip.

The *l* box is filled with left margin. The *t* box is filled with top margin. The *r* box is filled with right margin. The *b* box is filled with bottom margin.

```
(send an-editor-snip get-max-height)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the maximum display height of the snip; zero or `'none` indicates that there is no maximum.

```
(send an-editor-snip get-max-width)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the maximum display width of the snip; zero or `'none` indicates that there is no maximum.

```
(send an-editor-snip get-min-height)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the minimum display height of the snip; zero or `'none` indicates that there is no minimum.

```
(send an-editor-snip get-min-width)
 → (or/c (and/c real? (not/c negative?)) 'none)
```

Gets the minimum display width of the snip; zero or `'none` indicates that there is no minimum.

```
(send an-editor-snip get-tight-text-fit) → boolean?
```

Reports whether the snip is in tight-text-fit mode. See `get-extent` for more information.

See also `set-tight-text-fit`.

```
(send an-editor-snip resize w h) → boolean?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Overrides resize in snip%.

Sets the snip's minimum and maximum width and height to the specified values minus the snip border space. See also set-min-width set-max-width set-max-height set-min-height.

Also sets the minimum and maximum width of the editor owned by the snip to the given width (minus the snip border space) via set-max-width and set-min-width.

```
(send an-editor-snip set-align-top-line tight?) → void?
  tight? : any/c
```

Enables or disables align-top-line mode. See get-extent for more information.

See also get-align-top-line.

```
(send an-editor-snip set-editor editor) → void?
  editor : (or/c (or/c (is-a?/c text%) (is-a?/c pasteboard%)) #f)
```

Sets the editor contained by the snip, releasing the old editor in the snip (if any). If the new editor already has an administrator, then the new editor is *not* installed into the snip.

When an editor-snip% object is not inserted in an editor, it does not have an administrator. During this time, it does not give its contained editor an administrator, either. The administratorless contained editor can therefore "defect" to some other display with an administrator. When a contained editor defects and the snip is eventually inserted into a different editor, the snip drops the traitor contained editor, setting its contained editor to #f.

```
(send an-editor-snip set-inset l t r b) → void?
  l : exact-nonnegative-integer?
  t : exact-nonnegative-integer?
  r : exact-nonnegative-integer?
  b : exact-nonnegative-integer?
```

Sets the current border insets for the snip. The inset sets how much space is left between the edge of the snip and the border.

```
(send an-editor-snip set-margin l t r b) → void?
  l : exact-nonnegative-integer?
  t : exact-nonnegative-integer?
  r : exact-nonnegative-integer?
  b : exact-nonnegative-integer?
```

Sets the current margins for the snip. The margin sets how much space is left between the edge of the editor's contents and the edge of the snip.

```
(send an-editor-snip set-max-height h) → void?
  h : (or/c (and/c real? (not/c negative?)) 'none)
```

An editor-snip% normally stretches to wrap around the size of the editor it contains. This method limits the height of the snip (and if the editor is larger, only part of the editor is displayed).

Zero or 'none disables the limit.

```
(send an-editor-snip set-max-width w) → void?
  w : (or/c (and/c real? (not/c negative?)) 'none)
```

An editor-snip% normally stretches to wrap around the size of the editor it contains. This method limits the width of the snip (and if the editor is larger, only part of the editor is displayed). The contained editor's width limits are not changed by this method.

Zero or 'none disables the limit.

```
(send an-editor-snip set-min-height h) → void?
  h : (or/c (and/c real? (not/c negative?)) 'none)
```

An editor-snip% normally stretches to wrap around the size of the editor it contains. This method sets the minimum height of the snip (and if the editor is smaller, the editor is top-aligned in the snip).

Zero or 'none disables the limit.

```
(send an-editor-snip set-min-width w) → void?
  w : (or/c (and/c real? (not/c negative?)) 'none)
```

An editor-snip% normally stretches to wrap around the size of the editor it contains. This method sets the minimum width of the snip (and if the editor is smaller, the editor is left-aligned in the snip). The contained editor's width limits are not changed by this method.

Zero or 'none disables the limit.

```
(send an-editor-snip set-tight-text-fit tight?) → void?
  tight? : any/c
```

Enables or disables tight-text-fit mode. See get-extent for more information.

See also get-tight-text-fit.

```
(send an-editor-snip show-border show?) → void?
  show? : any/c
```

Shows or hides the snip's border.

```
(send an-editor-snip style-background-used?) → boolean?
```

Returns `#t` if the snip uses its style's background and transparency information when drawing, `#f` otherwise.

See also `use-style-background`.

```
(send an-editor-snip use-style-background use?) → void?
  use? : any/c
```

Causes the snip to use or not used (the default) its style's background and transparency information for drawing the background within the snip's border.

If *use?* is `#f`, the style background and transparency information is ignored, otherwise is it used.

7.9 editor-stream-in%

```
editor-stream-in% : class?
  superclass: object%
```

An `editor-stream-in%` object is used to read editor information from a file or other input stream (such as the clipboard).

```
(make-object editor-stream-in% base)
 → (is-a?/c editor-stream-in%)
  base : (is-a?/c editor-stream-in-base%)
```

An in-stream base—possibly an `editor-stream-in-bytes-base%` object—must be supplied in *base*.

```
(send an-editor-stream-in get v) → (is-a?/c editor-stream-in%)
  v : (box/c exact-integer?)
(send an-editor-stream-in get v) → (is-a?/c editor-stream-in%)
  v : (box/c real?)
```

Reads data from the stream, returning itself. Reading from a bad stream always gives 0.

The v box is filled with the next integer or floating-point value in the stream.

```
(send an-editor-stream-in get-bytes [len]) → (or/c bytes? #f)
  len : (or/c (box/c exact-nonnegative-integer?) #f) = #f
```

Like get-unterminated-bytes, but the last read byte is assumed to be a nul terminator and discarded. Use this method when data is written by a call to put without an explicit byte count, and use get-unterminated-bytes when data is written with an explicit byte count.

The len box is filled with the length of the byte string plus one (to indicate the terminator), unless len is #f.

```
(send an-editor-stream-in get-exact)
 → (or/c exact-integer? (and/c real? inexact?))
```

Returns the next number value in the stream. Despite the name, this method may return an inexact number, but only if the next element in the stream was actually written as an inexact number.

```
(send an-editor-stream-in get-fixed v)
 → (is-a?/c editor-stream-in%)
  v : (box/c (integer-in -9999999999 99999999999))
```

The v box is filled with a fixed-size integer from the stream obtained through get-fixed-exact.

```
(send an-editor-stream-in get-fixed-exact)
 → (integer-in -9999999999 99999999999)
```

Gets a fixed-sized integer from the stream. See put-fixed for more information. Reading from a bad stream always gives 0.

```
(send an-editor-stream-in get-inexact) → real?
```

Returns the next floating-point value in the stream.

```
(send an-editor-stream-in get-unterminated-bytes [len])
 → (or/c bytes? #f)
  len : (or/c (box/c exact-nonnegative-integer?) #f) = #f
```

Returns the next byte string from the stream. This is the recommended way to read bytes back in from a stream; use put with two arguments (passing along the length of the bytes) to write out the bytes to match this method.

Reading from a bad stream returns #f or #"".

Note that when put is not given a byte length, it includes an extra byte for a nul terminator; use get-bytes to read such byte strings.

The *len* box is filled with the length of the byte string, unless *len* is #f.

```
(send an-editor-stream-in jump-to pos) → void?
  pos : exact-nonnegative-integer?
```

Jumps to a given position in the stream.

```
(send an-editor-stream-in ok?) → boolean?
```

Returns #t if the stream is ready for reading, #f otherwise. Reading from a bad stream always returns 0 or "".

```
(send an-editor-stream-in remove-boundary) → void?
```

See set-boundary.

```
(send an-editor-stream-in set-boundary n) → void?
  n : exact-nonnegative-integer?
```

Sets a file-reading boundary at *n* bytes past the current stream location. If there is an attempt to read past this boundary, an error is signaled. The boundary is removed with a call to remove-boundary. Every call to set-boundary must be balanced by a call to remove-boundary.

Boundaries help keep a subroutine from reading too much data leading to confusing errors. However, a malicious subroutine can call remove-boundary on its own.

```
(send an-editor-stream-in skip n) → void?
  n : exact-nonnegative-integer?
```

Skips past the next *n* bytes in the stream.

```
(send an-editor-stream-in tell) → exact-nonnegative-integer?
```

Returns the current stream position.

7.10 editor-stream-in-base%

```
editor-stream-in-base% : class?
  superclass: object%
```

An editor-stream-in-base% object is used by an editor-stream-in% object to perform low-level reading of data.

The editor-stream-in-base% class is never instantiated directly, but the derived class editor-stream-in-bytes-base% can be instantiated. New derived classes must override all of the methods described in this section.

```
(send an-editor-stream-in-base bad?) → boolean?
```

Returns #t if there has been an error reading from the stream, #f otherwise.

```
(send an-editor-stream-in-base read data)
 → exact-nonnegative-integer?
  data : (and/c vector? (not immutable?))
```

Like read-bytes, but fills a supplied vector with Latin-1 characters instead of filling a byte string. This method is implemented by default via read-bytes.

```
(send an-editor-stream-in-base read-bytes  bstr
                                           [start
                                            end])
 → exact-nonnegative-integer?
  bstr : (and/c bytes? (not immutable?))
  start : exact-nonnegative-integer? = 0
  end : exact-nonnegative-integer? = (bytes-length bstr)
```

Reads bytes to fill the supplied byte string. The return value is the number of bytes read, which may be less than the number requested if the stream is emptied. If the stream is emptied, the next call to bad? must return #t.

The bytes that are read are stored in *bstr* starting at position *start* and going to at most to *end*.

```
(send an-editor-stream-in-base read-byte) → (or/c byte? #f)
```

Reads a single byte and return it, or returns #f if no more bytes are available. The default implementation of this method uses read-bytes.

```
(send an-editor-stream-in-base seek pos) → void?
  pos : exact-nonnegative-integer?
```

Moves to the specified absolute position in the stream.

```
(send an-editor-stream-in-base skip n) → void?
  n : exact-nonnegative-integer?
```

Skips past the next n characters in the stream.

```
(send an-editor-stream-in-base tell)
 → exact-nonnegative-integer?
```

Returns the current stream position.

7.11 editor-stream-in-bytes-base%

```
editor-stream-in-bytes-base% : class?
  superclass: editor-stream-in-base%
```

An editor-stream-in-bytes-base% object can be used to read editor data from a byte string.

```
(make-object editor-stream-in-bytes-base% s)
 → (is-a?/c editor-stream-in-bytes-base%)
  s : bytes?
```

Creates a stream base that reads from s.

7.12 editor-stream-out%

```
editor-stream-out% : class?
  superclass: object%
```

An editor-stream-out% object is used to write editor information to a file or other output stream (such as the clipboard).

```
(make-object editor-stream-out% base)
 → (is-a?/c editor-stream-out%)
  base : (is-a?/c editor-stream-out-base%)
```

An out-stream base—possibly an editor-stream-out-bytes-base% object—must be supplied in base.

```
(send an-editor-stream-out jump-to pos) → void?
  pos : exact-nonnegative-integer?
```

Jumps to a given position in the stream.

```
(send an-editor-stream-out ok?) → boolean?
```

Returns #t if the stream is ready for writing, #f otherwise. Writing to a bad stream has no effect.

```
(send an-editor-stream-out pretty-finish) → void?
```

Ensures that the stream ends with a newline. This method is called by write-editor-global-footer.

```
(send an-editor-stream-out pretty-start) → void?
```

Writes a “comment” into the stream that identifies the file format. This method is called by write-editor-global-header.

```
(send an-editor-stream-out put n v)
 → (is-a?/c editor-stream-out%)
  n : exact-nonnegative-integer?
  v : bytes?
(send an-editor-stream-out put v)
 → (is-a?/c editor-stream-out%)
  v : bytes?
(send an-editor-stream-out put v)
 → (is-a?/c editor-stream-out%)
  v : exact-integer?
(send an-editor-stream-out put v)
 → (is-a?/c editor-stream-out%)
  v : real?
```

Writes *v*, or *n* bytes of *v*.

When *n* is supplied with a byte-string *v*, use `get-unterminated-bytes` to read the bytes later. This is the recommended way to write out bytes to be easily read in later; use `get-unterminated-bytes` to read the bytes back in.

If *n* is not supplied and *v* is a byte string, then for historical reasons, the actual number of bytes written includes a `#\nul` terminator, so use `get-bytes` instead of `get-unterminated-bytes` to read the bytes later.

If *v* is a `real?`, but not an `exact-integer?`, then it is converted to an inexact number as part of the process of writing it.

```
(send an-editor-stream-out put-fixed v)
 → (is-a?/c editor-stream-out%)
  v : (integer-in -9999999999 99999999999)
```

Puts a fixed-sized integer into the stream. This method is needed because numbers are usually written in a way that takes varying numbers of bytes. In some cases it is useful to temporary write a `0` to a stream, write more data, and then go back and change the `0` to another number; such a process requires a fixed-size number.

Numbers written to a stream with `put-fixed` must be read with `get-fixed-exact` or `get-fixed`.

```
(send an-editor-stream-out put-unterminated v)
 → (is-a?/c editor-stream-out%)
  v : bytes?
```

The same as calling `put` with `(bytes-length v)` and *v*.

```
(send an-editor-stream-out tell) → exact-nonnegative-integer?
```

Returns the current stream position.

7.13 editor-stream-out-base%

```
editor-stream-out-base% : class?
  superclass: object%
```

An `editor-stream-out-base%` object is used by an `editor-stream-out%` object to perform low-level writing of data.

The editor-stream-out-base% class is never instantiated directly, but the derived class editor-stream-out-bytes-base% can be instantiated. New derived classes must override all of the methods described in this section.

```
(send an-editor-stream-out-base bad?) → boolean?
```

Returns #t if there has been an error writing to the stream, #f otherwise.

```
(send an-editor-stream-out-base seek pos) → void?
  pos : exact-nonnegative-integer?
```

Moves to the specified absolute position in the stream.

```
(send an-editor-stream-out-base tell)
 → exact-nonnegative-integer?
```

Returns the current stream position.

```
(send an-editor-stream-out-base write data) → void?
  data : (listof char?)
```

Writes data (encoded as Latin-1 characters) to the stream. This method is implemented by default via write-bytes.

```
(send an-editor-stream-out-base write-bytes bstr) → void?
  bstr : bytes?
```

Writes data to the stream.

7.14 editor-stream-out-bytes-base%

```
editor-stream-out-bytes-base% : class?
  superclass: editor-stream-out-base%
```

An editor-stream-out-bytes-base% object can be used to write editor data into a byte string.

```
(new editor-stream-out-bytes-base%)
 → (is-a?/c editor-stream-out-bytes-base%)
```

Creates an empty stream.

```
(send an-editor-stream-out-bytes-base get-bytes) → bytes?
```

Returns the current contents of the stream.

7.15 editor-wordbreak-map%

```
editor-wordbreak-map% : class?
  superclass: object%
```

An editor-wordbreak-map% objects is used with a text% objects to specify word-breaking criteria for the default wordbreaking function. See also set-wordbreak-map, get-wordbreak-map, find-wordbreak, and set-wordbreak-func.

A global object the-editor-wordbreak-map is created automatically and used as the default map for all text% objects.

A wordbreak objects implements a mapping from each character to a list of symbols. The following symbols are legal elements of the list:

- 'caret
- 'line
- 'selection
- 'user1
- 'user2

The presence of a flag in a character's value indicates that the character does not break a word when searching for breaks using the corresponding reason. For example, if 'caret is present, then the character is a non-breaking character for caret-movement words. (Each stream of non-breaking characters is a single word.)

```
(new editor-wordbreak-map%) → (is-a?/c editor-wordbreak-map%)
```

All ASCII alpha-numeric characters are initialized with '(caret line selection). All other ASCII non-whitespace characters except - are initialized with '(line). All ASCII whitespace characters and - are initialized with null.

```
(send an-editor-wordbreak-map get-map char)
 → (listof (or/c 'caret 'line 'selection 'user1 'user2))
  char : char?
```

Gets the mapping value for *char*. See editor-wordbreak-map% for more information.

```
(send an-editor-wordbreak-map set-map char
                                        value) → void?
  char : char?
  value : (listof (or/c 'caret 'line 'selection 'user1 'user2))
```

Sets the mapping value for *char* to *value*. See editor-wordbreak-map% for more information.

7.16 keymap%

```
keymap% : class?
  superclass: object%
```

A keymap% object is used by editor<%> objects to map keyboard and mouse sequences to arbitrary functions in an extensible way. Keymaps can be used without editors, as well. A keymap% object contains

- a mapping from function names to event-handling procedures; and
- a mapping from key and mouse sequences to function names.

A handler procedure in a keymap is invoked with a key-event% object or a mouse-event% object. It is also given another value that depends on the context in which the keymap is used (or, more specifically, the arguments to handle-key-event or handle-mouse-event). For keymaps associated with editor<%> objects, the extra parameter is generally the editor<%> object that received the keyboard or mouse event.

```
(new keymap%) → (is-a?/c keymap%)
```

Creates an empty keymap.

```
(send a-keymap add-function name func) → void?
  name : string?
  func : (any/c (is-a?/c event%) . -> . any)
```

Names a new function to handle events, called in response to handle-key-event, handle-mouse-event, or call-function. The return value is of the procedure is ignored.

If there was already a function mapped to this name, it will be replaced with the given function.

When the function is called, it gets the arguments that were passed to handle-key-event, handle-mouse-event, or call-function. For keymaps associated with an editor, this is normally the target editor.

```
(send a-keymap is-function-added? fname) → boolean?
  fname : string?
```

Returns #t if *fname* has been added via keymap% to this keymap and #f otherwise.

This method doesn't check chained keymaps to see if the function has been added to one of those.

```
(send a-keymap break-sequence) → void?
```

Clears the state of the keymap if it is in the middle of a key sequence. For example, the user may have hit escape, and then changed to another window; if escape is part of a keyboard sequence, the keymap state needs to be cleared because the user is not going to complete the sequence.

A break callback function can be installed with set-break-sequence-callback.

```
(send a-keymap call-function  name
                              in
                              event
                             [try-chain?]) → boolean?
  name : string?
  in : any/c
  event : (is-a?/c event%)
  try-chain? : any/c = #f
```

Calls a named event handler directly. If the function cannot be found or the found handler did not want to handle the event, #f is returned. Otherwise, the return value is the boolean return value of the event handler.

The *in* and *event* arguments are passed on to the keymap handler procedure if one is found.

