



GTK+ 4 Status Update

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History

1998 — 1.0

- really the Gimp toolkit

1999 — 1.2

- GObject

2002 — 2.0

- Pango
- ATK
- cairo

2011 — 3.0

- client-side windows
- client-side decorations
- CSS
- touch, gestures
- GL rendering
- broadway, wayland



Present

3.22

- the final, stable 3.x series

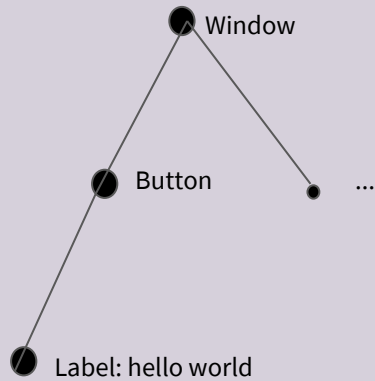
3.90 — since mid-2016

- integrate GSK, fully GL/Vulkan based rendering
- build with meson
- modernize GDK APIs
- fully switch to event controllers
- composite widgets

4.0 — 2018 ?

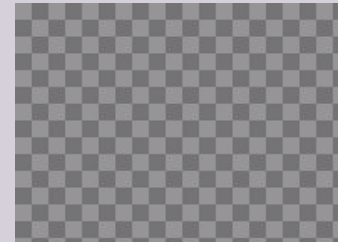
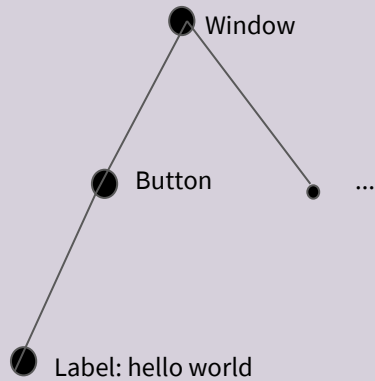


Drawing in GTK+ 3





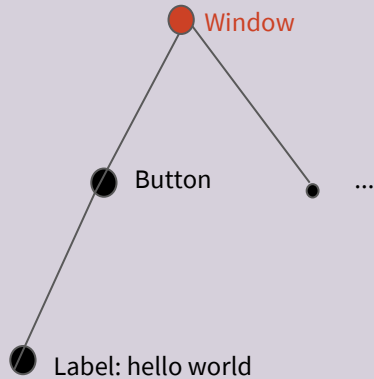
Drawing in GTK+ 3



Create a cairo surface



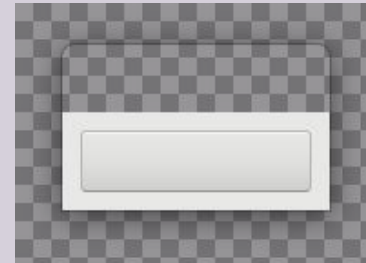
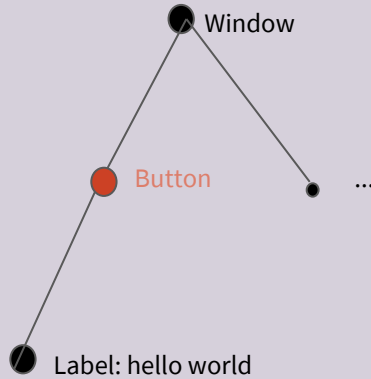
Drawing in GTK+ 3



Call `draw()` on each widget...



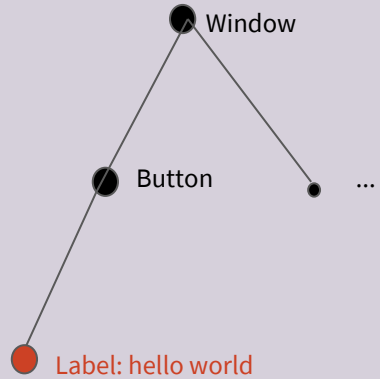
Drawing in GTK+ 3



Call draw functions to render CSS background, border, shadow...



