GTK+

- Gimp Tool Kit
- Toolkit zur GUI-Programmierung
- Verfügbar für Unix/Linuxsysteme, einschl. Mac und Windows
- Basiert auf C
  https://developer.gnome.org/gtk3/stable/gtk-getting-started.html
- Tutorial:
-
- Installation unter ubuntu mittels
  sudo apt-get install libgtk-3-dev
- Alle Beispiele basieren auf dem o.g. Tutorium

Der Build Prozess

Ein einfaches Programm wird mit nachfolgendem Kommando kompilert:

```
gcc gtk1.c -o gtk1 `pkg-config --cflags --libs gtk+-3.0`
```

Dabei erzeugt `pkg-config --cflags --libs gtk+-3.0` Commandlineoptions, hauptsächlich zu Includefiles ,ihren Verzeichnissen und Bibliotheken:

```
pkg-config --cflags --libs gtk+-3.0
```

```
-pthread -I/usr/include/gtk-3.0 -I/usr/include/atk-1.0
-I/usr/include/at-spi2-atk/2.0 -I/usr/include/pango-1.0
-I/usr/include/gio-unix-2.0/ -I/usr/include/cairo
-I/usr/include/gdk-pixbuf-2.0 -I/usr/include/glib-2.0
-I/usr/lib/x86_64-linux-gnu/glib-2.0/include
-I/usr/include/harfbuzz -I/usr/include/freetype2
-I/usr/include/pixman-1 -I/usr/include/libpng12  -lgtk-3 -lgdk-
3 -latk-1.0 -lgio-2.0 -lpangocairo-1.0 -lgdk_pixbuf-2.0 -
lcairo-gobject -lpango-1.0 -lcairo -lgobject-2.0 -lglib-2.0
```

Alles dreht sich um Widgets – was ist das?

- Zusammensetzung aus
  - Window (Fenster)
  - Gadget (Vorrichtung, Gerät, Dingsbums, Apparatur, techn. Spielerei, ...)
- Letzlich - Fenster mit einer speziellen Funktionalität
- Widgets sind Buttons, Checkboxes, Eingabefelder (ein-/mehrzeilig) … oder Container
- Synonyme Bezeichnungen sind Controlls, Components (java), Bedienelemente

Helloprogramm

```
#include <gtk/gtk.h>


int main( int   argc, char *argv[]
{
    GtkWidget *window;
    gtk_init (&argc, &argv);
    window = gtk_window_new (GTK_WINDOW_TOPLEVEL);
    gtk_widget_show  (window);
    gtk_main ();
    return 0;
}
```

gtk_init(gint *argc, gchar ***argv)

GtkWidget *gtk_window_new (GtkWindowType type);
Erzeugt ein Toplevel-Window

void gtk_widget_show (GtkWidget *widget);
Wird als sichtbar markiert

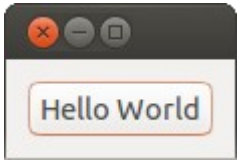
void gtk_main (void);
Startet die mainloop der Applikation.
Programm bleibt in dieser Funktion
Bis zum Beenden

Ergänzungen

```
int main( int   argc,
          char *argv[] )
{
 int i;
 GtkWidget *window;
 gtk_init (&argc, &argv);

 for (i=0; i<argc; i++) puts(argv[i]);

 window = gtk_window_new (GTK_WINDOW_TOPLEVEL);

 //gtk_window_set_title((GtkWindow *)window,"GTK-Spass");
 gtk_window_set_title(GTK_WINDOW (window),"GTK-Spass");
 g_signal_connect (window, "destroy", G_CALLBACK (gtk_main_quit), NULL);

 gtk_widget_show  (window);
 gtk_main ();
 return 0;
}
```