If *try-chain?* is not #f, keymaps chained to this one are searched for the function name. If the function is not found and *try-chain?* is #f; an exception is also raised, but the exception handler cannot escape (see §1.6.4 "Continuations and Event Dispatch").

```
(send a-keymap chain-to-keymap next
                               prefix?) → void?
  next : (is-a?/c keymap%)
  prefix? : any/c
```

Chains *next* off *a-keymap* The *next* keymap will be used to handle events which are not handled by *a-keymap*.

If *prefix?* is a true value, then *next* will take precedence over other keymaps already chained to *a-keymap* in the case that both keymaps map the same key sequence. When one chained keymap maps a key that is a prefix of another, then the shorter key sequence is always used, regardless of *prefix?*.

Multiple keymaps can be chained off one keymap using chain-to-keymap. When keymaps are chained off a main keymap, events not handled by the main keymap are passed to the chained keymaps until some chained keymap handles the events. Keymaps can be chained together in an arbitrary acyclic graph.

Keymap chaining is useful because multiple-event sequences are handled correctly for chained groups. Without chaining, a sequence of events can produce state in a keymap that must be reset when a callback is invoked in one of the keymaps. This state can be manually cleared with break-sequence, though calling the break-sequence method also invokes the handler installed by set-break-sequence-callback.

```
(send a-keymap get-double-click-interval)
 → (integer-in 0 1000000)
```

Returns the maximum number of milliseconds that can separate the clicks of a double-click.

The default interval is determined in a platform-specific way, but it can be overridden globally though the 'GRacket:doubleClickTime preference; see §10 “Preferences”.

```
(send a-keymap handle-key-event in event) → boolean?
  in : any/c
  event : (is-a?/c key-event%)
```

Attempts to handle a keyboard event, returning #t if the event was handled (i.e., a handler was found and it returned a true value), #f otherwise.

See also call-function.

```
(send a-keymap handle-mouse-event in event) → boolean?
  in : any/c
  event : (is-a?/c mouse-event%)
```

Attempts to handle a mouse event, returning #t if the event was handled (i.e., a handler was found and it returned a true value), #f otherwise.

See also call-function.

```
(send a-keymap map-function keyname fname) → void?
  keyname : string?
  fname : string?
```

Maps an input state sequence to a function name using a string-encoded sequence in *keyname*. The format of *keyname* is a sequence of semicolon-delimited input states; each state is made up of a sequence of modifier identifiers followed by a key identifier.

The modifier identifiers are:

- `s:` — All platforms: Shift
- `c:` — All platforms: Control
- `a:` — Mac OS: Option
- `m:` — Windows: Alt; Unix: Meta; Mac OS: Command, when `map-command-as-meta-key` produces `#t`
- `d:` — Mac OS: Command
- `l:` — All platforms: Caps Lock
- `g:` — Windows: Control plus Alt as AltGr; see `get-control+meta-is-altgr` in `key-event%`
- `?:` — All platforms: allow match to character produced by opposite use of Shift, AltGr/Option, and/or Caps Lock, when available; see `get-other-shift-key-code` in `key-event%`

If a particular modifier is not mentioned in a state string, it matches states whether that modifier is pressed or not pressed. A `~` preceding a modifier makes the string match only states where the corresponding modifier is not pressed. If the state string begins with `:`, then the string matches a state only if modifiers among Shift, Control, Option, Alt, Meta, and Command that are not mentioned in the string are not pressed.

A key identifier can be either a character on the keyboard (e.g., `a`, `2`, `?`) or a special name. The special names are as follows:

- `leftbutton` (button down)
- `rightbutton`
- `middlebutton`
- `leftbuttondouble` (button down for double-click)

- `rightbuttondouble`
- `middlebuttondouble`
- `leftbuttontriple` (button down for triple-click)
- `rightbuttontriple`
- `middlebuttontriple`
- `leftbuttonseq` (all events from button down through button up)
- `rightbuttonseq`
- `middlebuttonseq`
- `wheelup`
- `wheeldown`
- `wheelleft`
- `wheelright`
- `esc`
- `delete`
- `del` (same as `delete`)
- `insert`
- `ins` (same as `insert`)
- `add`
- `subtract`
- `multiply`
- `divide`
- `backspace`
- `back`
- `return`
- `enter` (same as `return`)
- `tab`
- `space`
- `right`

- `left`
- `up`
- `down`
- `home`
- `end`
- `pageup`
- `pagedown`
- `semicolon` (since `;` separates sequence steps)
- `colon` (since `:` separates modifiers)
- `numpad0`
- `numpad1`
- `numpad2`
- `numpad3`
- `numpad4`
- `numpad5`
- `numpad6`
- `numpad7`
- `numpad8`
- `numpad9`
- `numpadenter`
- `f1`
- `f2`
- `f3`
- `f4`
- `f5`
- `f6`
- `f7`
- `f8`

- `f9`
- `f10`
- `f11`
- `f12`
- `f13`
- `f14`
- `f15`
- `f16`
- `f17`
- `f18`
- `f19`
- `f20`
- `f21`
- `f22`
- `f23`
- `f24`

For a special keyword, the capitalization does not matter. However, capitalization is important for single-letter keynames. Furthermore, single-letter ASCII keynames are treated specially: `A` and `s:a` are both treated as `s:A`. However, when `c:` is included on Windows without `m:`, or when `d:` is included on Mac OS, then ASCII letters are not upcased with `s:`, since the upcasing behavior of the Shift key is cancelled by Control without Alt (on Windows) or by Command (on Mac OS).

A state can match multiple state strings mapped in a keymap (or keymap chain); when a state matches multiple state strings, a mapping is selected by ranking the strings according to specificity. A state string that mentions more pressed modifiers ranks higher than other state strings, and if two strings mention the same number of pressed modifiers, the one that mentions more unpressed modifiers ranks higher. Finally, a state string that includes `?:` and matches only with the opposite use of Shift, AltGr/Option, and/or Caps Lock ranks below all matches that do not depend on `?:`, and one that requires the opposite use of both Shift and AltGr/Option ranks even lower. In the case that multiple matching strings have the same rank, a match is selected arbitrarily.

Examples:

- `"space"` — matches whenever the space bar is pressed, regardless of the state of modifiers keys.
- `"~c:space"` — matches whenever the space bar is pressed and the Control key is not pressed.
- `"a"` — matches whenever `a` is typed, regardless of the state of modifiers keys (other than Shift).
- `":a"` — matches only when `a` is typed with no modifier keys pressed.
- `"~c:a"` — matches whenever `a` is typed and neither the Shift key nor the Control key is pressed.
- `"c:m:~g:x"` — matches whenever `x` is typed with Control and Alt (Windows) or Meta (Unix) is pressed, as long as the Control-Alt combination is not formed by AltGr on Windows.
- `":esc;:c:c"` — matches an Escape key press (no modifiers) followed by a Control-C press (no modifiers other than Control).
- `"?:d:+"` — matches when Command is pressed with key that produces `+`, even if producing `+` normally requires pressing Shift.

A call to `map-function` that would map a particular key sequence both as a prefix and as a complete sequence raises an exception, but the exception handler cannot escape (see §1.6.4 “Continuations and Event Dispatch”).

A function name does not have to be mapped to a handler before input states are mapped to the name; the handler is dispatched by name at the time of invocation. The event handler mapped to a function name can be changed without affecting the map from input states to function names.

Changed in version 1.2 of package `gui-lib`: Added `g:` and `~g:` support.

```
(send a-keymap remove-chained-keymap keymap) → void?
  keymap : (is-a?/c keymap%)
```

If *keymap* was previously chained from this keymap (through `chain-to-keymap`), then it is removed from the chain-to list.

```
(send a-keymap remove-grab-key-function) → void?
```

Removes a callback installed with `set-grab-key-function`.

```
(send a-keymap remove-grab-mouse-function) → void?
```

Removes a callback installed with set-grab-mouse-function.

```
(send a-keymap set-break-sequence-callback f) → void?
  f : (-> any)
```

Installs a callback procedure that is invoked when break-sequence is called. After it is invoked once, the callback is removed from the keymap. If another callback is installed before break-sequence is called, the old callback is invoked immediately before the new one is installed.

```
(send a-keymap set-double-click-interval n) → void?
  n : (integer-in 0 1000000)
```

Sets the maximum number of milliseconds that can separate the clicks of a double-click.

```
(send a-keymap set-grab-key-function f) → void?
  f : ((or/c string? false?)
       (is-a?/c keymap%)
       any/c
       (is-a?/c key-event%)
       . -> . any)
```

Installs a callback procedure that is invoked after the keymap matches input to a function name or fails to match an input. Only one keyboard grab function can be installed at a time. When keymaps are chained to a keymap with a grab callback, the callback is invoked for matches in the chained keymap (when the chained keymap does not have its own grab callback).

If a grab callback returns a true value for a matching or non-matching callback, the event is considered handled. If the callback returns a true value for a matching callback, then the matching keymap function is not called by the keymap.

The callback procedure *f* will be invoked as:

```
(f str keymap editor event)
```

The *str* argument is the name of a function for a matching callback, or #f for a non-matching callback. The *keymap* argument is the keymap that matched (possibly a keymap chained to the one in which the callback was installed) or the keymap in which the callback was installed. The *editor* and *event* arguments are the same as passed on to the matching keymap function.

Key grab callback functions are de-installed with remove-grab-key-function.

```
(send a-keymap set-grab-mouse-function f) → void?
  f : ((or/c string? false?)
       (is-a?/c keymap%)
       any/c
       (is-a?/c mouse-event%)
       . -> . any)
```

Like set-grab-key-function, but for mouse events.

7.17 pasteboard%

```
pasteboard% : class?
  superclass: object%
  extends: editor<%>
```

A pasteboard% object is an editor for displaying snips with arbitrary locations.

```
(new pasteboard%) → (is-a?/c pasteboard%)
```

The editor will not be displayed until it is attached to an editor-canvas% object or some other display.

A new keymap% object is created for the new editor. See also get-keymap and set-keymap.

A new style-list% object is created for the new editor. See also get-style-list and set-style-list.

```
(send a-pasteboard add-selected snip) → void?
  snip : (is-a?/c snip%)
(send a-pasteboard add-selected x y w h) → void?
  x : real?
  y : real?
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Selects snips without deselecting other snips. When coordinates are given, this method selects all snips that intersect with the given rectangle (in editor coordinates).

The selection in a pasteboard can be changed by the system in response to other method calls, and such changes do not go through this method; use on-select to monitor selection changes.

```
(send a-pasteboard after-delete snip) → void?
  snip : (is-a?/c snip%)
```

Refine this method with `augment`.

Specification: Called after a snip is deleted from the editor (and after the display is refreshed; use `on-delete` and `begin-edit-sequence` to avoid extra refreshes when `after-delete` modifies the editor).

See also `can-delete?` and `on-edit-sequence`.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-pasteboard after-insert snip
                                before
                                x
                                y)      → void?
  snip : (is-a?/c snip%)
  before : (or/c (is-a?/c snip%) #f)
  x : real?
  y : real?
```

Refine this method with `augment`.

Specification: Called after a snip is inserted into the editor (and after the display is refreshed; use `on-insert` and `begin-edit-sequence` to avoid extra refreshes when `after-insert` modifies the editor).

See also `can-insert?` and `on-edit-sequence`.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-pasteboard after-interactive-move event) → void?
  event : (is-a?/c mouse-event%)
```

Refine this method with `augment`.

Specification: Called after the user stops interactively dragging snips (the ones that are selected; see `find-next-selected-snip`). The mouse event that terminated the move (usually a button-up event) is provided.

See also `can-interactive-move?` and `on-interactive-move`.

Default implementation: Does nothing.

```
(send a-pasteboard after-interactive-resize snip) → void?
  snip : (is-a?/c snip%)
```

Refine this method with `augment`.

Specification: Called after the user stops interactively resizing a snip (the one that is currently selected; see `find-next-selected-snip`). The *snip* argument is the snip that was resized.

See also `can-interactive-resize?` and `on-interactive-resize`.

Default implementation: Does nothing.

```
(send a-pasteboard after-move-to snip
                                 x
                                 y
                                 dragging?) → void?
  snip : (is-a?/c snip%)
  x : real?
  y : real?
  dragging? : any/c
```

Refine this method with `augment`.

Specification: Called after a given snip is moved within the editor (and after the display is refreshed; use `on-move-to` and `begin-edit-sequence` to avoid extra refreshes when `after-move-to` modifies the editor).

If *dragging?* is not `#f`, then this move was a temporary move for dragging.

See also `can-move-to?` and `on-edit-sequence`.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-pasteboard after-reorder snip
                                 to-snip
                                 before?) → boolean?
  snip : (is-a?/c snip%)
  to-snip : (is-a?/c snip%)
  before? : any/c
```

Refine this method with `augment`.

Specification: Called before a snip is moved in the pasteboard's front-to-back snip order (and after the display is refreshed; use `on-reorder` and `begin-edit-sequence` to avoid extra refreshes when `after-reorder` modifies the editor).

If *`before?`* is `#t`, then *`snip`* was moved before *`to-snip`*, otherwise *`snip`* was moved after *`to-snip`*.

See also `can-reorder?` and `on-edit-sequence`.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-pasteboard after-resize snip
                                w
                                h
                                resized?) → void?
  snip : (is-a?/c snip%)
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
  resized? : any/c
```

Refine this method with `augment`.

Specification: Called after a given snip is resized (and after the display is refreshed; use `on-resize` and `begin-edit-sequence` to avoid extra refreshes when `after-resize` modifies the editor), or after an unsuccessful resize attempt was made.

If *`resized?`* is not `#f`, the snip was successfully resized.

See also `can-resize?` and `on-edit-sequence`.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-pasteboard after-select snip on?) → void?
  snip : (is-a?/c snip%)
  on? : any/c
```

Refine this method with `augment`.

Specification: Called after a snip in the pasteboard is selected or deselected. See also `on-select`. This method is not called after selected snip is deleted (and thus de-selected indirectly); see also `after-delete`.

If *`on?`* is `#t`, then *`snip`* was just selected, otherwise *`snip`* was just deselected.

See also `can-select?` and `on-edit-sequence`.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-pasteboard can-delete? snip) → boolean?
  snip : (is-a?/c snip%)
```

Refine this method with `augment`.

Specification: Called before a snip is deleted from the editor. If the return value is `#f`, then the delete will be aborted.

See also `on-delete` and `after-delete`.

The editor is internally locked for writing when this method is called (see also §5.9 “Internal Editor Locks”).

Default implementation: Returns `#t`.

```
(send a-pasteboard can-insert? snip
                               before
                               x
                               y)     → boolean?
  snip : (is-a?/c snip%)
  before : (or/c (is-a?/c snip%) #f)
  x : real?
  y : real?
```

Refine this method with `augment`.

Specification: Called before a snip is inserted from the editor. If the return value is `#f`, then the insert will be aborted.

See also `on-insert` and `after-insert`.

The editor is internally locked for writing when this method is called (see also §5.9 “Internal Editor Locks”).

Default implementation: Returns `#t`.

```
(send a-pasteboard can-interactive-move? event) → boolean?
  event : (is-a?/c mouse-event%)
```

Refine this method with `augment`.

Specification: Called when the user starts interactively dragging snips (the ones that are selected; see `find-next-selected-snip`). All of the selected snips will be moved. If `#f` is returned, the interactive move is disallowed. The mouse event that started the move (usually a button-down event) is provided.

See also `on-interactive-move`, `after-interactive-move`, and `interactive-adjust-move`.

Default implementation: Returns `#t`.

```
(send a-pasteboard can-interactive-resize? snip) → boolean?
  snip : (is-a?/c snip%)
```

Refine this method with `augment`.

Specification: Called when the user starts interactively resizing a snip (the one that is selected; see `find-next-selected-snip`). If `#f` is returned, the interactive resize is disallowed.

The *snip* argument is the snip that will be resized.

See also `after-interactive-resize`, `after-interactive-resize`, and `interactive-adjust-resize`.

Default implementation: Returns `#t`.

```
(send a-pasteboard can-move-to? snip
                                x
                                y
                                dragging?) → boolean?
  snip : (is-a?/c snip%)
  x : real?
  y : real?
  dragging? : any/c
```

Refine this method with `augment`.

Specification: Called before a snip is moved in the editor. If the return value is `#f`, then the move will be aborted.

If *dragging?* is not `#f`, then this move is a temporary move for dragging.

See also `on-move-to` and `after-move-to`.

The editor is internally locked for writing when this method is called (see also §5.9 “Internal Editor Locks”).

Default implementation: Returns `#t`.

```
(send a-pasteboard can-reorder? snip
                                to-snip
                                before?) → boolean?
  snip : (is-a?/c snip%)
  to-snip : (is-a?/c snip%)
  before? : any/c
```

Refine this method with `augment`.

Specification: Called before a snip is moved in the pasteboard's front-to-back snip order. If the return value is `#f`, then the reordering will be aborted.

If *before?* is `#t`, then *snip* is to be moved before *to-snip*, otherwise *snip* is to be moved after *to-snip*.

See also `on-reorder` and `after-reorder`.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Returns `#t`.

```
(send a-pasteboard can-resize? snip w h) → boolean?
  snip : (is-a?/c snip%)
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Refine this method with `augment`.

Specification: Called before a snip is resized in the editor. If the return value is `#f`, then the resize will be aborted.

See also `on-resize` and `after-resize`.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Returns `#t`.

```
(send a-pasteboard can-select? snip on?) → boolean?
  snip : (is-a?/c snip%)
  on? : any/c
```

Refine this method with `augment`.

Specification: This method is called before a snip in the pasteboard is selected or deselected.

If #f is returned, the selection change is disallowed. This method is not called when a selected snip is to be deleted (and thus de-selected indirectly); see also can-delete?.

If *on?* is #t, then *snip* will be selected, otherwise *snip* will be deselected.

See also on-select and after-select.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks").

Default implementation: Returns #t.

```
(send a-pasteboard change-style [style snip]) → void?
  style : (or/c (is-a?/c style-delta%) (is-a?/c style<%>) #f)
        = #f
  snip : (or/c (is-a?/c snip%) #f) = #f
```

Changes the style of *snip* to a specific style or by applying a style delta. If *snip* is #f, then all currently selected snips are changed. If *style* is #f, then the default style is used, according to default-style-name.

To change a large collection of snips from one style to another style, consider providing a style<%> instance rather than a style-delta% instance. Otherwise, change-style must convert the style-delta% instance to the style<%> instance for every snip; this conversion consumes both time and (temporary) memory.

When a *style* is provided: The editor's style list must contain *style*, otherwise the style is not changed. See also convert in style-list%.

```
(send a-pasteboard copy-self-to dest) → void?
  dest : (or/c (is-a?/c text%) (is-a?/c pasteboard%))
```

Overrides copy-self-to in editor<%>.