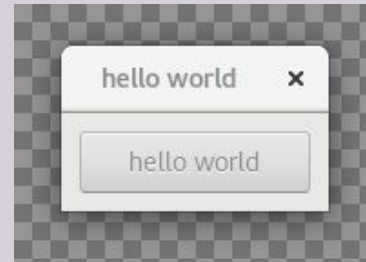
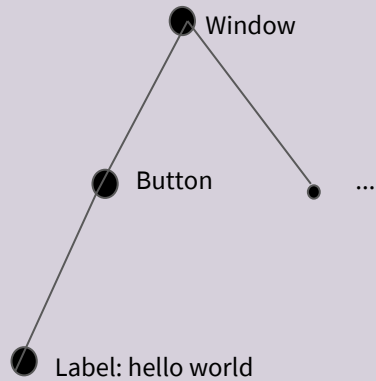
Drawing in GTK+ 3



Call Pango to render text...



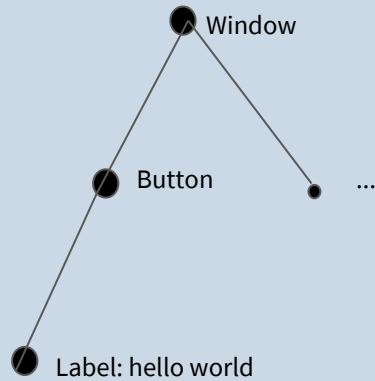
Drawing in GTK+ 3



Send the completed frame to the display server

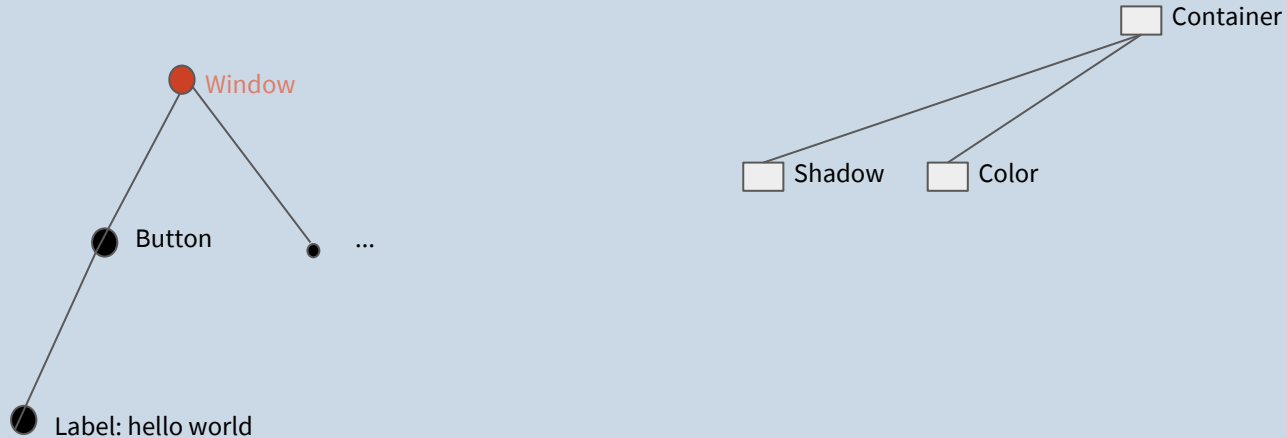


Drawing in GTK+ 4