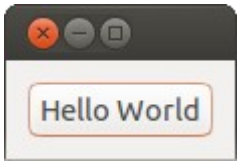
#define g_signal_connect(instance, detailed_signal, c_handler, data)
Bewirkt, dass unser Window bei Auftreten eines „destoy“-Ereignisses die Funktion gtk_main_quit(NULL) aufruft und damit nicht nur das Hauptfenster schließt, sondern auch das Programm ordentlich beendet.

```
int main( int   argc,
          char *argv[] )
{
  int i;
  GtkWidget *window;
  GtkWidget *button;

  gtk_init (&argc, &argv);

  for (i=0; i<argc;i++)puts(argv[i]);
  window = gtk_window_new (GTK_WINDOW_TOPLEVEL);
  gtk_window_set_title(GTK_WINDOW (window),"GTK-Spass");
  g_signal_connect (window, "delete-event", G_CALLBACK (on_delete_event), NULL);
  g_signal_connect (window, "destroy", G_CALLBACK (gtk_main_quit), NULL);
  gtk_container_set_border_width (GTK_CONTAINER (window), 10);
  button = gtk_button_new_with_label ("Hello World");
  g_signal_connect (button, "clicked", G_CALLBACK (print_hello), NULL);
  g_signal_connect_swapped (button, "clicked", G_CALLBACK (gtk_widget_destroy), window);
  //g_signal_connect_swapped (button, "clicked", G_CALLBACK (on_delete_event), window);
  gtk_container_add (GTK_CONTAINER (window), button);
  gtk_widget_show (button);
  gtk_widget_show (window);
  gtk_main ();
  return 0;
}
```



Callback für Eventhandling

```
static gboolean
on_delete_event (GtkWidget *widget,
                 GdkEvent  *event,
                 gpointer   data)
{
  g_print ("delete event occurred\n");
  //return TRUE;
  return FALSE;
}

static void
print_hello (GtkWidget *widget,
             gpointer   data)
{
  g_print ("Hello World\n");
}
```



Mehrere Buttons

- `GtkWidget * gtk_grid_new (void);`
  - Erzeugt ein neues Widget (GridContainerWidget)
  - Es können mehrere Widgets eingefügt werden
  - Die Widgets werden in eine Gitterstruktur einsortiert
- `void gtk_container_add (GtkContainer *container,`
  `GtkWidget *widget);`
  - Fügt einen Container in ein anderes Widget ein, bei uns in das Hauptfenster
- `void gtk_grid_attach (GtkGrid *grid, GtkWidget *child, gint left, gint top, gint width, gint height);`
  - Fügt ein Widget (child) in den GridContainer ein

Anderes Layout

- Widget GtkImage erlaubt das Einfügen von Bildern
- Durch Einsetzen eines anderen Containers an Stelle von Grid wird ein anderes Layout erzeugt.
- Andere Contaioner sind
  - **GtkListBox**
  - GtkFlowBox
  - GtkPaned
  - GtkNotebook
  - . . .

```
int main (int   argc, char *argv[])
{
  GtkWidget *window;
  GtkWidget *list;
  GtkWidget *button;
  gtk_init (&argc, &argv);
  window = gtk_window_new (GTK_WINDOW_TOPLEVEL);
  gtk_window_set_title (GTK_WINDOW (window), "Grid");
  g_signal_connect (window, "destroy", G_CALLBACK (gtk_main_quit), NULL);
  gtk_container_set_border_width (GTK_CONTAINER (window), 10);
  list = gtk_list_box_new ();
  gtk_container_add (GTK_CONTAINER (window), list);
  button = gtk_button_new_with_label ("Button 1");
  g_signal_connect (button, "clicked", G_CALLBACK (print_hello), "Hello 1");
  gtk_list_box_insert (GTK_LIST_BOX (list), button,0);
  button = gtk_button_new_with_label ("Button 2");
  g_signal_connect (button, "clicked", G_CALLBACK (print_hello), "Hello 2");
  gtk_list_box_insert (GTK_LIST_BOX (list), button,1);
  button = gtk_button_new_with_label ("Quit");
  g_signal_connect (button, "clicked", G_CALLBACK (gtk_main_quit), NULL);
  gtk_list_box_insert (GTK_LIST_BOX (list), button,2);
  GtkWidget *image;
  image = gtk_image_new_from_file ("lampe.jpg");
  gtk_list_box_insert (GTK_LIST_BOX (list), image,3);
  gtk_widget_show_all (window);
  gtk_main ();
  return 0;
}
```