In addition to the default copy-self-to in editor<%> work, the dragability, selection visibility state, and scroll step of *a-pasteboard* are installed into *dest*.

```
(send a-pasteboard delete) → void?
(send a-pasteboard delete snip) → void?
  snip : (is-a?/c snip%)
```

Deletes *snip* when provided, or deletes the currently selected snips from the editor when *snip* is not provided.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use on-delete to monitor content deletion changes.

```
(send a-pasteboard do-copy time extend?) → void?
  time : exact-integer?
  extend? : any/c
```

Specification: Called to copy the editor's current selection into the clipboard. This method is provided so that it can be overridden by subclasses. Do not call this method directly; instead, call `copy`.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an `exn:fail:contract` exception is raised.

Default implementation: Copies the current selection, extending the current clipboard contexts if *extend?* is true.

```
(send a-pasteboard do-paste time) → void?
  time : exact-integer?
```

Specification: Called to paste the current contents of the clipboard into the editor. This method is provided so that it can be overridden by subclasses. Do not call this method directly; instead, call `paste`.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an `exn:fail:contract` exception is raised.

Default implementation: Pastes.

```
(send a-pasteboard do-paste-x-selection time) → void?
  time : exact-integer?
```

Specification: Called to paste the current contents of the X11 selection on Unix (or the clipboard on Windows and Mac OS) into the editor. This method is provided so that it can be overridden by subclasses. Do not call this method directly; instead, call `paste-x-selection`.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an `exn:fail:contract` exception is raised.

Default implementation: Pastes.

```
(send a-pasteboard erase) → void?
```

Deletes all snips from the editor.

See also delete.

```
(send a-pasteboard find-next-selected-snip start)
 → (or/c (is-a?/c snip%) #f)
  start : (or/c (is-a?/c snip%) #f)
```

Returns the next selected snip in the editor, starting the search after *start*. (See §5.1 “Editor Structure and Terminology” for information about snip order in pasteboards.) If *start* is #f, then the search starts with the first snip in the editor (and thus returns the first selected snip, if any are selected). If no more selected snips are available, or if *start* is not in the pasteboard, #f is returned.

```
(send a-pasteboard find-snip x y [after])
 → (or/c (is-a?/c snip%) #f)
  x : real?
  y : real?
  after : (or/c (is-a?/c snip%) #f) = #f
```

Finds the frontmost snip (after a given snip) that intersects a given location. See §5.1 “Editor Structure and Terminology” for information about snip order in pasteboards.

The *x* and *y* arguments are in editor coordinates. If *after* is not supplied, the frontmost snip at *x* and *y* is returned, otherwise the frontmost snip behind *after* is returned. If *after* is a snip that is not in the pasteboard, #f is returned.

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when get-admin returns an administrator (not #f).

```
(send a-pasteboard get-area-selectable) → boolean?
```

Returns whether snips can be selected by dragging a selection box in the pasteboard’s background. By default, area selection is allowed. See also set-area-selectable.

Added in version 1.12 of package gui-lib.

```
(send a-pasteboard get-center) → real? real?
```

Returns the center of the pasteboard in pasteboard coordinates.

The first result is the x-coordinate of the center and the second result is the y-coordinate of the center.

```
(send a-pasteboard get-dragable) → boolean?
```

Returns whether snips in the editor can be interactively dragged by event handling in `on-default-event`: `#t` if dragging is allowed, `#f` otherwise. By default, dragging is allowed. See also `set-dragable`.

```
(send a-pasteboard get-scroll-step)
 → (and/c real? (not/c negative?))
```

Gets the editor location offset for each vertical scroll position. See also `set-scroll-step`.

```
(send a-pasteboard get-selection-visible) → boolean?
```

Returns whether selection dots are drawn around the edge of selected snips in the pasteboard. By default, selection dots are on. See also `set-selection-visible`.

```
(send a-pasteboard insert snip) → void?
  snip : (is-a?/c snip%)
(send a-pasteboard insert snip before x y) → void?
  snip : (is-a?/c snip%)
  before : (or/c (is-a?/c snip%) #f)
  x : real?
  y : real?
(send a-pasteboard insert snip x y) → void?
  snip : (is-a?/c snip%)
  x : real?
  y : real?
(send a-pasteboard insert snip before) → void?
  snip : (is-a?/c snip%)
  before : (or/c (is-a?/c snip%) #f)
```

Extends `insert` in `editor<%>`.

Inserts *snip* at location (*x*, *y*) just in front of *before*. (See §5.1 “Editor Structure and Terminology” for information about snip order in pasteboards.) If *before* is not provided or is `#f`, then *snip* is inserted behind all other snips. If *x* and *y* are not provided, the snip is added at the center of the pasteboard.

```
(send a-pasteboard interactive-adjust-mouse x
                                            y) → void?
  x : (box/c real?)
  y : (box/c real?)
```

Specification: This method is called during interactive dragging and resizing (of the currently selected snips; see `find-next-selected-snip`) to preprocess the current mouse location

(in editor coordinates). The snip and actual x and y coordinates are passed into the method (boxed); the resulting coordinates are used instead of the actual mouse location.

See also `interactive-adjust-resize`.

Default implementation: A negative value for either `x` or `y` is replaced with `0`.

```
(send a-pasteboard interactive-adjust-move snip
                                           x
                                           y)   → void?
  snip : (is-a?/c snip%)
  x : (box/c real?)
  y : (box/c real?)
```

Specification: This method is called during an interactive move (for each selected snip) to preprocess the user-determined snip location for each selected snip. The snip and mouse-determined locations (in editor coordinates) are passed into the method (boxed); the resulting locations are used for graphical feedback to the user during moving.

The actual mouse coordinates are first sent through `interactive-adjust-mouse` before determining the locations passed into this method.

Default implementation: Does nothing.

```
(send a-pasteboard interactive-adjust-resize snip
                                             width
                                             height) → void?
  snip : (is-a?/c snip%)
  width : (box/c (and/c real? (not/c negative?)))
  height : (box/c (and/c real? (not/c negative?)))
```

Specification: This method is called during interactive resizing of a snip to preprocess the user-determined snip size. The snip and mouse-determined height and width are passed into the method (boxed); the resulting height and width are used for graphical feedback to the user during resizing.

The actual mouse coordinates are first sent through `interactive-adjust-mouse` before determining the sizes passed into this method.

Default implementation: Does nothing.

```
(send a-pasteboard is-selected? snip) → boolean?
  snip : (is-a?/c snip%)
```

Returns `#t` if a specified snip is currently selected or `#f` otherwise.

```
(send a-pasteboard lower snip) → void?
  snip : (is-a?/c snip%)
```

Moves the snip one level deeper (i.e., behind one more other snip) in the pasteboard's snip order. See §5.1 "Editor Structure and Terminology" for information about snip order in pasteboards.

See also `raise`, `set-before`, and `set-after`.

```
(send a-pasteboard move snip x y) → void?
  snip : (is-a?/c snip%)
  x : real?
  y : real?
(send a-pasteboard move x y) → void?
  x : real?
  y : real?
```

Moves *snip* right *x* pixels and down *y* pixels. If *snip* is not provided, then all selected snips are moved.

Snip locations in a pasteboard can be changed by the system in response to other method calls, and such changes do not go through this method; use `on-move-to` to monitor snip position changes.

```
(send a-pasteboard move-to snip x y) → void?
  snip : (is-a?/c snip%)
  x : real?
  y : real?
```

Moves *snip* to a given location in the editor.

Snip locations in a pasteboard can be changed by the system in response to other method calls, and such changes do not go through this method; use `on-move-to` to monitor snip position changes.

```
(send a-pasteboard no-selected) → void?
```

Deselects all selected snips in the editor.

The selection in a pasteboard can be changed by the system in response to other method calls, and such changes do not go through this method; use `on-select` to monitor selection changes.

```
(send a-pasteboard on-default-char event) → void?
  event : (is-a?/c key-event%)
```

Overrides on-default-char in editor<%>.

Calls delete with no arguments in response to the Delete or Backspace key, and calls move with suitable 0/1/-1 arguments in response to an arrow key.

```
(send a-pasteboard on-default-event event) → void?
  event : (is-a?/c mouse-event%)
```

Overrides on-default-event in editor<%>.

Selects, drags, and resizes snips:

- Clicking on a snip selects the snip. Shift-clicking extends the current selection with the snip.
- Clicking in the space between snips drags a selection box; once the mouse button is released, all snips touching the box are selected. Shift-clicking extends the current selection with the new snips.
- Double-clicking on a snip calls on-double-click.
- Clicking on a selected snip drags the selected snip(s) to a new location.
- Clicking on a hiliting tab for a selected object resizes the object.

```
(send a-pasteboard on-delete snip) → void?
  snip : (is-a?/c snip%)
```

Refine this method with augment.

Called before a snip is deleted from the editor, after can-delete? is called to verify that the deletion is allowed. The after-delete method is guaranteed to be called after the delete has completed.

The editor is internally locked for writing when this method is called (see also §5.9 “Internal Editor Locks”). Use after-delete to modify the editor, if necessary.

```
(send a-pasteboard on-double-click snip
                                   event) → void?
  snip : (is-a?/c snip%)
  event : (is-a?/c mouse-event%)
```

Specification: This method is called when the user double-clicks on a snip in the editor. The clicked-on snip and event records are passed to the method.

Default implementation: If *snip* accepts events, it is designated as the caret owner and all snips in the editor are unselected.

```
(send a-pasteboard on-insert snip before x y) → void?
  snip : (is-a?/c snip%)
  before : (or/c (is-a?/c snip%) #f)
  x : real?
  y : real?
```

Refine this method with `augment`.

Called before a snip is inserted from the editor, after `can-insert?` is called to verify that the insertion is allowed. The `after-insert` method is guaranteed to be called after the insert has completed.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks"). Use `after-insert` to modify the editor, if necessary.

```
(send a-pasteboard on-interactive-move event) → void?
  event : (is-a?/c mouse-event%)
```

Refine this method with `augment`.

Specification: Called when the user starts interactively dragging snips (the ones that are selected; see `find-next-selected-snip`), after `can-interactive-move?` is called to verify that the move is allowed. The `after-interactive-move` method is guaranteed to be called after the move has completed. All of the selected snips will be moved. The mouse event that started the move (usually a button-down event) is provided.

See also `interactive-adjust-move`.

Default implementation: Does nothing.

```
(send a-pasteboard on-interactive-resize snip) → void?
  snip : (is-a?/c snip%)
```

Refine this method with `augment`.

Specification: Called when the user starts interactively resizing a snip (the one that is selected; see `find-next-selected-snip`), after `can-interactive-resize?` is called to verify that the resize is allowed. The `after-interactive-resize` method is guaranteed to be called after the resize has completed.

The *snip* argument is the snip that will be resized.

Default implementation: Does nothing.

```
(send a-pasteboard on-move-to snip
                              x
                              y
                              dragging?) → void?
  snip : (is-a?/c snip%)
  x : real?
  y : real?
  dragging? : any/c
```

Refine this method with `augment`.

Specification: Called before a snip is moved in the editor, after `can-move-to?` is called to verify that the move is allowed. The `after-move-to` method is guaranteed to be called after the move has completed.

If *dragging?* is not `#f`, then this move is a temporary move for dragging.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks"). Use `after-move-to` to modify the editor, if necessary. See also `on-interactive-move` and `interactive-adjust-move`.

Default implementation: Does nothing.

```
(send a-pasteboard on-reorder snip
                              to-snip
                              before?) → void?
  snip : (is-a?/c snip%)
  to-snip : (is-a?/c snip%)
  before? : any/c
```

Refine this method with `augment`.

Specification: Called before a snip is moved in the pasteboard's front-to-back snip order, after `can-reorder?` is called to verify that the reorder is allowed. The `after-reorder` method is guaranteed to be called after the reorder has completed.

If *before?* is `#t`, then *snip* is to be moved before *to-snip*, otherwise *snip* is to be moved after *to-snip*.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks"). Use `after-reorder` to modify the editor, if necessary.

Default implementation: Does nothing.

```
(send a-pasteboard on-resize snip w h) → void?
```

```
  snip : (is-a?/c snip%)
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Refine this method with `augment`.

Specification: Called before a snip is resized by the editor, after `can-resize?` is called to verify that the resize is allowed. The `after-resize` method is guaranteed to be called after the resize has completed.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks"). Use `after-resize` to modify the editor, if necessary.

Note that a snip calls `resized`, not this method, to notify the pasteboard that the snip resized itself.

Default implementation: Does nothing.

```
(send a-pasteboard on-select snip on?) → void?
  snip : (is-a?/c snip%)
  on? : any/c
```

Refine this method with `augment`.

Specification: Called before a snip in the pasteboard is selected or deselected, after `can-select?` is called to verify that the selection is allowed. The `after-select` method is guaranteed to be called after the selection has completed. This method is not called when a selected snip is to be deleted (and thus de-selected indirectly); see also `on-delete` .

If *on?* is `#t`, then *snip* will be selected, otherwise *snip* will be deselected.

The editor is internally locked for writing when this method is called (see also §5.9 "Internal Editor Locks"). Use `after-select` to modify the editor, if necessary.

Default implementation: Does nothing.

```
(send a-pasteboard raise snip) → void?
  snip : (is-a?/c snip%)
```

Moves a snip one level shallower (i.e., in front of one more other snip) in the pasteboard's snip order. See §5.1 "Editor Structure and Terminology" for information about snip order in pasteboards.

See also `lower`, `set-before`, and `set-after`.

```
(send a-pasteboard remove snip) → void?
  snip : (is-a?/c snip%)
```

Removes the specified snip from the editor in a non-undoable manner (so the snip is completely free of the pasteboard can be used in other editors).

See also delete.

```
(send a-pasteboard remove-selected snip) → void?
  snip : (is-a?/c snip%)
```

Deselects *snip* (if it is currently selected) without deselecting any other snips.

The selection in a pasteboard can be changed by the system in response to other method calls, and such changes do not go through this method; use on-select to monitor selection changes.

```
(send a-pasteboard resize snip w h) → boolean?
  snip : (is-a?/c snip%)
  w : (and/c real? (not/c negative?))
  h : (and/c real? (not/c negative?))
```

Attempts to resize a given snip. If the snip allows resizing, #t is returned, otherwise #f is returned. Using this method instead of calling the snip's resize method directly will make the resize undo-able.

```
(send a-pasteboard set-after snip after) → void?
  snip : (is-a?/c snip%)
  after : (or/c (is-a?/c snip%) #f)
```

Changes the depth of *snip* moving it just behind *after*. If *after* is #f, *snip* is moved to the back. See §5.1 "Editor Structure and Terminology" for information about snip order in pasteboards.

See also raise, lower, and set-before.

```
(send a-pasteboard set-area-selectable allow-drag?) → void?
  allow-drag? : any/c
```

Set whether snips can be selected by dragging a selection box in the pasteboard's background by event handling in on-default-event: a true value allows selection, #f disallows selection. See also get-area-selectable.

Added in version 1.12 of package gui-lib.

```
(send a-pasteboard set-before snip before) → void?
  snip : (is-a?/c snip%)
  before : (or/c (is-a?/c snip%) #f)
```

Changes the depth of *snip* moving it just in front of *before*. If *before* is #f, *snip* is moved to the front. See §5.1 "Editor Structure and Terminology" for information about snip order in pasteboards.

See also raise, lower, and set-after.

```
(send a-pasteboard set-dragable allow-drag?) → void?
  allow-drag? : any/c
```

Sets whether snips in the editor can be interactively dragged by event handling in on-default-event: a true value allows dragging, #f disallows dragging. See also get-dragable.

```
(send a-pasteboard set-scroll-step stepsize) → void?
  stepsize : (and/c real? (not/c negative?))
```

Sets the editor location offset for each vertical scroll position. See also get-scroll-step.

```
(send a-pasteboard set-selected snip) → void?
  snip : (is-a?/c snip%)
```

Selects a specified snip (deselecting all others).

The selection in a pasteboard can be changed by the system in response to other method calls, and such changes do not go through this method; use on-select to monitor selection changes.

```
(send a-pasteboard set-selection-visible visible?) → void?
  visible? : any/c
```

Sets whether selection dots are drawn around the edge of selected snips in the pasteboard. See also get-selection-visible.

7.18 text%

```
text% : class?
  superclass: object%
  extends: editor<%>
```

A text% object is a standard text editor. A text editor is displayed on the screen through an editor-canvas% object or some other display.

```
(new text%
  [[line-spacing line-spacing]
   [tab-stops tab-stops]
   [auto-wrap auto-wrap]])      → (is-a?/c text%)
 line-spacing : (and/c real? (not/c negative?)) = 1.0
 tab-stops : (listof real?) = null
 auto-wrap : any/c = #f
```

The *line-spacing* argument sets the additional amount of space (in DC units) inserted between each line in the editor when the editor is displayed. This spacing is included in the reported height of each line.

See set-tabs for information about tabstops.

If *auto-wrap* is true, then auto-wrapping is enabled via auto-wrap.

A new keymap% object is created for the new editor. See also get-keymap and set-keymap.

A new style-list% object is created for the new editor. See also get-style-list and set-style-list.

```
(send a-text after-change-style start len) → void?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called after the style is changed for a given range (and after the display is refreshed; use on-change-style and begin-edit-sequence to avoid extra refreshes when after-change-style modifies the editor).

See also can-change-style? and on-edit-sequence.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-text after-delete start len) → void?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called after a given range is deleted from the editor (and after the display is refreshed; use on-delete and begin-edit-sequence to avoid extra refreshes when after-delete modifies the editor).

The *start* argument specifies the starting position of the deleted range. The *len* argument specifies number of deleted items (so *start*+*len* is the ending position of the deleted range).

See also can-delete? and on-edit-sequence.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-text after-insert start len) → void?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called after items are inserted into the editor (and after the display is refreshed; use on-insert and begin-edit-sequence to avoid extra refreshes when after-insert modifies the editor).

The *start* argument specifies the position of the insert. The *len* argument specifies the total length (in positions) of the inserted items.

See also can-insert? and on-edit-sequence.

No internals locks are set when this method is called.

Default implementation: Does nothing.

```
(send a-text after-merge-snips pos) → void?
  pos : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called after adjacent snips in the editor are combined into one.

The *pos* argument specifies the position within the editor where the snips were merged (i.e., one old snip was just before *pos*, one old was just after *pos*, and the new snip spans *pos*).

See also merge-with.

Default implementation: Does nothing.

```
(send a-text after-set-position) → void?
```

Refine this method with augment.

Specification: Called after the start and end position have been moved (but not when the position is moved due to inserts or deletes).

See also on-edit-sequence.

Default implementation: Does nothing.