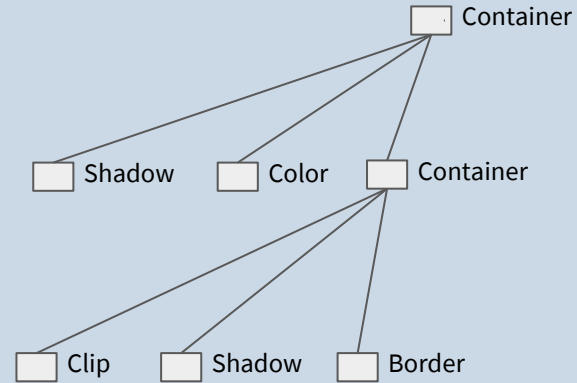
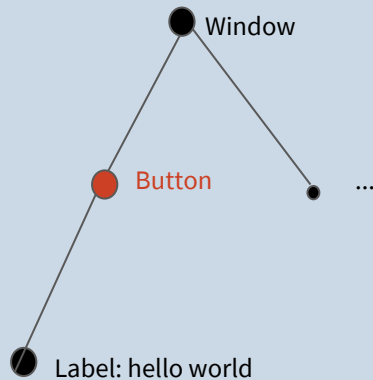
Drawing in GTK+ 4



Call `snapshot()` on each widget to create render nodes...



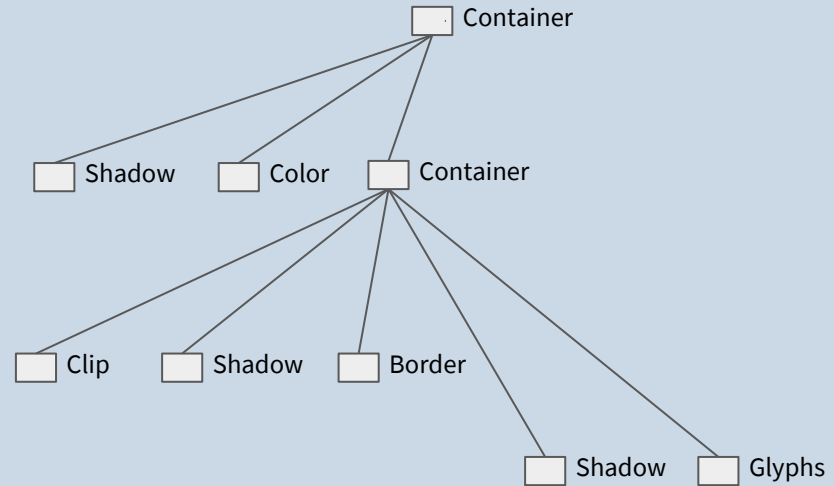
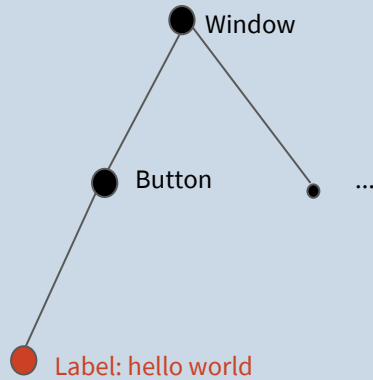
Drawing in GTK+ 4



Create render nodes for CSS background, border, shadow...