```
(send a-text after-set-size-constraint) → void?
```

Refine this method with augment.

Specification: Called after the editor's maximum or minimum height or width is changed (and after the display is refreshed; use on-set-size-constraint and begin-edit-sequence to avoid extra refreshes when after-set-size-constraint modifies the editor).

(This callback method is provided because setting an editor's maximum width may cause lines to be re-flowed with soft newlines.)

See also can-set-size-constraint? and on-edit-sequence.

Default implementation: Does nothing.

```
(send a-text after-split-snip pos) → void?
  pos : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called after a snip in the editor is split into two, either through a call to split-snip or during some other action, such as inserting.

The *pos* argument specifies the position within the editor where a snip was split.

Default implementation: Does nothing.

```
(send a-text call-clickback start end) → void?
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
```

Simulates a user click that invokes a clickback, if the given range of positions is within a clickback's region. See also §5.8 "Clickbacks".

```
(send a-text can-change-style? start len) → boolean?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called before the style is changed in a given range of the editor. If the return value is #f, then the style change will be aborted.

The editor is internally locked for writing during a call to this method (see also §5.9 “Internal Editor Locks”). Use `after-change-style` to modify the editor, if necessary.

See also `on-change-style`, `after-change-style`, and `on-edit-sequence`.

Default implementation: Returns `#t`.

```
(send a-text can-delete? start len) → boolean?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with `augment`.

Specification: Called before a range is deleted from the editor. If the return value is `#f`, then the delete will be aborted.

The *start* argument specifies the starting position of the range to delete. The *len* argument specifies number of items to delete (so *start*+*len* is the ending position of the range to delete).

The editor is internally locked for writing during a call to this method (see also §5.9 “Internal Editor Locks”). Use `after-delete` to modify the editor, if necessary.

See also `on-delete`, `after-delete`, and `on-edit-sequence`.

Default implementation: Returns `#t`.

```
(send a-text can-insert? start len) → boolean?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with `augment`.

Specification: Called before items are inserted into the editor. If the return value is `#f`, then the insert will be aborted.

The *start* argument specifies the position of the potential insert. The *len* argument specifies the total length (in positions) of the items to be inserted.

The editor is internally locked for writing during a call to this method (see also §5.9 “Internal Editor Locks”). Use `after-insert` to modify the editor, if necessary.

See also `on-insert`, `after-insert`, and `on-edit-sequence`.

Default implementation: Returns `#t`.

```
(send a-text can-set-size-constraint?) → boolean?
```

Refine this method with `augment`.

Specification: Called before the editor's maximum or minimum height or width is changed. If the return value is `#f`, then the change will be aborted.

(This callback method is provided because setting an editor's maximum width may cause lines to be re-flowed with soft newlines.)

See also `on-set-size-constraint`, `after-set-size-constraint`, and `on-edit-sequence`.

Default implementation: Returns `#t`.

```
(send a-text caret-hidden?) → boolean?
```

Returns `#t` if the caret is hidden for this editor or `#f` otherwise.

See also `hide-caret`.

```
(send a-text change-style  delta
                           [start
                            end
                            counts-as-mod?]) → void?
  delta : (or/c (is-a?/c style-delta%) #f)
  start : (or/c exact-nonnegative-integer? 'start) = 'start
  end : (or/c exact-nonnegative-integer? 'end) = 'end
  counts-as-mod? : any/c = #t
(send a-text change-style  style
                           [start
                            end
                            counts-as-mod?]) → void?
  style : (or/c (is-a?/c style<%>) #f)
  start : (or/c exact-nonnegative-integer? 'start) = 'start
  end : (or/c exact-nonnegative-integer? 'end) = 'end
  counts-as-mod? : any/c = #t
```

Changes the style for a region in the editor by applying a style delta or installing a specific style. If *start* is `'start` and *end* is `'end`, then the currently selected items are changed. Otherwise, if *end* is `'end`, then the style is changed from *start* until the end of the selection. If *counts-as-mod?* is `#f`, then `set-modified` is not called after applying the style change.

To change a large collection of snips from one style to another style, consider providing a `style<%>` instance rather than a `style-delta%` instance. Otherwise, `change-style` must convert the `style-delta%` instance to the `style<%>` instance for every snip; this conversion consumes both time and (temporary) memory.

When *style* is provided: The editor's style list must contain *style*, otherwise the style is not changed. See also convert in style-list%.

```
(send a-text copy [extend? time start end]) → void?
  extend? : any/c = #f
  time : exact-integer? = 0
  start : (or/c exact-nonnegative-integer? 'start) = 'start
  end : (or/c exact-nonnegative-integer? 'end) = 'end
```

Extends copy in editor<%>.

Copies specified range of text into the clipboard. If *extend?* is not #f, the old clipboard contents are appended. If *start* is 'start or *end* is 'end, then the current selection start/end is used.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-text copy-self-to dest) → void?
  dest : (or/c (is-a?/c text%) (is-a?/c pasteboard%))
```

Overrides copy-self-to in editor<%>.

In addition to the default copy-self-to in editor<%> work, this editor's file format, word-break function, wordbreak map, click-between-threshold, caret visibility state, overwrite mode state, and autowrap bitmap are installed into *dest*.

```
(send a-text cut [extend? time start end]) → void?
  extend? : any/c = #f
  time : exact-integer? = 0
  start : (or/c exact-nonnegative-integer? 'start) = 'start
  end : (or/c exact-nonnegative-integer? 'end) = 'end
```

Overrides cut in editor<%>.

Copies and then deletes the specified range. If *extend?* is not #f, the old clipboard contents are appended. If *start* is 'start or *end* is 'end, then the current selection start/end is used.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-text delete start [end scroll-ok?]) → void?
  start : (or/c exact-nonnegative-integer? 'start)
  end : (or/c exact-nonnegative-integer? 'back) = 'back
  scroll-ok? : any/c = #t
(send a-text delete) → void?
```

Deletes the specified range or the currently selected text (when no range is provided) in the editor. If *start* is 'start, then the starting selection position is used; if *end* is 'back, then only the grapheme preceding *start* is deleted. If *scroll-ok?* is not #f and *start* is the same as the current caret position, then the editor's display may be scrolled to show the new selection position.

The content of an editor can be changed by the system in response to other method calls, and such changes do not go through this method; use on-delete to monitor content deletion changes.

Changed in version 1.67 of package gui-lib: Changed 'back to delete a grapheme instead of a character.

```
(send a-text do-copy start end time extend?) → void?
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
  time : exact-integer?
  extend? : any/c
```

Specification: Called to copy a region of the editor into the clipboard. This method is provided so that it can be overridden by subclasses. Do not call this method directly; instead, call copy.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

Default implementation: Copy the data from *start* to *end*, extending the current clipboard contexts if *extend?* is not #f.

```
(send a-text do-paste start time) → void?
  start : exact-nonnegative-integer?
  time : exact-integer?
```

Specification: Called to paste the current contents of the clipboard into the editor. This method is provided so that it can be overridden by subclasses. Do not call this method directly; instead, call paste.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

Default implementation: Pastes into the position *start*.

```
(send a-text do-paste-x-selection start
                                  time) → void?
  start : exact-nonnegative-integer?
  time : exact-integer?
```

Specification: Called to paste the current contents of the X11 selection on Unix (or the clipboard on Windows or Mac OS) into the editor. This method is provided so that it can be overridden by subclasses. Do not call this method directly; instead, call `paste-x-selection`.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an `exn:fail:contract` exception is raised.

Default implementation: Pastes into the position *start*.

```
(send a-text erase) → void?
```

Erases the contents of the editor.

See also `delete`.

```
(send a-text extend-position pos) → void?
  pos : exact-nonnegative-integer?
```

Updates the selection (see `set-position`) based on the result of `get-extend-end-position`, `get-extend-start-position`, and *pos*.

If *pos* is before the extend start and extend end positions, then the selection goes from *pos* to the extend end position. If it is after, then the selection goes from the extend start position to *pos*.

Use this method to implement shift-modified movement keys in order to properly extend the selection.

```
(send a-text find-line y [on-it]) → exact-nonnegative-integer?
  y : real?
  on-it : (or/c (box/c any/c) #f) = #f
```

Given a location in the editor, returns the line at the location. Lines are numbered starting with `0`.

The *on-it* box is filled with `#t` if the line actually touches this position, or `#f` otherwise, unless *on-it* is `#f`. (A large enough *y* will always return the last line number, but will set *on-it* to `#f`.)

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see `refresh-delayed?`).

```
(send a-text find-newline [direction
                           start
                           end])
 → (or/c exact-nonnegative-integer? #f)
  direction : (or/c 'forward 'backward) = 'forward
  start : (or/c exact-nonnegative-integer? 'start) = 'start
  end : (or/c exact-nonnegative-integer? 'eof) = 'eof
```

Like `find-string`, but specifically finds a paragraph break (possibly more efficiently than searching text).

```
(send a-text find-next-non-string-snip after)
 → (or/c (is-a?/c snip%) #f)
  after : (or/c (is-a?/c snip%) #f)
```

Given a snip, returns the next snip in the editor (after the given one) that is not an instance of `string-snip%`. If `#f` is given as the snip, the result is the first non-string snip in the editor (if any). If no non-string snip is found after the given snip, the result is `#f`.

```
(send a-text find-position  x
                            y
                           [at-eol
                            on-it
                            edge-close])
 → exact-nonnegative-integer?
  x : real?
  y : real?
  at-eol : (or/c (box/c any/c) #f) = #f
  on-it : (or/c (box/c any/c) #f) = #f
  edge-close : (or/c (box/c real?) #f) = #f
```

Given a location in the editor, returns the position at the location.

See §5.3 “End of Line Ambiguity” for a discussion of the *at-eol* argument. The *on-it* box is filled with `#t` if the line actually touches this position, or `#f` otherwise, unless *on-it* is `#f`.

The *edge-close* box is filled with a value indicating how close the point is to the vertical edges of the item when the point falls on the item, unless *edge-close* is `#f`. If the point is strictly to the left of the item’s left edge, the value is `-100.0`; if the point is at or to the right of the item’s right edge, the value is `100.0`; otherwise, the value is zero or negative if the point is closest to the left, positive if the point is closest to the right edge of the item, and the magnitude of the value is the distance from the point to the edge of the item.

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when `get-admin` returns an administrator (not `#f`). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see `refresh-delayed?`).

```
(send a-text find-position-in-line  line
                                    x
                                   [at-eol
                                    on-it
                                    edge-close])
 → exact-nonnegative-integer?
  line : exact-nonnegative-integer?
  x : real?
  at-eol : (or/c (box/c any/c) #f) = #f
  on-it : (or/c (box/c any/c) #f) = #f
  edge-close : (or/c (box/c real?) #f) = #f
```

Given a location within a line of the editor, returns the position at the location. Lines are numbered starting with `0`.

See §5.3 “End of Line Ambiguity” for a discussion of the *at-eol* argument. The *on-it* box is filled with `#t` if the line actually touches this position, or `#f` otherwise, unless *on-it* is `#f`.

See `find-position` for a discussion of *edge-close*.

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when `get-admin` returns an administrator (not `#f`). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see `refresh-delayed?`).

```
(send a-text find-snip pos direction [s-pos])
 → (or/c (is-a?/c snip%) #f)
  pos : exact-nonnegative-integer?
  direction : (or/c 'before-or-none 'before 'after 'after-or-none)
  s-pos : (or/c (box/c exact-nonnegative-integer?) #f) = #f
```

Returns the snip at a given position, or `#f` if an appropriate snip cannot be found.

If the position *pos* is between two snips, *direction* specifies which snip to return; *direction* can be any of the following:

- `'before-or-none` — returns the snip before the position, or `#f` if *pos* is `0`

- `'before` — returns the snip before the position, or the first snip if *pos* is `0`
- `'after` — returns the snip after the position, or the last snip if *pos* is the last position
- `'after-or-none` – returns the snip after the position, or `#f` if *pos* is the last position or larger

The *s-pos* box is filled with the position where the returned snip starts, unless *s-pos* is `#f`.

```
(send a-text find-string  str
                          [direction
                           start
                           end
                           get-start?
                           case-sensitive?])
 → (or/c exact-nonnegative-integer? #f)
  str : non-empty-string?
  direction : (or/c 'forward 'backward) = 'forward
  start : (or/c exact-nonnegative-integer? 'start) = 'start
  end : (or/c exact-nonnegative-integer? 'eof) = 'eof
  get-start? : any/c = #t
  case-sensitive? : any/c = #t
```

Finds an exact-match string in the editor and returns its position. If the string is not found, `#f` is returned.

The *direction* argument can be `'forward` or `'backward`, indicating a forward search or backward search respectively. In the case of a forward search, the return value is the starting position of the string; for a backward search, the ending position is returned. However, if *get-start?* is `#f`, then the other end of the string position will be returned.

The *start* and *end* arguments set the starting and ending positions of a forward search (use *start* > *end* for a backward search). If *start* is `'start`, then the search starts at the start of the selection. If *end* is `'eof`, then the search continues to the end (for a forward search) or start (for a backward search) of the editor.

If *case-sensitive?* is `#f`, then an uppercase and lowercase of each alphabetic character are treated as equivalent.

```
(send a-text find-string-embedded
 str
 [direction
  start
  end
  get-start?
  case-sensitive?
  #:recur-inside? recur-inside?])
```

```
→ (or/c exact-nonnegative-integer?
        #f
        (cons/c
         (is-a?/c editor<%>)
         (flat-rec-contract
          nested-editor-search-result
          (or/c (cons/c (is-a?/c editor<%>)
                        nested-editor-search-result)
                exact-nonnegative-integer?))))
 str : non-empty-string?
 direction : (or/c 'forward 'backward) = 'forward
 start : (or/c exact-nonnegative-integer? 'start) = 'start
 end : (or/c exact-nonnegative-integer? 'eof) = 'eof
 get-start? : any/c = #t
 case-sensitive? : any/c = #t
 recur-inside? : (-> (is-a?/c editor-snip%) any/c) = (λ (x) #t)
```

Like `find-string`, but also searches in embedded editors, returning a series of cons pairs whose `car` positions are the editors on the path to the editor where the search string occurred and whose final `cdr` position is the search result position.

Each time an embedded editor is encountered, *recur-inside?* is called with the `editor-snip%` object; if *recur-inside?* returns `#false`, results from that embedded editor (and editors embedded into it) are skipped.

Changed in version 1.80 of package `gui-lib`: Added the *recur-inside?* argument

```
(send a-text find-string-all  str
                              [direction
                               start
                               end
                               get-start?
                               case-sensitive])
 → (listof exact-nonnegative-integer?)
 str : non-empty-string?
 direction : (or/c 'forward 'backward) = 'forward
 start : (or/c exact-nonnegative-integer? 'start) = 'start
 end : (or/c exact-nonnegative-integer? 'eof) = 'eof
 get-start? : any/c = #t
 case-sensitive : any/c = #t
```

Finds all occurrences of a string using `find-string`. If no occurrences are found, the empty list is returned. The arguments are the same as for `find-string`.

```
(send a-text find-string-embedded-all
 str
 [direction
  start
  end
  get-start?
  case-sensitive
  #:recur-inside? recur-inside?])
→ (listof (or/c exact-nonnegative-integer?
                (cons/c
                 (is-a?/c editor<%>)
                 (flat-rec-contract
                  nested-editor-search-result
                  (or/c (cons/c (is-a?/c editor<%>)
                                nested-editor-search-result)
                        (listof exact-nonnegative-integer?))))))
 str : non-empty-string?
 direction : (or/c 'forward 'backward) = 'forward
 start : (or/c exact-nonnegative-integer? 'start) = 'start
 end : (or/c exact-nonnegative-integer? 'eof) = 'eof
 get-start? : any/c = #t
 case-sensitive : any/c = #t
 recur-inside? : (-> (is-a?/c editor-snip%) any/c) = (λ (x) #t)
```

Like find-string-all, but also searches in embedded editors like find-string-embedded, returning the search results as a list of the editors that contain the matches.

Changed in version 1.80 of package gui-lib: Added the *recur-inside?* argument

```
(send a-text find-wordbreak start
                            end
                            reason) → void?
 start : (or/c (box/c exact-nonnegative-integer?) #f)
 end : (or/c (box/c exact-nonnegative-integer?) #f)
 reason : (or/c 'caret 'line 'selection 'user1 'user2)
```

Finds wordbreaks in the editor using the current wordbreak procedure. See also set-wordbreak-func.

The contents of the *start* argument specifies an position to start searching backwards to the next word start; its will be filled with the starting position of the word that is found. If *start* is #f, no backward search is performed.

The contents of the *end* argument specifies an position to start searching forwards to the

next word end; its will be filled with the ending position of the word that is found. If *end* is #f, no forward search is performed.

The *reason* argument specifies more information about what the wordbreak is used for. For example, the wordbreaks used to move the caret may be different from the wordbreaks used to break lines. The possible values of *reason* are:

- 'caret — find a wordbreak suitable for moving the caret
- 'line — find a wordbreak suitable for breaking lines
- 'selection — find a wordbreak suitable for selecting the closest word
- 'user1 — for other (not built-in) uses
- 'user2 — for other (not built-in) uses

The actual handling of *reason* is controlled by the current wordbreak procedure; see set-wordbreak-funcfor details. The default handler and default wordbreak map treats alphanumeric characters the same for 'caret, 'line, and 'selection. Non-alphanumeric, non-space, non-hyphen characters do not break lines, but do break caret and selection words. For example a comma should not be counted as part of the preceding word for moving the caret past the word or double-clicking the word, but the comma should stay on the same line as the word (and thus counts in the same "line word").

```
(send a-text flash-off) → void?
```

Turns off the hiliting and shows the normal selection range again; see flash-on. There is no effect if this method is called when flashing is already off.

```
(send a-text flash-on  start
                       end
                      [at-eol?
                       scroll?
                       timeout]) → void?
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
  at-eol? : any/c = #f
  scroll? : any/c = #t
  timeout : exact-nonnegative-integer? = 500
```

Temporarily hilites a region in the editor without changing the current selection.

See §5.3 "End of Line Ambiguity" for a discussion of the *at-eol?* argument. If *scroll?* is not #f, the editor's display will be scrolled if necessary to show the hilited region. If

timeout is greater than 0, then the hiliting will be automatically turned off after the given number of milliseconds.

See also flash-off.

```
(send a-text get-anchor) → boolean?
```

Returns #t if the selection is currently auto-extending. See also set-anchor.

```
(send a-text get-autowrap-bitmap-width)
 → (and/c real? (not/c negative?))
```

Returns the width of the bitmap last passed to set-autowrap-bitmap or zero? if no bitmap has been passed to set-autowrap-bitmap or if #f was most recently passed.

```
(send a-text get-between-threshold)
 → (and/c real? (not/c negative?))
```

Returns an amount used to determine the meaning of a user click. If the click falls within the threshold of a position between two items, then the click registers on the space between the items rather than on either item.

See also set-between-threshold.