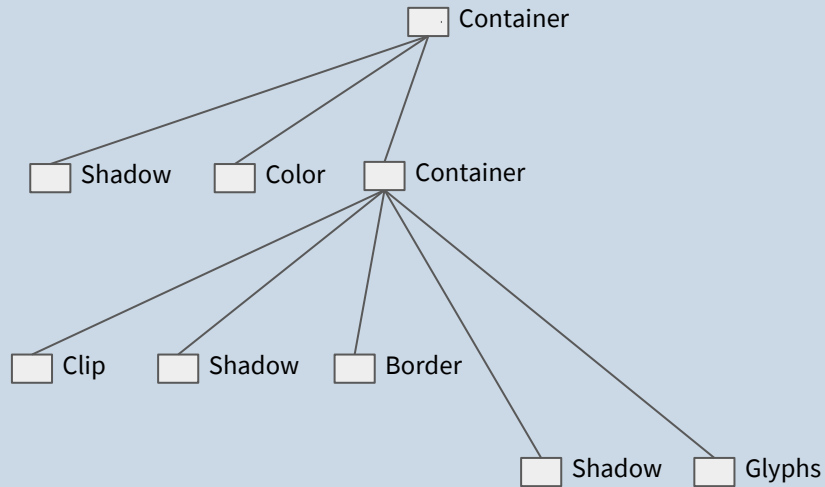
Drawing in GTK+ 4



Call snapshot functions to create render nodes for text



Drawing in GTK+ 4



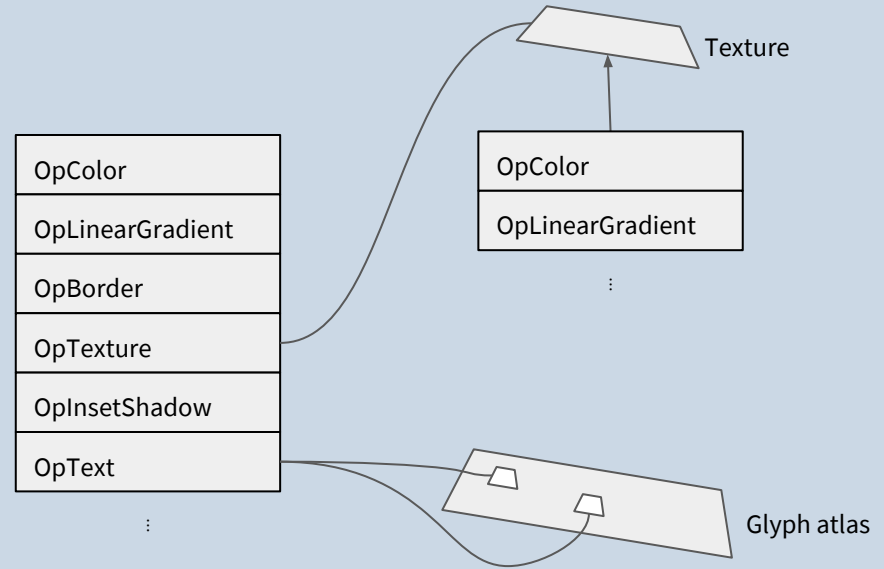
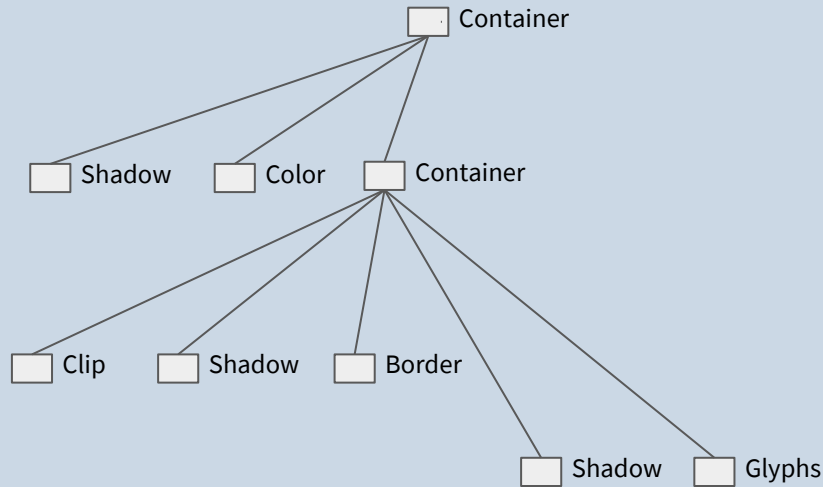
OpColor
OpLinearGradient
OpBorder
OpTexture
OpInsetShadow
OpText