```
(send a-text get-character start) → char?
  start : exact-nonnegative-integer?
```

Returns the character following the position *start*. The character corresponds to getting non-flattened text from the editor.

If *start* is greater than or equal to the last position, #\nul is returned.

```
(send a-text get-end-position) → exact-nonnegative-integer?
```

Returns the ending position of the current selection. See also get-position.

```
(send a-text get-extend-start-position)
 → exact-nonnegative-integer?
```

Returns the beginning of the "extend" region if the selection is currently being extended via, e.g., shift and a cursor movement key; otherwise returns the same value as get-start-position.

```
(send a-text get-extend-end-position)
 → exact-nonnegative-integer?
```

Returns the beginning of the “extend” region if the selection is currently being extended via, e.g., shift and a cursor movement key; otherwise returns the same value as `get-end-position`.

```
(send a-text get-file-format)
 → (or/c 'standard 'text 'text-force-cr)
```

Returns the format of the last file saved from or loaded into this editor. See also `load-file`.

```
(send a-text get-line-spacing)
 → (and/c real? (not/c negative?))
```

Returns the spacing inserted by the editor between each line. This spacing is included in the reported height of each line.

```
(send a-text get-overwrite-mode) → boolean?
```

Returns `#t` if the editor is in overwrite mode, `#f` otherwise. Overwrite mode only affects the way that `on-default-char` handles keyboard input for insertion characters. See also `set-overwrite-mode`.

```
(send a-text get-padding) → (and/c real? (not/c negative?))
                            (and/c real? (not/c negative?))
                            (and/c real? (not/c negative?))
                            (and/c real? (not/c negative?))
```

Returns the editor’s padding for its left, top, right, and bottom sides (in that order).

See also `set-padding`.

```
(send a-text get-position start [end]) → void?
  start : (or/c (box/c exact-nonnegative-integer?) #f)
  end : (or/c (box/c exact-nonnegative-integer?) #f) = #f
```

Returns the current selection range in positions. If nothing is selected, the *start* and *end* will be the same number and that number will be where the insertion point is.

See also get-start-position and get-end-position.

The *start* box is filled with the starting position of the selection, unless *start* is #f. The *end* box is filled with the ending position of the selection, unless *end* is #f.

```
(send a-text get-region-data start end)
 → (or/c (is-a?/c editor-data%) #f)
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
```

Gets extra data associated with a given region. See §5.2.1.2 “Editor Data” for more information.

This method is *not* called when the whole editor is saved to a file. In such cases, the information can be stored in the header or footer; see §5.2.2 “Global Data: Headers and Footers”.

This method is meant to be overridden; the default set-region-data method does not store information to be retrieved by this method.

```
(send a-text get-revision-number)
 → (and/c real? (not/c negative?))
```

Returns an inexact number that increments every time the editor is changed in one of the following ways: a snip is inserted (see after-insert), a snip is deleted (see after-delete), a snip is split (see after-split-snip), snips are merged (see after-merge-snips), or a snip changes its count (which is rare; see recounted).

```
(send a-text get-snip-position snip)
 → (or/c exact-nonnegative-integer? #f)
  snip : (is-a?/c snip%)
```

Returns the starting position of a given snip or #f if the snip is not in this editor.

```
(send a-text get-snip-position-and-location  snip
                                             pos
                                            [x
                                             y])   → boolean?
  snip : (is-a?/c snip%)
  pos : (or/c (box/c exact-nonnegative-integer?) #f)
  x : (or/c (box/c real?) #f) = #f
  y : (or/c (box/c real?) #f) = #f
```

This method is final, so it cannot be overridden.

Gets a snip's position and top left location in editor coordinates. The return value is `#t` if the snip is found, `#f` otherwise.

The *pos* box is filled with starting position of *snip*, unless *pos* is `#f`. The *x* box is filled with left location of *snip* in editor coordinates, unless *x* is `#f`. The *y* box is filled with top location of *snip* in editor coordinates, unless *y* is `#f`.

When location information is requested: The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see `refresh-delayed?`).

```
(send a-text get-start-position) → exact-nonnegative-integer?
```

Returns the starting position of the current selection. See also `get-position`.

```
(send a-text get-styles-sticky) → boolean?
```

In the normal mode for a text editor, style settings are sticky. With sticky styles, when a string or character is inserted into an editor, it gets the style of the snip preceding the insertion point (or the snip that includes the insertion point if text is inserted into an exiting string snip). Alternatively, if `change-style` is called to set the style at the caret position (when it is not a range), then the style is remembered; if the editor is not changed before text is inserted at the caret, then the text gets the remembered style.

With non-sticky styles, text inserted into an editor always gets the style in the editor's style list named by `default-style-name`.

See also `set-styles-sticky`.

```
(send a-text get-tabs [length
                       tab-width
                       in-units]) → (listof real?)
  length : (or/c (box/c exact-nonnegative-integer?) #f) = #f
  tab-width : (or/c (box/c real?) #f) = #f
  in-units : (or/c (box/c any/c) #f) = #f
```

Returns the current tab-position array as a list.

The *length* box is filled with the length of the tab array (and therefore the returned list), unless *length* is `#f`. The *tab-width* box is filled with the width used for tabs past the end of the tab array, unless *tab-width* is `#f`. The *in-units* box is filled with `#t` if the tabs are specified in canvas units or `#f` if they are specified in space-widths, unless *in-units* is `#f`.

See also `set-tabs`.

```
(send a-text get-text [start
                       end
                       flattened?
                       force-cr?]) → string?
  start : exact-nonnegative-integer? = 0
  end : (or/c exact-nonnegative-integer? 'eof) = 'eof
  flattened? : any/c = #f
  force-cr? : any/c = #f
```

Gets the text from *start* to *end*. If *end* is `'eof`, then the contents are returned from *start* until the end of the editor.

If *flattened?* is not `#f`, then flattened text is returned. See §5.5 "Flattened Text" for a discussion of flattened vs. non-flattened text.

If *force-cr?* is not `#f` and *flattened?* is not `#f`, then automatic newlines (from word-wrapping) are written into the return string as real newlines.

```
(send a-text get-top-line-base)
 → (and/c real? (not/c negative?))
```

Returns the distance from the top of the editor to the alignment baseline of the top line. This method is primarily used when an editor is an item within another editor. The reported baseline distance includes the editor's top padding (see `set-padding`).

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when `get-admin` returns an administrator (not `#f`). For `text%` objects, calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see `refresh-delayed?`).

```
(send a-text get-visible-line-range  start
                                     end
                                    [all?]) → void?
  start : (or/c (box/c exact-nonnegative-integer?) #f)
  end : (or/c (box/c exact-nonnegative-integer?) #f)
  all? : any/c = #t
```

Returns the range of lines which are currently visible (or partially visible) to the user. Lines are numbered starting with `0`.

The *start* box is filled with first line visible to the user, unless *start* is `#f`. The *end* box is filled with last line visible to the user, unless *end* is `#f`.

If the editor is displayed by multiple canvases and *all?* is #t, then the computed range includes all visible lines in all displays. Otherwise, the range includes only the visible lines in the current display.

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when get-admin returns an administrator (not #f). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send a-text get-visible-position-range  start
                                         end
                                        [all?]) → void?
  start : (or/c (box/c exact-nonnegative-integer?) #f)
  end : (or/c (box/c exact-nonnegative-integer?) #f)
  all? : any/c = #t
```

Returns the range of positions that are currently visible (or partially visible) to the user.

The *start* box is filled with first position visible to the user, unless *start* is #f. The *end* box is filled with last position visible to the user, unless *end* is #f.

If the editor is displayed by multiple canvases and *all?* is #t, then the computed range includes all visible positions in all displays. Otherwise, the range includes only the visible positions in the current display.

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when get-admin returns an administrator (not #f). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send a-text get-wordbreak-map)
 → (or/c (is-a?/c editor-wordbreak-map%) #f)
```

Returns the wordbreaking map that is used by the standard wordbreaking function. See set-wordbreak-map and editor-wordbreak-map% for more information.

```
(send a-text grapheme-position n) → exact-nonnegative-integer?
  n : exact-nonnegative-integer?
```

Returns the number of items in the editor that form the first *n* graphemes; or, equivalently, converts from an grapheme-based position to a item-based position.

Added in version 1.67 of package gui-lib.

```
(send a-text hide-caret hide?) → void?
  hide? : any/c
```

Determines whether the caret is shown when the editor has the keyboard focus.

If *hide?* is not #f, then the caret or selection hiliting will not be drawn for the editor. The editor can still own the keyboard focus, but no caret will be drawn to indicate the focus.

See also caret-hidden? and lock.

```
(send a-text insert  str
                     start
                    [end
                     scroll-ok?
                     join-graphemes?]) → void?
  str : string?
  start : exact-nonnegative-integer?
  end : (or/c exact-nonnegative-integer? 'same) = 'same
  scroll-ok? : any/c = #t
  join-graphemes? : any/c = #f
(send a-text insert  n
                     str
                     start
                    [end
                     scroll-ok?
                     join-graphemes?]) → void?
  n : (and/c exact-nonnegative-integer?
             (<=/c (string-length str)))
  str : string?
  start : exact-nonnegative-integer?
  end : (or/c exact-nonnegative-integer? 'same) = 'same
  scroll-ok? : any/c = #t
  join-graphemes? : any/c = #f
(send a-text insert str) → void?
  str : string?
(send a-text insert n str [join-graphemes?]) → void?
  n : (and/c exact-nonnegative-integer?
             (<=/c (string-length str)))
  str : string?
  join-graphemes? : any/c = #f
(send a-text insert  snip
                     start
                    [end
                     scroll-ok?]) → void?
  snip : (is-a?/c snip%)
```

```
  start : exact-nonnegative-integer?
  end : (or/c exact-nonnegative-integer? 'same) = 'same
  scroll-ok? : any/c = #t
(send a-text insert snip) → void?
  snip : (is-a?/c snip%)
(send a-text insert char) → void?
  char : char?
(send a-text insert char start [end]) → void?
  char : char?
  start : exact-nonnegative-integer?
  end : (or/c exact-nonnegative-integer? 'same) = 'same
```

Overrides `insert` in `editor<%>`.

Inserts text or a snip into *a-text* at position *start*. If *n* is provided, the only the first *n* characters of *str* are inserted.

When a *snip* is provided: The snip cannot be inserted into multiple editors or multiple times within a single editor. As the snip is inserted, its current style is converted to one in the editor's style list; see also `convert`.

When a *char* is provided: Multiple calls to the character-inserting method are grouped together for undo purposes, since this case of the method is typically used for handling user keystrokes. However, this undo-grouping feature interferes with the undo grouping performed by `begin-edit-sequence` and `end-edit-sequence`, so the string-inserting method should be used instead during undoable edit sequences.

When *start* is not provided, the current selection start is used. If the current selection covers a range of items, then *char* replaces the selected text. The selection's start and end positions are moved to the end of the inserted character.

For a case where *end* is not provided and has no default, the current selection end is used. Otherwise, if *end* is not `'same`, then the inserted value replaces the region from *start* to *end*, and the selection is left at the end of the inserted text. Otherwise, if the insertion position is before or equal to the selection's start/end position, then the selection's start/end position is incremented by the length of *str*.

If *scroll-ok?* is not `#f` and *start* is the same as the current selection's start position, then the editor's display is scrolled to show the new selection position.

If *join-graphemes?* is provided and not `#f` or if a character is provided to insert, then if characters before or after the inserted content would form a grapheme that spans the start or end of the inserted content, those characters are effectively added to the start and end of the inserted content, and the insertion range is adjusted to cover the absorbed characters. As a result, the grapheme-forming characters will be reliably placed in the same snip so that the grapheme renders properly. That adjustment may effectively change the style of the inserted

content or of existing content that is involved with newly formed grapheme clusters

See also get-styles-sticky.

```
(send a-text kill [time]) → void?
  time : exact-integer? = 0
(send a-text kill time start end) → void?
  time : exact-integer?
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
```

Overrides kill in editor<%>.

Cuts the text in the given region. If *start* and *end* are not supplied, then the selected region plus all whitespace to the end of line is cut; the newline is also cut if only whitespace exists between the selection and the end of line.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-text last-line) → exact-nonnegative-integer?
```

Returns the number of the last line in the editor. Lines are numbered starting with 0, so this is one less than the number of lines in the editor.

See also paragraph-start-position, which operates on paragraphs (determined by explicit newline characters) instead of lines (determined by both explicit newline characters and automatic line-wrapping).

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for line-start-position (which handles specially the case of no display when the editor has a maximum width).

```
(send a-text last-paragraph) → exact-nonnegative-integer?
```

Returns the number of the last paragraph in the editor. Paragraphs are numbered starting with 0, so this is one less than the number of paragraphs in the editor.

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send a-text last-position) → exact-nonnegative-integer?
```

Returns the last selection position in the editor. This is also the number of items in the editor.

```
(send a-text line-end-position  line
                                [visible?])
 → exact-nonnegative-integer?
  line : exact-nonnegative-integer?
  visible? : any/c = #t
```

Returns the last position of a given line. Lines are numbered starting with `0`.

If there are fewer than *line*-1 lines, the end of the last line is returned. If *line* is less than 0, then the end of the first line is returned.

If the line ends with invisible items (such as a newline) and *visible?* is not `#f`, the first position before the invisible items is returned.

See also `paragraph-start-position`, which operates on paragraphs (determined by explicit newline characters) instead of lines (determined by both explicit newline characters and automatic line-wrapping).

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see `refresh-delayed?`). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for `line-start-position` (which handles specially the case of no display when the editor has a maximum width).

```
(send a-text line-length i) → exact-nonnegative-integer?
  i : exact-nonnegative-integer?
```

Returns the number of items in a given line. Lines are numbered starting with `0`.

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see `refresh-delayed?`). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for `line-start-position` (which handles specially the case of no display when the editor has a maximum width).

```
(send a-text line-location line [top?]) → real?
  line : exact-nonnegative-integer?
  top? : any/c = #t
```

Given a line number, returns the location of the line. Lines are numbered starting with `0`.

If *top?* is not `#f`, the location for the top of the line is returned; otherwise, the location for the bottom of the line is returned.

See also paragraph-start-position, which operates on paragraphs (determined by explicit newline characters) instead of lines (determined by both explicit newline characters and automatic line-wrapping).

The result is only valid when the editor is displayed (see §5.1 “Editor Structure and Terminology”). Editors are displayed when get-admin returns an administrator (not #f). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send a-text line-paragraph start) → exact-nonnegative-integer?
  start : exact-nonnegative-integer?
```

Returns the paragraph number of the paragraph containing the line. Lines are numbered starting with 0. Paragraphs are numbered starting with 0.

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for line-start-position (which handles specially the case of no display when the editor has a maximum width).

```
(send a-text line-start-position  line
                                  [visible?])
 → exact-nonnegative-integer?
  line : exact-nonnegative-integer?
  visible? : any/c = #t
```

Returns the first position of the given line. Lines are numbered starting with 0.

If there are fewer than *line*-1 lines, the start of the last line is returned. If *line* is less than 0, then the start of the first line is returned.

If the line starts with invisible items and *visible?* is not #f, the first position past the invisible items is returned.

See also paragraph-start-position, which operates on paragraphs (determined by explicit newline characters) instead of lines (determined by both explicit newline characters and automatic line-wrapping).

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?).

To calculate lines, if the following are true:

- the editor is not displayed (see §5.1 “Editor Structure and Terminology”),
- a maximum width is set for the editor, and
- the editor has never been viewed

then this method ignores the editor’s maximum width and any automatic line breaks it might imply. If the first two of the above conditions are true and the editor was *formerly* displayed, this method uses the line breaks from the most recent display of the editor. (Insertions or deletions since the display shift line breaks within the editor in the same way as items.)

```
(send a-text move-position  code
                            [extend?
                             kind])  → void?
  code : (or/c 'home 'end 'right 'left 'up 'down)
  extend? : any/c = #f
  kind : (or/c 'simple 'word 'page 'line) = 'simple
```

Moves the current selection.

The possible values for *code* are:

- 'home — go to start of file
- 'end — go to end of file
- 'right — move right
- 'left — move left
- 'up — move up
- 'down — move down

If *extend?* is not #f, the selection range is extended instead of moved. If anchoring is on (see get-anchor and set-anchor), then *extend?* is effectively forced to #t. See also get-extend-start-position and get-extend-end-position.

The possible values for *kind* are:

- 'simple — move one grapheme or line
- 'word — works with 'right or 'left
- 'page — works with 'up or 'down
- 'line — works with 'right or 'left; moves to the start or end of the line

See also set-position.

Changed in version 1.67 of package gui-lib: Changed 'simple mode to move left or right by a grapheme instead of an item.

```
(send a-text on-change-style start len) → void?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called before the style is changed in a given range of the editor, after can-change-style? is called to verify that the change is ok. The after-change-style method is guaranteed to be called after the change has completed.

The editor is internally locked for writing during a call to this method (see also §5.9 "Internal Editor Locks"). Use after-change-style to modify the editor, if necessary.

See also on-edit-sequence.

Default implementation: Does nothing.

```
(send a-text on-default-char event) → void?
  event : (is-a?/c key-event%)
```

Overrides on-default-char in editor<%>.

Handles the following:

- Delete and Backspace — calls delete.
- The arrow keys, Page Up, Page Down, Home, and End (including shifted versions) — moves the selection position with move-position.
- Any other character in the range (integer->char 32) to (integer->char 255) — inserts the character into the editor (in grapheme-joining mode; see insert).

Note that an editor's editor-canvas% normally handles mouse wheel events (see also on-char).

Changed in version 1.67 of package gui-lib: Changed character inserting to use grapheme-joining mode.

```
(send a-text on-default-event event) → void?
  event : (is-a?/c mouse-event%)
```

Overrides on-default-event in editor<%>.

Tracks clicks on a clickback (see set-clickback) of changes the selection. Note that on-event dispatches to a caret-owning snip and detects a click on an event-handling snip before calling to this method.

- Clicking on a clickback region starts clickback tracking. See set-clickback for more information. Moving over a clickback changes the shape of the mouse cursor.
- Clicking anywhere else moves the caret to the closest position between items. Shift-clicking extends the current selection.
- Dragging extends the selection, scrolling if possible when the selection is dragged outside the editor's visible region.

```
(send a-text on-delete start len) → void?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called before a range is deleted from the editor, after can-delete? is called to verify that the deletion is ok. The after-delete method is guaranteed to be called after the delete has completed.

The *start* argument specifies the starting position of the range to delete. The *len* argument specifies number of items to delete (so *start*+*len* is the ending position of the range to delete).