⋮

GSK translates render nodes into backend operations



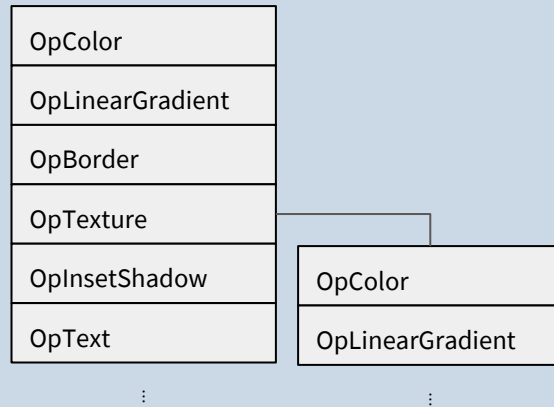
Drawing in GTK+ 4



Upload textures and use Pango to render glyphs



Drawing in GTK+ 4



Send the render operations to the GPU



Render nodes in the Inspector

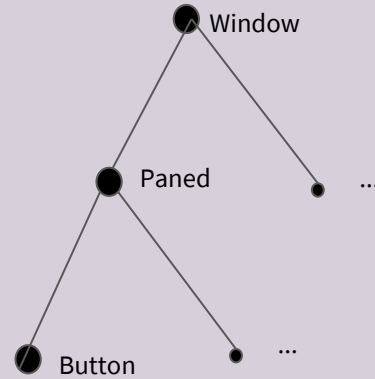
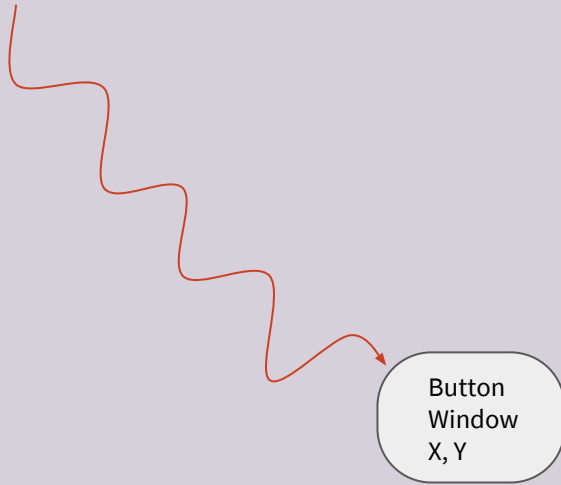
The screenshot shows the Qt Inspector window with the following components:

- Top Bar:** Objects, Global, CSS, Recorder, and a close button (x).
- Left Panel:** A list of render nodes with their durations:
 - Start of Recording
 - Full Render
 - Partial Render +73ms
 - Partial Render +34ms
 - Partial Render +40ms
 - Partial Render +17ms
 - Partial Render +51ms
 - Partial Render +647ms
 - Partial Render
- Tree View:** A tree structure under 'Render<GtkWindow>':
 - Outset Shadow
 - Outset Shadow
 - BackgroundColor
 - BackgroundLayerClip<0>
 - CrossFadedImage<0.155939>
 - image() Fallback Color
 - LinearGradient<3stops>
 - Inset Shadow
 - Border
 - Shadow<1>
 - Glyphs<11>
 - BackgroundColorClip
 - BackgroundColor
 - BackgroundLayerClip<0>
 - LinearGradient<3stops>
 - Inset Shadow
 - Border
 - Glyphs<11>
 - Shadow<1>
 - Recoloring Icon
- Property Table:** A table with two columns: Property and Value.

Property	Value
Type	Container
Bounds	199.00 x 123.00 + 0.00 + 0.00
Children	13
- Preview:** A visual representation of a dialog box titled 'hello world' with a close button (x) and a button labeled 'hello world'.