The editor is internally locked for writing during a call to this method (see also §5.9 "Internal Editor Locks"). Use after-delete to modify the editor, if necessary.

See also on-edit-sequence.

Default implementation: Does nothing.

```
(send a-text on-insert start len) → void?
  start : exact-nonnegative-integer?
  len : exact-nonnegative-integer?
```

Refine this method with augment.

Specification: Called before items are inserted into the editor, after can-insert? is called to verify that the insertion is ok. The after-insert method is guaranteed to be called after the insert has completed.

The *start* argument specifies the position of the insert. The *len* argument specifies the total length (in positions) of the items to be inserted.

The editor is internally locked for writing during a call to this method (see also §5.9 "Internal Editor Locks"). Use `after-insert` to modify the editor, if necessary.

See also `on-edit-sequence`.

Default implementation: Does nothing.

```
(send a-text on-new-string-snip) → (is-a?/c string-snip%)
```

Specification: Called by `insert` when a string or character is inserted into the editor, this method creates and returns a new instance of `string-snip%` to store inserted text. The returned string snip is empty (i.e., its count is zero).

Default implementation: Returns a `string-snip%` instance.

```
(send a-text on-new-tab-snip) → (is-a?/c tab-snip%)
```

Specification: Creates and returns a new instance of `tab-snip%` to store an inserted tab. The returned tab snip is empty (i.e., its count is zero).

Default implementation: Returns a `tab-snip%` instance.

```
(send a-text on-reflow) → void?
```

Refine this method with `augment`.

Specification: Called after locations have changed and are recomputed for the editor. *Default implementation:* Does nothing.

```
(send a-text on-set-size-constraint) → void?
```

Refine this method with `augment`.

Specification: Called before the editor's maximum or minimum height or width is changed, after `can-set-size-constraint?` is called to verify that the change is ok. The `after-set-size-constraint` method is guaranteed to be called after the change has completed.

(This callback method is provided because setting an editor's maximum width may cause lines to be re-flowed with soft newlines.)

See also `on-edit-sequence`.

Default implementation: Does nothing.

```
(send a-text paragraph-end-line paragraph)
 → exact-nonnegative-integer?
  paragraph : exact-nonnegative-integer?
```

Returns the ending line of a given paragraph. Paragraphs are numbered starting with 0. Lines are numbered starting with 0.

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for line-start-position (which handles specially the case of no display when the editor has a maximum width).

```
(send a-text paragraph-end-position  paragraph
                                     [visible?])
 → exact-nonnegative-integer?
  paragraph : exact-nonnegative-integer?
  visible? : any/c = #t
```

Returns the ending position of a given paragraph. Paragraphs are numbered starting with 0.

If there are fewer than *paragraph*-1 paragraphs, the end of the last paragraph is returned. If *paragraph* is less than 0, then the end of the first paragraph is returned.

If the paragraph ends with invisible items (such as a newline) and *visible?* is not #f, the first position before the invisible items is returned.

```
(send a-text paragraph-start-line paragraph)
 → exact-nonnegative-integer?
  paragraph : exact-nonnegative-integer?
```

Returns the starting line of a given paragraph. If *paragraph* is greater than the highest-numbered paragraph, then the editor's end position is returned. Paragraphs are numbered starting with 0. Lines are numbered starting with 0.

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for line-start-position (which handles specially the case of no display when the editor has a maximum width).

```
(send a-text paragraph-start-position  paragraph
                                       [visible?])
 → exact-nonnegative-integer?
  paragraph : exact-nonnegative-integer?
  visible? : any/c = #t
```

Returns the starting position of a given paragraph. Paragraphs are numbered starting with 0.

If there are fewer than *paragraph*-1 paragraphs, the start of the last paragraph is returned.

If the paragraph starts with invisible items and *visible?* is not #f, the first position past the invisible items is returned.

```
(send a-text paste [time start end]) → void?
  time : exact-integer? = 0
  start : (or/c exact-nonnegative-integer? 'start 'end) = 'start
  end : (or/c exact-nonnegative-integer? 'same) = 'same
```

Overrides paste in editor<%>.

Pastes into the specified range. If *start* is 'start, then the current selection start position is used. If *start* is 'end, then the current selection end position is used. If *end* is 'same, then *start* is used for *end*, unless *start* is 'start, in which case the current selection end position is used.

See §5.7 "Cut and Paste Time Stamps" for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-text paste-next) → void?
```

Editors collectively maintain a copy ring that holds up to 30 previous copies (and cuts) among the editors. When it is called as the next method on an editor after a paste, the paste-next method replaces the text from a previous paste with the next data in the copy ring, incrementing the ring pointer so that the next paste-next pastes in even older data.

It is a copy "ring" because the ring pointer wraps back to the most recent copied data after the oldest remembered data is pasted. Any cut, copy, or (regular) paste operation resets the copy ring pointer back to the beginning.

If the previous operation on the editor was not a paste, calling paste-next has no effect.

```
(send a-text paste-x-selection [time
                                start
                                end]) → void?
  time : exact-integer? = 0
  start : (or/c exact-nonnegative-integer? 'start 'end) = 'start
  end : (or/c exact-nonnegative-integer? 'same) = 'same
```

Overrides paste-x-selection in editor<%>.

Pastes into the specified range. If *start* is 'start, then the current selection start position is used. If *start* is 'end, then the current selection end position is used. If *end* is 'same, then *start* is used for *end*, unless *start* is 'start, in which case the current selection end position is used.

See §5.7 “Cut and Paste Time Stamps” for a discussion of the *time* argument. If *time* is outside the platform-specific range of times, an exn:fail:contract exception is raised.

```
(send a-text position-grapheme n) → exact-nonnegative-integer?
  n : exact-nonnegative-integer?
```

Returns the number of graphemes within the editor formed by the first *n* items; or, equivalently, converts from an item-based position to a grapheme-based position.

Added in version 1.67 of package gui-lib.

```
(send a-text position-line start [at-eol?])
 → exact-nonnegative-integer?
  start : exact-nonnegative-integer?
  at-eol? : any/c = #f
```

Returns the line number of the line containing a given position. Lines are numbered starting with 0.

See also paragraph-start-position, which operates on paragraphs (determined by explicit newline characters) instead of lines (determined by both explicit newline characters and automatic line-wrapping).

See §5.3 “End of Line Ambiguity” for a discussion of *at-eol?*.

Calling this method may force the recalculation of location information if a maximum width is set for the editor, even if the editor currently has delayed refreshing (see refresh-delayed?). If the editor is not displayed and the editor has a maximum width, line breaks are calculated as for line-start-position (which handles specially the case of no display when the editor has a maximum width).

```
(send a-text position-location  start
                               [x
                                y
                                top?
                                at-eol?
                                whole-line?]) → void?
  start : exact-nonnegative-integer?
  x : (or/c (box/c real?) #f) = #f
  y : (or/c (box/c real?) #f) = #f
  top? : any/c = #t
  at-eol? : any/c = #f
  whole-line? : any/c = #f
```

Returns the location of a given position. See also position-locations.

The *x* box is filled with the x-location of the position *start* in editor coordinates, unless *x* is #f. The *y* box is filled with the y-location (top or bottom; see below) of the position *start* in editor coordinates, unless *y* is #f.

See §5.3 "End of Line Ambiguity" for a discussion of *at-eol?*.

If *top?* is not #f, the top coordinate of the location is returned, otherwise the bottom coordinate of the location is returned.

The top *y* location may be different for different positions within a line when different-sized graphic objects are used. If *whole-line?* is not #f, the minimum top location or maximum bottom location for the whole line is returned in *y*.

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when get-admin returns an administrator (not #f). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send a-text position-locations  start
                                 [top-x
                                  top-y
                                  bottom-x
                                  bottom-y
                                  at-eol?
                                  whole-line?]) → void?
  start : exact-nonnegative-integer?
  top-x : (or/c (box/c real?) #f) = #f
  top-y : (or/c (box/c real?) #f) = #f
  bottom-x : (or/c (box/c real?) #f) = #f
  bottom-y : (or/c (box/c real?) #f) = #f
  at-eol? : any/c = #f
  whole-line? : any/c = #f
```

Like position-location, but returns both the "top" and "bottom" results at once.

The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when get-admin returns an administrator (not #f). Calling this method may force the recalculation of location information, even if the editor currently has delayed refreshing (see refresh-delayed?).

```
(send a-text position-paragraph  start
                                 [at-eol?])
 → exact-nonnegative-integer?
  start : exact-nonnegative-integer?
  at-eol? : any/c = #f
```

See §5.3 “End of Line Ambiguity” for a discussion of *at-eol?*.

Returns the paragraph number of the paragraph containing a given position.

```
(send a-text read-from-file  stream
                             start
                            [overwrite-styles?]) → boolean?
  stream : (is-a?/c editor-stream-in%)
  start : (or/c exact-nonnegative-integer? 'start)
  overwrite-styles? : any/c = #f
(send a-text read-from-file  stream
                            [overwrite-styles?]) → boolean?
  stream : (is-a?/c editor-stream-in%)
  overwrite-styles? : any/c = #f
```

Extends `read-from-file` in `editor<%>`.

New data is inserted at the position indicated by *start*, or at the current position if *start* is `'start`.

```
(send a-text remove-clickback start end) → void?
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
```

Removes all clickbacks installed for exactly the range *start* to *end*. See also §5.8 “Clickbacks”.

```
(send a-text scroll-to-position  start
                                [at-eol?
                                 end
                                 bias])  → boolean?
  start : exact-nonnegative-integer?
  at-eol? : any/c = #f
  end : (or/c exact-nonnegative-integer? 'same) = 'same
  bias : (or/c 'start 'end 'none) = 'none
```

Scrolls the editor so that a given position is visible.

If *end* is `'same` or equal to *start*, then position *start* is made visible. See §5.3 “End of Line Ambiguity” for a discussion of *at-eol?*.

If *end* is not `'same` and not the same as *start*, then the range *start* to *end* is made visible and *at-eol?* is ignored.

When the specified range cannot fit in the visible area, *bias* indicates which end of the range

to display. When *bias* is 'start, then the start of the range is displayed. When *bias* is 'end, then the end of the range is displayed. Otherwise, *bias* must be 'none.

If the editor is scrolled, then the editor is redrawn and the return value is #t; otherwise, the return value is #f. If refreshing is delayed (see refresh-delayed?), then the scroll request is saved until the delay has ended. The scroll is performed (immediately or later) by calling scroll-editor-to.

Scrolling is disallowed when the editor is internally locked for reflowing (see also §5.9 "Internal Editor Locks").

The system may scroll the editor without calling this method. For example, a canvas displaying an editor might scroll the editor to handle a scrollbar event.

```
(send a-text set-anchor on?) → void?
  on? : any/c
```

Turns anchoring on or off. This method can be overridden to affect or detect changes in the anchor state. See also get-anchor.

If *on?* is not #f, then the selection will be automatically extended when cursor keys are used (or, more generally, when move-position is used to move the selection or the *keep-anchor?* argument to set-position is a true value), otherwise anchoring is turned off. Anchoring is automatically turned off if the user does anything besides cursor movements.

```
(send a-text set-autowrap-bitmap bitmap)
 → (or/c (is-a?/c bitmap%) #f)
  bitmap : (or/c (is-a?/c bitmap%) #f)
```

Sets the bitmap that is drawn at the end of a line when it is automatically line-wrapped.

If *bitmap* is #f, no autowrap indicator is drawn (this is the default). The previously used bitmap (possibly #f) is returned.

Setting the bitmap is disallowed when the editor is internally locked for reflowing (see also §5.9 "Internal Editor Locks").

```
(send a-text set-between-threshold threshold) → void?
  threshold : (and/c real? (not/c negative?))
```

Sets the graphical distance used to determine the meaning of a user click. If a click falls within *threshold* of a position between two items, then the click registers on the space between the items rather than on either item.

See also get-between-threshold.

```
(send a-text set-clickback  start
                            end
                            f
                           [hilite-delta
                            call-on-down?]) → void?
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
  f : (-> (is-a?/c text%)
          exact-nonnegative-integer?
          exact-nonnegative-integer?
          any)
  hilite-delta : (or/c (is-a?/c style-delta%) #f) = #f
  call-on-down? : any/c = #f
```

Installs a clickback for a given region. If a clickback is already installed for an overlapping region, this clickback takes precedence.

The callback procedure *f* is called when the user selects the clickback. The arguments to *f* are this editor and the starting and ending range of the clickback.

The *hilite-delta* style delta is applied to the clickback text when the user has clicked and is still holding the mouse over the clickback. If *hilite-delta* is `#f`, then the clickback region's style is not changed when it is being selected.

If *call-on-down?* is not `#f`, the clickback is called immediately when the user clicks the mouse button down, instead of after a mouse-up event. The *hilite-delta* argument is not used in this case.

See also §5.8 "Clickbacks".

```
(send a-text set-file-format format) → void?
  format : (or/c 'standard 'text 'text-force-cr)
```

Set the format of the file saved from this editor.

The legal formats are:

- `'standard` — a standard editor file
- `'text` — a text file
- `'text-force-cr` — a text file; when writing, change automatic newlines (from word-wrapping) into real newlines

The file format of an editor can be changed by the system in response to file loading and saving method calls, and such changes do not go through this method; use on-load-file and on-save-file to monitor such file format changes.

```
(send a-text set-line-spacing space) → void?
  space : (and/c real? (not/c negative?))
```

Sets the spacing inserted by the editor between each line. This spacing is included in the reported height of each line.

```
(send a-text set-overwrite-mode on?) → void?
  on? : any/c
```

Enables or disables overwrite mode. See get-overwrite-mode. This method can be overridden to affect or detect changes in the overwrite mode.

```
(send a-text set-padding left
                         top
                         right
                         bottom) → void?
  left : (and/c real? (not/c negative?))
  top : (and/c real? (not/c negative?))
  right : (and/c real? (not/c negative?))
  bottom : (and/c real? (not/c negative?))
```

Sets padding that insets the editor's content when drawn within its display.

Unlike any margin that may be applied by the editor's display, padding is counted in location information that is reported by methods such as position-location. For example, with a *left* padding of 17.0 and a *top* padding of 9.0, the location of position 0 will be (17.0, 9.0) rather than (0, 0). Padding also contributes to the editor's size as reported by get-extent.

```
(send a-text set-paragraph-alignment paragraph
                                     alignment) → void?
  paragraph : exact-nonnegative-integer?
  alignment : (or/c 'left 'center 'right)
```

Sets a paragraph-specific horizontal alignment. The alignment is only used when the editor has a maximum width, as set with set-max-width. Paragraphs are numbered starting with 0.

This method is experimental. It works reliably only when the paragraph is not merged or split. Merging or splitting a paragraph with alignment settings causes the settings to be transferred unpredictably (although other paragraphs in the editor can be safely split or merged). If the last paragraph in an editor is empty, settings assigned to it are ignored.

```
(send a-text set-paragraph-margins paragraph
                                   first-left
                                   left
                                   right)     → void?
  paragraph : exact-nonnegative-integer?
  first-left : (and/c real? (not/c negative?))
  left : (and/c real? (not/c negative?))
  right : (and/c real? (not/c negative?))
```

Sets a paragraph-specific margin. Paragraphs are numbered starting with `0`.

The first line of the paragraph is indented by *first-left* points within the editor. If the paragraph is line-wrapped (when the editor has a maximum width), subsequent lines are indented by *left* points. If the editor has a maximum width, the paragraph's maximum width for line-wrapping is *right* points smaller than the editor's maximum width.

This method is experimental. See `set-paragraph-alignment` for more information.

```
(send a-text set-position  start
                          [end
                           at-eol?
                           scroll?
                           seltype]) → void?
  start : exact-nonnegative-integer?
  end : (or/c exact-nonnegative-integer? 'same) = 'same
  at-eol? : any/c = #f
  scroll? : any/c = #t
  seltype : (or/c 'default 'x 'local) = 'default
```

Sets the current selection in the editor.

If *end* is `'same` or less than or equal to *start*, the current start and end positions are both set to *start*. Otherwise the given range is selected.

See §5.3 "End of Line Ambiguity" for a discussion of *at-eol?*. If *scroll?* is not `#f`, then the display is scrolled to show the selection if necessary.

The *seltype* argument is only used when the X Window System selection mechanism is enabled. The possible values are:

- 'default — if this window has the keyboard focus and given selection is non-empty, make it the current X selection
- 'x — if the given selection is non-empty, make it the current X selection
- 'local — do not change the current X selection

Setting the position is disallowed when the editor is internally locked for reflowing (see also §5.9 “Internal Editor Locks”).

The system may change the selection in an editor without calling this method (or any visible method).

See also editor-set-x-selection-mode.

```
(send a-text set-position-bias-scroll  bias
                                       start
                                      [end
                                       ateol?
                                       scroll?
                                       seltype]) → void?
  bias : (or/c 'start-only 'start 'none 'end 'end-only)
  start : exact-nonnegative-integer?
  end : (or/c exact-nonnegative-integer? 'same) = 'same
  ateol? : any/c = #f
  scroll? : any/c = #t
  seltype : (or/c 'default 'x 'local) = 'default
```

Like set-position, but a scrolling bias can be specified.

The possible values for *bias* are:

- 'start-only — only insure that the starting position is visible
- 'start — if the range doesn’t fit in the visible area, show the starting position
- 'none — no special scrolling instructions
- 'end — if the range doesn’t fit in the visible area, show the ending position
- 'end-only — only insure that the ending position is visible

See also scroll-to-position.

```
(send a-text set-region-data start end data) → void?
  start : exact-nonnegative-integer?
  end : exact-nonnegative-integer?
  data : (is-a?/c editor-data%)
```

Specification: Sets extra data associated with a given region. See §5.2.1.2 “Editor Data” and `get-region-data` for more information.

This method is meant to be overridden in combination with `get-region-data` .

Default implementation: Does nothing.

```
(send a-text set-styles-sticky sticky?) → void?
  sticky? : any/c
```

See `get-styles-sticky` for information about sticky styles.

```
(send a-text set-tabs  tabs
                       [tab-width
                        in-units?]) → void?
  tabs : (listof real?)
  tab-width : real? = 20
  in-units? : any/c = #t
```

Sets the tabbing array for the editor.

The *tabs* list determines the tabbing array. The tabbing array specifies the x-locations where each tab occurs. Tabs beyond the last specified tab are separated by a fixed amount *tab-width*. If *in-units?* is not `#f`, then tabs are specified in canvas units; otherwise, they are specified as a number of spaces. (If tabs are specified in spaces, then the graphic tab positions will change with the font used for the tab.)