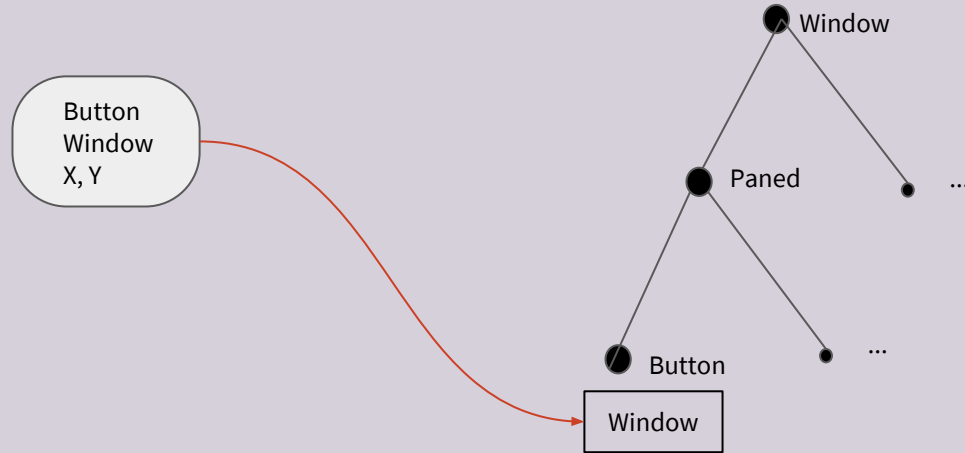
Input in GTK+ 3



An event arrives



Input in GTK+ 3

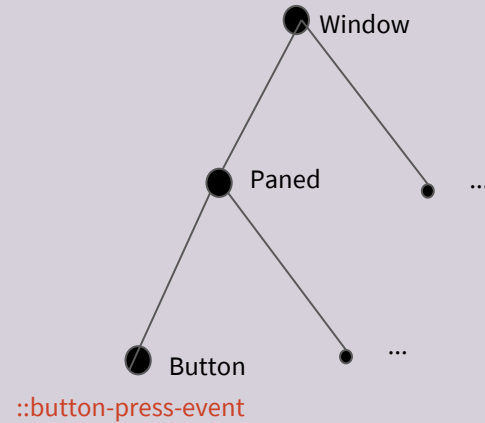


Route it by matching the window



Input in GTK+ 3

Button
Window
X, Y

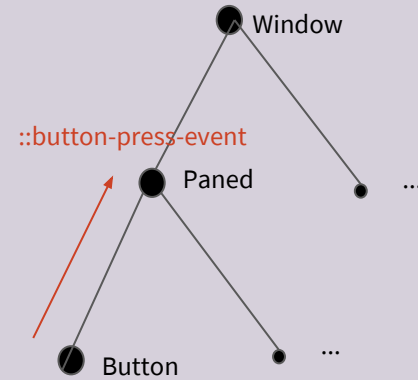


Emit event signals



Input in GTK+ 3

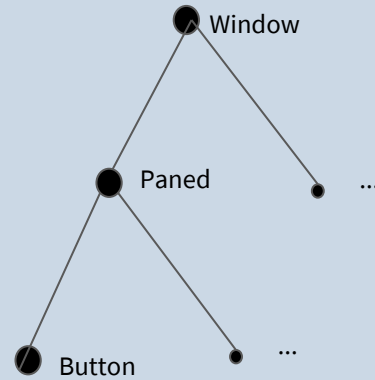
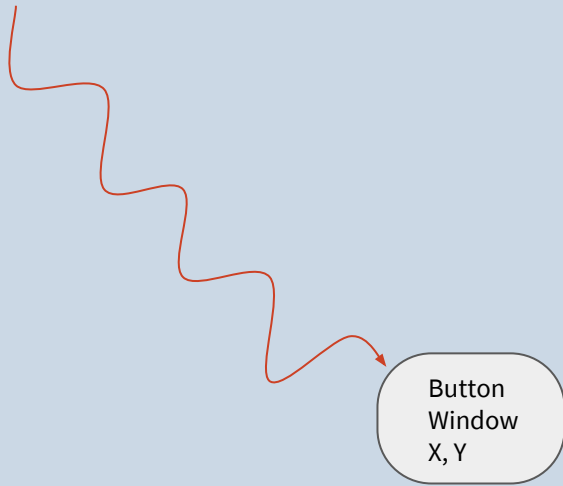
Button
Window
X, Y