Setting tabs is disallowed when the editor is internally locked for reflowing (see also §5.9 “Internal Editor Locks”).

```
(send a-text set-wordbreak-func f) → void?
  f : ((is-a?/c text%) (or/c (box/c exact-nonnegative-integer?) #f)
                       (or/c (box/c exact-nonnegative-integer?) #f)
                       symbol?
       . -> . any)
```

Sets the word-breaking function for the editor. For information about the arguments to the word-breaking function, see `find-wordbreak`.

The standard wordbreaking function uses the editor's editor-wordbreak-map% object to determine which characters break a word. See also editor-wordbreak-map% and set-wordbreak-map.

Since the wordbreak function will be called when line breaks are being determined (in an editor that has a maximum width), there is a constrained set of text% methods that the wordbreak function is allowed to invoke. It cannot invoke a member function that uses information about locations or lines (which are identified in this manual with "The result is only valid when the editor is displayed (see §5.1 "Editor Structure and Terminology"). Editors are displayed when get-admin returns an administrator (not #f)."), but it can still invoke member functions that work with snips and items.

```
(send a-text set-wordbreak-map map) → void?
  map : (or/c (is-a?/c editor-wordbreak-map%) #f)
```

Sets the wordbreaking map that is used by the standard wordbreaking function. See editor-wordbreak-map% for more information.

If *map* is #f, then the standard map (the-editor-wordbreak-map) is used.

```
(send a-text split-snip pos) → void?
  pos : exact-nonnegative-integer?
```

Given a position, splits the snip that includes the position (if any) so that the position is between two snips. The snip may refuse to split, although none of the built-in snip classes will ever refuse.

Splitting a snip is disallowed when the editor is internally locked for reflowing (see also §5.9 "Internal Editor Locks").

```
(send a-text write-to-file stream [start end]) → boolean?
  stream : (is-a?/c editor-stream-out%)
  start : exact-nonnegative-integer? = 0
  end : (or/c exact-nonnegative-integer? 'eof) = 'eof
```

Extends write-to-file in editor<%>.

If *start* is 0 and *end* is 'eof negative, then the entire contents are written to the stream. If *end* is 'eof, then the contents are written from *start* until the end of the editor. Otherwise, the contents of the given range are written.

8 Editor Functions

```
(add-editor-keymap-functions keymap) → void?
  keymap : (is-a?/c keymap%)
```

Given a keymap% object, the keymap is loaded with mappable functions that apply to all editor<%> objects:

- "copy-clipboard"
- "copy-append-clipboard"
- "cut-clipboard"
- "cut-append-clipboard"
- "paste-clipboard"
- "paste-x-selection"
- "delete-selection"
- "clear-selection"
- "undo"
- "redo"
- "select-all"

```
(add-pasteboard-keymap-functions keymap) → void?
  keymap : (is-a?/c keymap%)
```

Given a keymap% object, the table is loaded with mappable functions that apply to pasteboard% objects. Currently, there are no such functions.

See also add-editor-keymap-functions.

```
(add-text-keymap-functions keymap) → void?
  keymap : (is-a?/c keymap%)
```

Given a keymap% object, the table is loaded with functions that apply to all text% objects:

- "forward-character"
- "backward-character"

- "previous-line"
- "next-line"
- "previous-page"
- "next-page"
- "forward-word"
- "backward-word"
- "forward-select"
- "backward-select"
- "select-down"
- "select-up"
- "select-page-up"
- "select-page-down"
- "forward-select-word"
- "backward-select-word"
- "beginning-of-file"
- "end-of-file"
- "beginning-of-line"
- "end-of-line"
- "select-to-beginning-of-file"
- "select-to-end-of-file"
- "select-to-beginning-of-line"
- "select-to-end-of-line"
- "copy-clipboard"
- "copy-append-clipboard"
- "cut-clipboard"
- "cut-append-clipboard"
- "paste-clipboard"
- "paste-x-selection"

- "delete-selection"
- "delete-previous-character"
- "delete-next-character"
- "clear-selection"
- "delete-to-end-of-line"
- "delete-next-word"
- "delete-previous-word"
- "delete-line"
- "undo"
- "redo"

See also add-editor-keymap-functions.

```
(append-editor-font-menu-items menu) → void?
  menu : (or/c (is-a?/c menu%) (is-a?/c popup-menu%))
```

Appends menu items to *menu* to implement a standard set of font-manipulation operations, such as changing the font face or style. The callback for each menu item uses get-edit-target-object in top-level-window<%> (finding the frame by following a chain of parents until a frame is reached); if the result is an editor<%> object, change-style in text% or change-style in pasteboard% is called on the editor.

```
(append-editor-operation-menu-items
 menu
 [text-only?
  #:popup-position popup-position])
→ void?
 menu : (or/c (is-a?/c menu%) (is-a?/c popup-menu%))
 text-only? : any/c = #t
 popup-position : (or/c #f (list/c (is-a?/c text%) exact-nonnegative-integer?))
                = #f
```

Appends menu items to *menu* to implement the standard editor operations, such as cut and paste. The callback for each menu item uses get-edit-target-object in top-level-window<%> (finding the frame by following a chain of parents until a frame is reached); if the result is an editor<%> object, do-edit-operation in editor<%> is called on the editor.

If *text-only?* is #f, then menu items that insert non-text snips (such as Insert Image...) are appended to the menu.

If *popup-position* is not #f, then append-editor-operation-menu-items is expected to have been called to build a popup menu and the two elements of the list should be the text% object where the mouse was clicked for the popup menu and the position where the click happened. In that case, the Copy and Cut menus are enabled when the click lands on a snip that is not a string-snip%, and the corresponding callbacks will copy and cut that one snip.

```
(current-text-keymap-initializer)
 → ((is-a?/c keymap%) . -> . any/c)
(current-text-keymap-initializer proc) → void?
  proc : ((is-a?/c keymap%) . -> . any/c)
```

Parameter that specifies a keymap-initialization procedure. This procedure is called to initialize the keymap of a text-field% object or a text% object created by graphical-read-eval-print-loop.

The initializer takes a keymap object and returns nothing. The default initializer chains the given keymap to an internal keymap that implements standard text editor keyboard and mouse bindings for cut, copy, paste, undo, and select-all. The right mouse button is mapped to popup an edit menu when the button is released.

Changed in version 1.51 of package gui-lib: Changed Unix keybindings in the default initializer to match Windows, dropping start-of-line and end-of-line bindings.

```
(editor-set-x-selection-mode on) → void?
  on : any/c
```

On Unix, editor selections conform to the X11 Windows selection conventions. If *on* is #f, the behavior is switched exclusively to the clipboard-based convention (where copy must be explicitly requested before a paste).

```
(get-the-editor-data-class-list)
 → (is-a?/c editor-data-class-list<%>)
```

Gets the editor data class list instance for the current eventspace.

```
(get-the-snip-class-list) → (is-a?/c snip-class-list<%>)
```

Gets the snip class list instance for the current eventspace.

```
(map-command-as-meta-key on?) → void?
  on? : any/c
(map-command-as-meta-key) → boolean?
```

Determines the interpretation of m: for a keymap% mapping on Mac OS. See also map-function in keymap%.

First case:

If *on?* is #t, m: corresponds to the Command key. If *on?* is #f, then m: corresponds to no key on Mac OS.

Second case:

Returns #t if m: corresponds to Command, #f otherwise.

```
(open-input-graphical-file filename) → input-port?
  filename : string?
```

Opens *filename* (in 'binary mode) and checks whether it looks like a "graphical" file in editor format. If the file does not appear to be an editor file, the file port is returned with line counting enabled. Otherwise, the file is loaded into an editor, and the result port is created with open-input-text-editor.

```
(open-input-text-editor
  text-editor
 [start-position
  end-position
  snip-filter
  port-name
  expect-to-read-all?
  #:lock-while-reading? lock-while-reading?])
→ input-port
 text-editor : (is-a?/c text%)
 start-position : exact-nonnegative-integer? = 0
 end-position : (or/c exact-nonnegative-integer? 'end) = 'end
 snip-filter : ((is-a?/c snip%) . -> . any/c) = (lambda (s) s)
 port-name : any/c = text-editor
 expect-to-read-all? : any/c = #f
 lock-while-reading? : any/c = #f
```

Creates an input port that draws its content from *text-editor*. The editor content between positions *start-position* and *end-position* is the content of the port. If *end-position* is 'end, the content runs until the end of the editor. If a snip that is not a string-snip% object spans *start-position* or *end-position*, the entire snip contributes to the port. If a string-snip% instance spans *start-position*, only the part of the snip after *start-position* contributes, and if a string-snip% object spans *end-position*, only the part before *end-position* contributes.

An instance of string-snip% in *text-editor* generates a character sequence in the resulting port. All other kinds of snips are passed to *snip-filter* to obtain a "special" value for the port. If a snip is returned as the first result from *snip-filter*, and if the snip is an instance of readable-snip<%>, the snip generates a special value for the port through

the read-special method. If snip-filter returns any other kind of snip, it is copied for the special result. Finally, a non-snip first result from snip-filter is used directly as the special result.

The port-name argument is used for the input port's name. The expect-to-read-all? argument is a performance hint; use #t if the entire port's stream will be read.

The result port must not be used if text-editor changes in any of the following ways: a snip is inserted (see after-insert), a snip is deleted (see after-delete), a snip is split (see after-split-snip), snips are merged (see after-merge-snips), or a snip changes its count (which is rare; see recounted). The get-revision-number method can be used to detect any of these changes.

To help guard against such uses, if lock-while-reading? argument is a true value, then open-input-text-editor will lock the text-editor and call begin-edit-sequence before it returns and unlock it and call end-edit-sequence after it is safe to use the above methods. (In some cases, it will not lock the editor or put it in an edit sequence at all, if using those methods are always safe.)

```
(open-output-text-editor  text-editor
                          [start-position
                           special-filter
                           port-name
                           #:eventspace eventspace]) → output-port
  text-editor : (is-a?/c text%)
  start-position :  (or/c exact-nonnegative-integer? (one/of 'end))
                 = 'end
  special-filter : (any/c . -> . any/c) = (lambda (x) x)
  port-name : any/c = text-editor
  eventspace : (or/c eventspace? #f) = (current-eventspace)
```

Creates an output port that delivers its content to text-editor. The content is written to text-editor starting at the position start-position, where 'end indicates that output should start at the text editor's current end position.

If special-filter is provided, it is applied to any value written to the port with write-special, and the result is inserted in its place. If a special value is a snip% object, it is inserted into the editor. Otherwise, the special value is displayed into the editor.

If line counting is enabled for the resulting output port, then the port will report the line, offset from the line's start, and position within the editor at which the port writes data.

If eventspace is not #f, then when the output port is used in a thread other than eventspace's handler thread, content is delivered to text-editor through a low-priority callback in eventspace. Thus, if eventspace corresponds to the eventspace for the editor's displays, writing to the output port is safe from any thread.

If *eventspace* is #f, beware that the port is only weakly thread-safe. Content is delivered to *text-editor* in an edit sequence, but an edit sequence is not enough synchronization if, for example, the editor is displayed in an enabled editor-canvas%. See §5.10 “Editors and Threads” for more information.

```
(read-editor-global-footer in) → boolean?
  in : (is-a?/c editor-stream-in%)
```

See read-editor-global-header. Call read-editor-global-footer even if read-editor-global-header returns #f.

```
(read-editor-global-header in) → boolean?
  in : (is-a?/c editor-stream-in%)
```

Reads data from *in* to initialize for reading editors from the stream. The return value is #t if the read succeeds, or #f otherwise.

One or more editors can be read from the stream by calling the editor’s read-from-file method. (The number of editors to be read must be known by the application beforehand.) When all editors are read, call read-editor-global-footer. Calls to read-editor-global-header and read-editor-global-footer must bracket any call to read-from-file, and only one stream at a time can be read using these methods or written using write-editor-global-header and write-editor-global-footer.

When reading from streams that span Racket versions, use read-editor-version before this procedure.

```
(read-editor-version  in
                      in-base
                      parse-format?
                     [raise-errors?]) → boolean?
  in : (is-a?/c editor-stream-in%)
  in-base : (is-a?/c editor-stream-in-base%)
  parse-format? : any/c
  raise-errors? : any/c = #t
```

Reads version information from *in-base*, where *in-base* is the base for *in*. The version information parsed from *in-base* is recorded in *in* for later version-sensitive parsing. The procedure result is true if the version information was read successfully and if the version is supported.

If *parse-format?* is true, then *in-base* is checked for an initial "WXME" format indicator. Use #f when "WXME" has been consumed already by format-dispatching code.

If *raise-errors?* is true, then an error in reading triggers an exception, instead of a #f result.

```
(text-editor-load-handler [filename]
                          expected-module-name) → any/c
  filename : path = string
  expected-module-name : (or/c symbol? #f)
```

This procedure is a load handler for use with `current-load`.

The handler recognizes Racket editor-format files (see §5.2 “File Format”) and decodes them for loading. It is normally installed as GRacket starts (see §18.1 “Running Racket or GRacket”).

The handler recognizes editor files by the first twelve characters of the file: `WXME01`⟨*digit*⟩⟨*digit*⟩ `##` . Such a file is opened for loading by creating a `text%` object, loading the file into the object with `insert-file`, and then converting the editor content into a port with `open-input-text-editor`. After obtaining a port in this way, the content is read in essentially the same way as by the default Racket load handler. The difference is that the editor may contain instances of `readable-snip<%>`, which are “read” though the snips’ `read-special` method; see `open-input-text-editor` for details.

```
the-editor-wordbreak-map : (is-a?/c editor-wordbreak-map%)
```

See `editor-wordbreak-map%`.

```
the-style-list : (is-a?/c style-list%)
```

See `style-list%`.

```
(write-editor-global-footer out) → boolean?
  out : (is-a?/c editor-stream-out%)
```

See `write-editor-global-header`. Call `write-editor-global-footer` even if `write-editor-global-header` returns `#f`.

```
(write-editor-global-header out) → boolean?
  out : (is-a?/c editor-stream-out%)
```

Writes data to *out*, initializing it for writing editors to the stream. The return value is `#t` if the write succeeds, or `#f` otherwise.

One or more editors can be written to the stream by calling the editor’s `write-to-file` method. When all editors are written, call `write-editor-global-footer`. Calls to `write-editor-global-header` and `write-editor-global-footer` must bracket any call to `write-to-file`, and only one stream at a time can be written using these methods or read using `read-editor-global-header` and `read-editor-global-footer`.

To support streams that span Racket versions, use `write-editor-version` before this procedure.

See also §5.2 “File Format”.

```
(write-editor-version out out-base) → boolean?
  out : (is-a?/c editor-stream-out%)
  out-base : (is-a?/c editor-stream-out-base%)
```

Writes version information to *out-base* in preparation for writing editor information to the stream *out*.

The *out* argument is currently not used, but *out-base* should be the base for *out*. In the future, *out* may record information about the version for later version-sensitive output.

The result is `#t` if the write succeeded, `#f` otherwise.

9 WXME Decoding

```
(require wxme)
```
package: wxme-lib

The wxme library provides tools for reading WXME editor<%>-format files (see §5.2 “File Format”) without the racket/gui library.

```
(is-wxme-stream? in) → boolean?
  in : input-port?
```

Peeks from *in* and returns #t if it starts with the magic bytes indicating a WXME-format stream (see §5.2 “File Format”), #f otherwise.

```
(wxme-port->text-port in [close?]) → input-port?
  in : input-port?
  close? : any/c = #t
```

Takes an input port whose stream starts with WXME-format data and returns an input port that produces a text form of the WXME content, like the result of opening a WXME file in DrRacket and saving it as text.

Unlike wxme-port->port, this function may take liberties with the snips in a way that would render a valid program invalid. For example, if the wxme stream *in* contains a bitmap image, then there may not be a reasonable text-only version of it and thus wxme-port->port might turn what would have been a valid Racket program into text that is a syntax error, Nevertheless, the result may still be useful for human readers or approximate program-processing tools that run only in a GUI-less context.

If *close?* is true, then closing the result port closes the original port.

See §9.1 “Snip Class Mapping” for information about the kinds of non-text content that can be read.

```
(wxme-port->port in [close? snip-filter]) → input-port?
  in : input-port?
  close? : any/c = #t
  snip-filter : (any/c . -> . any/c) = (lambda (x) x)
```

Takes an input port whose stream starts with WXME-format data and returns an input port that produces text content converted to bytes, and non-text content as “special” values (see read-char-or-special).

These special values produced by the new input port are different than the ones produced by reading a file into an editor<%> object. Instead of instances of the snip%, the special values are typically simple extensions of object%. See §9.1 “Snip Class Mapping” for information about the kinds of non-text content that can be read.

If *close?* is true, then closing the result port close the original port.

The *snip-filter* procedure is applied to any special value generated for the stream, and its result is used as an alternate special value.

If a special value (possibly produced by the filter procedure) is an object implementing the readable<%> interface, then the object's read-special method is called to produce the special value.

```
(extract-used-classes in) → (listof string?) (listof string?)
  in : input-port?
```

Returns two values: a list of snip-class names used by the given stream, and a list of data-class names used by the stream. If the stream is not a WXME stream, the result is two empty lists. The given stream is not closed, and only data for a WXME stream (if any) is consumed.

```
(register-lib-mapping! str mod-path) → void?
  str : string?
  mod-path : (cons/c 'lib (listof string?))
```

Maps a snip-class name to a quoted module path that provides a reader% implementation. The module path must have the form '(lib string ...), where each *string* contains only alpha-numeric ASCII characters, ., _, -, and spaces.

```
(string->lib-path str gui?)
 → (or/c (cons/c 'lib (listof string?))
         #f)
  str : string?
  gui? : any/c
```

Returns a quoted module path for *str* for either editor<%> mode when *gui?* is true, or wxme mode when *gui?* is #f. For the latter, built-in mappings and mapping registered via register-lib-mapping! are used. If *str* cannot be parsed as a library path, and if no mapping is available (either because the class is built-in or not known), the result is #f.

```
(unknown-extensions-skip-enabled) → boolean?
(unknown-extensions-skip-enabled skip?) → void?
  skip? : any/c
```

A parameter. When set to #f (the default), an exception is raised when an unrecognized snip class is encountered in a WXME stream. When set to a true value, instances of unrecognized snip classes are simply omitted from the transformed stream.

```
(broken-wxme-big-endian?) → boolean?
(broken-wxme-big-endian? big?) → void?
  big? : any/c
```

A parameter. Some old and short-lived WXME formats depended on the endian order of the machine where the file was saved. Set this parameter to pick the endian order to use when reading the file; the default is the current platform's endian order.

```
(wxme-read in) → any/c
  in : input-port?
```

Like `read`, but for a stream that starts with WXME-format data. If multiple S-expressions are in the WXME data, they are all read and combined with `'begin`.