...and propagate up



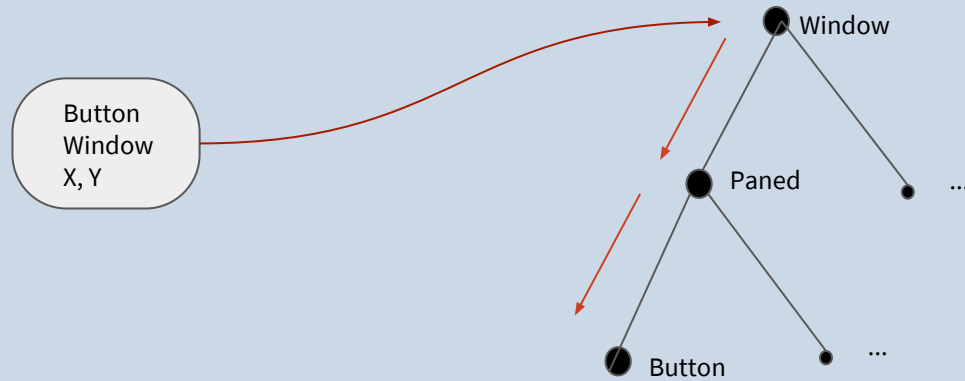
Input in GTK+ 4



An event arrives



Input in GTK+ 4

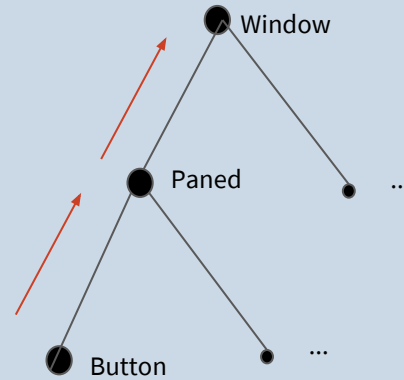


Route it by matching coordinates, top-down (capture)



Input in GTK+ 4

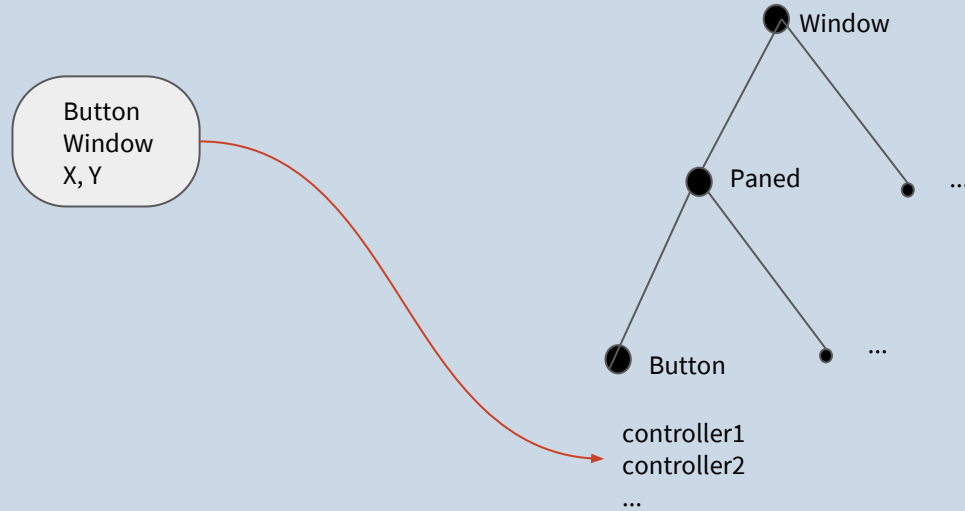
Button
Window
X, Y



...and back up (bubble)



Input in GTK+ 4



Pass the event to event controllers at each step



Composite Widgets in GTK+ 3



Custom drawing – *not* the CSS box model

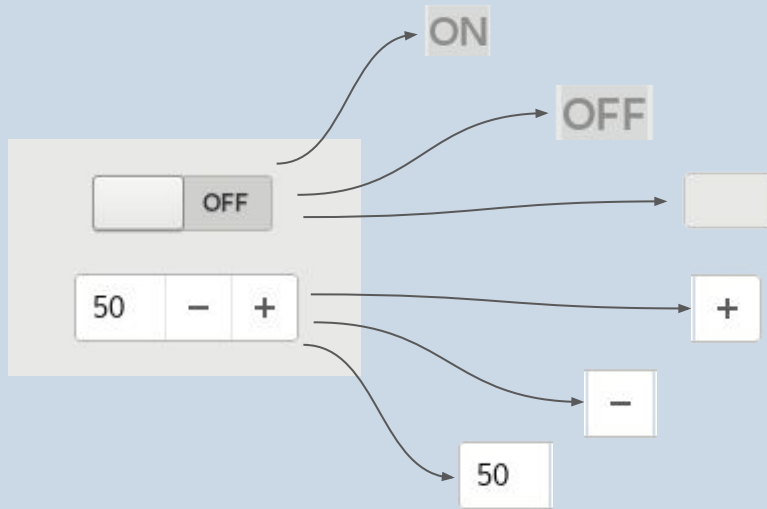
Custom event handling

Code duplication

A spinbutton *is* an entry



Composite Widgets in GTK+ 4



Any widget can have children

Widgets are close to CSS boxes

Composition instead of subclassing

A switch is *composed of*

- two labels
- a slider

A spinbutton *has*

- an entry
- two buttons



What's done

Vulkan renderer

GL renderer

New GDK apis

Event controllers

Composite widgets



What's left to do

Write cool examples

Complete API cleanups

Expose shaders for applications

Transformations for widgets

'Complicated' widgets: treeview,
textview



How you can help

Write cool examples

Port an application

Convert custom widgets to new APIs

Find what doesn't work, or is too complicated



Porting ?

Widgets are now visible by default

`gtk_box_pack_start/end` has less arguments

No more `event->button`



Heroes of GTK+ 4

Benjamin Otte

Daniel Boles

Emmanuele Bassi

Alexander Larsson

Timm Bäder

Chun-wei Fan

Carlos Garnacho

Руслан Ижбулатов

Jonas Ådahl



References

GTK+ 4 roadmap: <https://wiki.gnome.org/Projects/GTK+/Roadmap/GTK4>

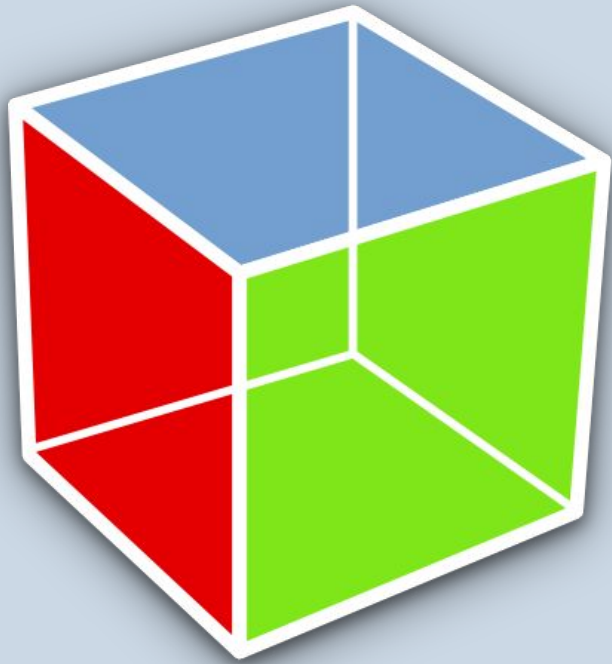
GTK+ sources: <https://git.gnome.org/browse/gtk+/>

GTK+ blog: <https://blog.gtk.org/>

GTK+ docs, migration guide: <https://developer.gnome.org/gtk4/>



Questions?



Thanks!