If `racket/gui/base` is available (as determined by `gui-available?`), then `open-input-text-editor` is used. Otherwise, `wxme-port->port` is used.

```
(wxme-read-syntax source-v in) → (or/c syntax? eof-object?)
  source-v : any/c
  in : input-port?
```

Like `read-syntax`, but for a WXME-format input stream. If multiple S-expressions are in the WXME data, they are all read and combined with `'begin`.

If `racket/gui/base` is available (as determined by `gui-available?`), then `open-input-text-editor` is used. Otherwise, `wxme-port->port` is used.

```
snip-reader<%> : interface?
```

An interface to be implemented by a reader for a specific kind of data in a WXME stream. The interface has two methods: `read-header` and `read-snip`.

```
(send a-snip-reader read-header version
                                stream) → any
  version : exact-nonnegative-integer?
  stream : (is-a?/c stream<%>)
```

Called at most once per WXME stream to initialize the data type's stream-specific information. This method usually does nothing.

```
(send a-snip-reader read-snip text-only?
                              version
                              stream)    → (if text-only?
                                               bytes?
                                               any/c)
  text-only? : boolean?
  version : exact-nonnegative-integer?
  stream : (is-a?/c stream<%>)
```

Called when an instance of the data type is encountered in the stream. This method reads the data and returns either bytes to be returned as part of the decoded stream or any other kind of value to be returned as a "special" value from the decoded stream. The result value can optionally be an object that implements `readable<%>`.

The *text-only?* argument is `#f` when `wxme-port->text-port` was called and `#t` when `wxme-port->port` was called.

`readable<%>` : `interface?`

An interface to be implemented by values returned from a snip reader. The only method is `read-special`.

```
(send a-readable read-special source
                              line
                              column
                              position) → any/c
  source : any/c
  line : (or/c exact-nonnegative-integer? #f)
  column : (or/c exact-nonnegative-integer? #f)
  position : (or/c exact-nonnegative-integer? #f)
```

Like `read-special`, but for non-graphical mode. When a value implements this interface, its `read-special` method is called with source-location information to obtain the "special" result from the WXME-decoding port.

`stream<%>` : `interface?`

Represents a WXME input stream for use by `snip-reader<%>` instances.

```
(send a-stream read-integer what)
 → (or/c (integer-in (- (expt 2 31)) (expt 2 31))
         (and/c real? inexact?))
  what : any/c
```

Like `get-exact`, returns either an exact integer or an inexact real.

The *what* field describes what is being read, for error-message purposes, in case the stream does not continue with an integer.

```
(send a-stream read-fixed-integer what) → exact-integer?
  what : any/c
```

Reads an exact integer that has a fixed size in the stream, analogous to `get-fixed`.

The *what* argument is as for `read-integer`.

```
(send a-stream read-inexact what) → (and/c real? inexact?)
  what : any/c
```

Reads an inexact real number, analogous to `get-inexact`.

The *what* argument is as for `read-integer`.

```
(send a-stream read-raw-bytes what) → bytes?
  what : any/c
```

Reads raw bytes, analogous to `get-unterminated-bytes`.

The *what* argument is as for `read-integer`.

```
(send a-stream read-bytes what) → bytes?
  what : any/c
```

Reads raw bytes, analogous to `get-bytes`.

The *what* argument is as for `read-integer`.

```
(send a-stream read-editor what) → input-port?
  what : any/c
```

Reads a nested editor, producing a new input port to extract the editor's content.

The *what* argument is as for `read-integer`.

```
(read-snip-from-port name who stream) → bytes?
  name : string?
  who : any/c
  stream : (is-a?/c stream<%>)
```

Given *name*, which is expected to be the name of a snipclass, uses that snipclass to read from the given stream at the current point in that stream. Returns the processed bytes, much like the `read-snip` method.

9.1 Snip Class Mapping

When graphical data is marshaled to the WXME format, it is associated with a snip-class name to be matched with an implementation at load time. See also §5.2.1.1 "Snip Classes".

Ideally, the snip-class name is generated as

```
(format "~s" (list '(lib string ...)
                   '(lib string ...)))
```

where each element of the formated list is a quoted module path (see module-path?). The *string*s must contain only alpha-numeric ASCII characters, plus ., _, -, and spaces, and they must not be "." or "..".

In that case, the first quoted module path is used for loading WXME files in graphical mode; the corresponding module must provide snip-class object that implements the snip-class% class. The second quoted module path is used by the wxme library for converting WXME streams without graphical support; the corresponding module must provide a reader object that implements the snip-reader<%> interface. Naturally, the snip-class% instance and snip-reader<%> instance are expected to parse the same format, but generate different results suitable for the different contexts (i.e., graphical or not).

If a snip-class name is generated as

```
(format "~s" '(lib string ...))
```

then graphical mode uses the sole module path, and wxme needs a compatibility mapping. Install one with register-lib-mapping!.

If a snip-class name has neither of the above formats, then graphical mode can use the data only if a snip class is registered for the name, or if it the name of one of the built-in classes: "wxtext", "wxtab", "wximage", or "wxmedia" (for nested editors). The wxme library needs a compatibility mapping installed with register-lib-mapping! if it is not one of the built-in classes.

Several compatibility mappings are installed automatically for the wxme library. They correspond to popular graphical elements supported by various versions of DrRacket, including comment boxes, fractions, XML boxes, Racket boxes, text boxes, and images generated by the htdp/image teachpack (or, more generally, from mrlib/cache-image-snip), and test-case boxes.

For a port created by wxme-port->port, nested editors are represented by instances of the editor% class provided by the wxme/editor library. This class provides a single method, get-content-port, which returns a port for the editor's content. Images are represented as instances of the image% class provided by the wxme/image library.

Comment boxes are represented as instances of a class that extends editor% to implement readable<%>; see wxme/comment. The read form produces a special comment (created by make-special-comment), so that the comment box disappears when read is used to read the stream; the special-comment content is the readable instance. XML, Racket, and text boxes similarly produce instances of editor% and readable<%> that expand in the usual way; see wxme/xml, wxme/scheme, and wxme/text. Images from the htdp/image teachpack are packaged as instances of cache-image% from the wxme/cache-image library.

Test-case boxes are packaged as instances of `test-case%` from the `wxme/test-case` library.

9.1.1 Nested Editors

```
(require wxme/editor)
```
package: wxme-lib

```
editor% : class?
  superclass: object%
```

Instantiated for plain nested editors in a WXME stream in text mode.

```
(send an-editor get-content-port) → input-port?
```

Returns a port (like the one from `wxme-port->port`) for the editor's content.

9.1.2 Images

```
(require wxme/image)
```
package: wxme-lib

```
image% : class?
  superclass: image-snip%
```

Instantiated for images in a WXME stream in text mode. This class can just be treated like `image-snip%` and should behave just like it, except it has the methods below in addition in case old code still needs them. In other words, the methods below are provided for backwards compatibility with earlier verisons of Racket.

```
(send an-image get-data) → (or/c bytes? #f)
```

Returns bytes for a PNG, XBM,or XPM file for the image.

```
(send an-image get-w) → (or/c exact-nonnegative-
integer? -1)
```

Returns the display width of the image, which may differ from the width of the actual image specified as data or by a filename; -1 means that the image data's width should be used.

```
(send an-image get-h) → (or/c exact-nonnegative-
integer? -1)
```

Returns the display height of the image, which may differ from the height of the actual image specified as data or by a filename; -1 means that the image data's height should be used.

```
(send an-image get-dx) → exact-integer?
```

Returns an offset into the actual image to be used as the left of the display image.

```
(send an-image get-dy) → exact-integer?
```

Returns an offset into the actual image to be used as the top of the display image.

9.2 DrRacket Comment Boxes

```
(require wxme/comment)
```
package: wxme-lib

```
reader : (is-a?/c snip-reader<%>)
```

A text-mode reader for comment boxes.

```
comment-editor% : class?
  superclass: editor%
  extends: readable<%>
```

Instantiated for DrRacket comment boxes in a WXME stream for text mode.

```
(send a-comment-editor get-data) → #f
```

No data is available.

```
(send a-comment-editor read-special source
                                    line
                                    column
                                    position) → any/c
  source : any/c
  line : (or/c exact-nonnegative-integer? #f)
  column : (or/c exact-nonnegative-integer? #f)
  position : (or/c exact-nonnegative-integer? #f)
```

Generates a special comment using make-special-comment. The special comment contains the comment text.

9.3 DrRacket XML Boxes

```
(require wxme/xml)
```
package: wxme-lib

```
reader : (is-a?/c snip-reader<%>)
```

A text-mode reader for XML boxes.

```
xml-editor% : class?
  superclass: editor%
  extends: readable<%>
```

Instantiated for DrRacket XML boxes in a WXME stream for text mode.

```
(send a-xml-editor get-data) → any/c
```

Returns `#t` if whitespace is elimited from the contained XML literal, `#f` otherwise.

```
(send a-xml-editor read-special source
                                line
                                column
                                position) → any/c
  source : any/c
  line : (or/c exact-nonnegative-integer? #f)
  column : (or/c exact-nonnegative-integer? #f)
  position : (or/c exact-nonnegative-integer? #f)
```

Generates a `quasiquote` S-expression that enclosed the XML, with `unquote` and `unquote-splicing` escapes for nested Racket boxes.

9.4 DrRacket Racket Boxes

```
(require wxme/scheme)
```
package: wxme-lib

```
reader : (is-a?/c snip-reader<%>)
```

A text-mode reader for Racket boxes.

```
scheme-editor% : class?
  superclass: editor%
  extends: readable<%>
```

Instantiated for DrRacket Racket boxes in a WXME stream for text mode.

```
(send a-scheme-editor get-data) → any/c
```

Returns `#t` if the box corresponds to a splicing unquote, `#f` for a non-splicing unquote.

```
(send a-scheme-editor read-special source
                                  line
                                  column
                                  position) → any/c
  source : any/c
  line : (or/c exact-nonnegative-integer? #f)
  column : (or/c exact-nonnegative-integer? #f)
  position : (or/c exact-nonnegative-integer? #f)
```

Generates an S-expression for the code in the box.

9.5 DrRacket Text Boxes

```
(require wxme/text)
```
package: wxme-lib

```
reader : (is-a?/c snip-reader<%>)
```

A text-mode reader for text boxes.

```
text-editor% : class?
  superclass: editor%
  extends: readable<%>
```

Instantiated for DrRacket text boxes in a WXME stream for text mode.

```
(send a-text-editor get-data) → #f
```

No data is available.

```
(send a-text-editor read-special source
                                line
                                column
                                position) → any/c
  source : any/c
  line : (or/c exact-nonnegative-integer? #f)
  column : (or/c exact-nonnegative-integer? #f)
  position : (or/c exact-nonnegative-integer? #f)
```

Generates a string containing the text.

9.6 DrRacket Fractions

```
(require wxme/number)
```
package: wxme-lib

```
reader : (is-a?/c snip-reader<%>)
```

A text-mode reader for DrRacket fractions that generates exact, rational numbers.

9.7 DrRacket Teachpack Images

```
(require wxme/cache-image)
```
package: wxme-lib

```
reader : (is-a?/c snip-reader<%>)
```

A text-mode reader for images in a WXME stream generated by the htdp/image teachpack—or, more generally, by mrlib/cache-image-snip.

```
cache-image% : class?
  superclass: object%
```

Instantiated for DrRacket teachpack boxes in a WXME stream for text mode.

```
(send a-cache-image get-argb) → (vectorof byte?)
```

Returns a vector of bytes representing the content of the image.

```
(send a-cache-image get-width) → exact-nonnegative-integer?
```

Returns the width of the image.

```
(send a-cache-image get-height) → exact-nonnegative-
integer?
```

Returns the height of the image.

```
(send a-cache-image get-pin-x) → exact-integer?
```

Returns an offset across into the image for the pinhole.

```
(send a-cache-image get-pin-y) → exact-integer?
```

Returns an offset down into the image for the pinhole.

9.8 DrRacket Test-Case Boxes

```
(require wxme/test-case)
```
package: wxme-lib

```
reader : (is-a?/c snip-reader<%>)
```

A text-mode reader for DrRacket test-case boxes in a WXME stream. It generates instances of test-case%.

```
test-case% : class?
  superclass: object%
```

Instantiated for old-style DrRacket test-case boxes in a WXME stream for text mode.

```
(send a-test-case get-comment) → (or/c #f input-port?)
```

Returns a port for the comment field, if any.

```
(send a-test-case get-test) → input-port?
```

Returns a port for the “test” field.

```
(send a-test-case get-expected) → input-port?
```

Returns a port for the “expected” field.

```
(send a-test-case get-should-raise) → (or/c #f input-port?)
```

Returns a port for the “should raise” field, if any.

```
(send a-test-case get-error-message) → (or/c #f input-
port?)
```

Returns a port for the “error msg” field, if any.

```
(send a-test-case get-enabled?) → boolean?
```

Returns #t if the test is enabled.

```
(send a-test-case get-collapsed?) → boolean?
```

Returns #t if the test is collapsed.

```
(send a-test-case get-error-box?) → boolean?
```

Returns #t if the test is for an exception.

10 Preferences

The racket/gui/base library supports a number of preferences for global configuration. The preferences are stored in the common file reported by find-system-path for 'pref-file, and preference values can be retrieved and changed through get-preference and put-preferences. Except for the except the 'GRacket:playcmd preference preference, the racket/gui/base library reads each of the preferences below once at startup.

Beware: The preferences file is read in case-insensitive mode (for historical reasons), so the symbols listed below must be surrounded with |.

The following are the preference names used by GRacket:

- 'GRacket:default-font-size preference — sets the default font size the basic style in a style list, and thus the default font size for an editor.
- 'GRacket:defaultMenuPrefix preference — sets the prefix used by default for menu item shortcuts on Unix, one of 'ctl, 'meta, or 'alt. The default is 'ctl. When this preference is set to 'meta or 'alt, underlined mnemonics (introduced by & in menu labels) are suppressed.
- 'GRacket:emacs-undo preference — a true value makes undo in editors by default preserve all editing history, including operations that are undone (as in Emacs); the set-undo-preserves-all-history in editor<%> method changes a specific editor's configuration.
- 'GRacket:wheelStep preference — sets the default mouse-wheel step size of editor-canvas% objects.
- 'GRacket:outline-inactive-selection preference — a true value causes selections in text editors to be shown with an outline of the selected region when the editor does no have the keyboard focus.
- 'GRacket:playcmd preference — used to format a sound-playing command; see play-sound for details.
- 'GRacket:doubleClickTime preference — overrides the platform-specific default interval (in milliseconds) for double-click events.

In each of the above cases, if no preference value is found using the GRacket-prefixed name, a MrEd-prefixed name is tried for backward compatibility.

11 Dynamic Loading

```
(require racket/gui/dynamic)
```
package: base

The racket/gui/dynamic library provides functions for dynamically accessing the racket/gui/base library, instead of directly requiring racket/gui or racket/gui/base.

```
(gui-available?) → boolean?
```

Returns #t if dynamic access to the GUI bindings is available. The bindings are available if racket/gui/base has been loaded, instantiated, and attached to the namespace in which racket/gui/dynamic was instantiated.

```
(gui-dynamic-require sym) → any
  sym : symbol?
```

Like dynamic-require, but specifically to access exports of racket/gui/base, and only when (gui-available?) returns true.

The gui-dynamic-require function is intended primarily for use under a (gui-available?) conditional. It can also be used as a shorthand for dynamic-require with 'racket/gui/base, but only after ensuring that the bindings are available. One way to make racket/gui/base bindings available, so that (gui-available?) returns true, is through dynamic-require:

```
(dynamic-require 'racket/gui/base #f)
```

Unlike require, using dynamic-require delays the instantiation of racket/gui/base until the run-time call of dynamic-require. With racket/gui/base so declared, gui-dynamic-require can be used to access bindings:

```
(define window (new (gui-dynamic-require 'frame%)
                    [label "Frame"]))
(send window show #t)
```

12 Startup Actions

The racket/gui/base module can be instantiated only once per operating-system process, because it sets hooks in the Racket run-time system to coordinate between Racket thread scheduling and GUI events. Attempting to instantiate it a second time results in an exception. Furthermore, on Mac OS, the sole instantiation of racket/gui/base must be in the process's original place.

Instantiating racket/gui/base sets two parameters:

- executable-yield-handler — The executable yield handler is set to evaluate (yield *initial-eventspace*) before chaining to the previously installed handler. As a result, the Racket process will normally wait until all top-level windows are closed, all callbacks are invoked, and all timers are stopped in the initial eventspace before the process exits.
- current-get-interaction-input-port — The interaction port handler is set to wrap the previously installed handler's result to yield to GUI events when the input port blocks on reading. This extension of the default handler's behavior is triggered only when the current thread is the handler thread of some eventspace, in which case current-eventspace is set to the eventspace before invoking yield. As a result, GUI events normally can be handled while read-eval-print-loop (such as run by the plain Racket executable) is blocked on input.

The thread where racket/gui/base is instantiated also becomes the handler thread for the initial eventspace. See also §1.6.2 "Eventspaces and Threads".

13 Init Libraries

`(require racket/gui/init)` package: `gui-lib`

The `racket/gui/init` library is the default start-up library for GRacket. It re-exports the `racket/init` and `racket/gui/base` libraries, and it sets `current-load` to use `text-editor-load-handler`.

`(require racket/gui/interactive)` package: `gui-lib`

Similar to `racket/interactive`, but for GRacket. This library can be changed by modifying `'gui-interactive-file` in the `"config.rktd"` file in `(find-config-dir)`. Additionally, if the file `"gui-interactive.rkt"` exists in `(find-system-path 'addon-dir)`, it is run rather than the installation wide graphical interactive module.

This library runs the `(find-graphical-system-path 'init-file)` file in the users home directory if it exists, rather than their `(find-system-path 'init-file)`. Unlike `racket/interactive`, this library does not start `xrepl`.

Added in version 1.27 of package `gui-lib`.

14 Platform Dependencies

See §31 “Platform Dependencies” in *The Racket Drawing Toolkit* for information on platform library dependencies for `racket/draw`. On Unix, GTK+ 3 is used if its libraries can be found and the `PLT_GTK2` environment is not defined. Otherwise, GTK+ 2 is used. The following additional system libraries must be installed for `racket/gui/base` in either case:

- `"libgdk-3.0[.0]"` (GTK+ 3) or `"libgdk-x11-2.0[.0]"` (GTK+ 2)
- `"libgdk_pixbuf-2.0[.0]"` (GTK+ 2)
- `"libgtk-3.0[.0]"` (GTK+ 3) or `"libgtk-x11-2.0[.0]"` (GTK+ 2)
- `"libgio-2.0[.0]"` — optional, for detecting interface scaling
- `"libGL[.1]"` — optional, for OpenGL support
- `"libunique-1.0[.0]"` — optional, for single-instance support (GTK+ 2)

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