Layout generieren

- Das gesamte Layout kann in einer XML-Datei beschrieben werden
- Mittels GtkBuilder wird die gesamte Oberfläche generiert.
- Die Applikation reduziert sich dann auf das Eventhandling

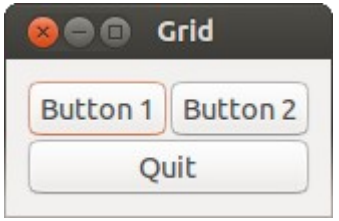
```
GtkBuilder *builder;
builder = gtk_builder_new ();
gtk_builder_add_from_file (builder, "gtk5.ui", NULL);
```

```
int main (int   argc, char *argv[])
{
 GtkBuilder *builder;
 GObject *window;
 GObject *button;

 gtk_init (&argc, &argv);
 builder = gtk_builder_new ();
 gtk_builder_add_from_file (builder, "gtk5.ui", NULL);
 window = gtk_builder_get_object (builder, "window");
 g_signal_connect (window, "destroy", G_CALLBACK (gtk_main_quit), NULL);

 button = gtk_builder_get_object (builder, "button1");
 g_signal_connect (button, "clicked", G_CALLBACK (print_hello), NULL);

 button = gtk_builder_get_object (builder, "button2");
 g_signal_connect (button, "clicked", G_CALLBACK (print_hello), NULL);

 button = gtk_builder_get_object (builder, "quit");
 g_signal_connect (button, "clicked", G_CALLBACK (gtk_main_quit), NULL);

 gtk_main ();

 return 0;
}
```

```
<interface>
  <object id="window" class="GtkWindow">
    <property name="visible">True</property>
    <property name="title">Grid</property>
    <property name="border-width">10</property>
    <child>
      <object id="grid" class="GtkGrid">
        <property name="visible">True</property>
        <child>
          <object id="button1" class="GtkButton">
            <property name="visible">True</property>
            <property name="label">Button 1</property>
          </object>
          <packing>
            <property name="left-attach">0</property>
            <property name="top-attach">0</property>
          </packing>
        </child>
        <child>
          <object id="button2" class="GtkButton">
            <property name="visible">True</property>
            <property name="label">Button 2</property>
          </object>
          <packing>
            <property name="left-attach">1</property>
            <property name="top-attach">0</property>
          </packing>
        </child>
        <child>
          <object id="quit" class="GtkButton">
            <property name="visible">True</property>
            <property name="label">Quit</property>
          </object>
          <packing>
            <property name="left-attach">0</property>
            <property name="top-attach">1</property>
            <property name="width">2</property>
          </packing>
        </child>
      </object>
      <packing>
      </packing>
    </child>
  </object>
</interface>
```

GtkListBox

GtkGrid



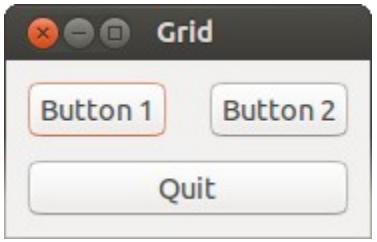
- Nicht validierendes XML
- Datenauszeichnungssprache
- Inhalte werden in 'Tags' verpackt
- Ähnlich html
- Ermöglicht den Einsatz von Oberflächengeneratoren
- Ermöglicht Änderung der Oberfläche ohne neu zu kompilieren

Oberflächengenerator glade

- Installation aus Package
- Tutorial:

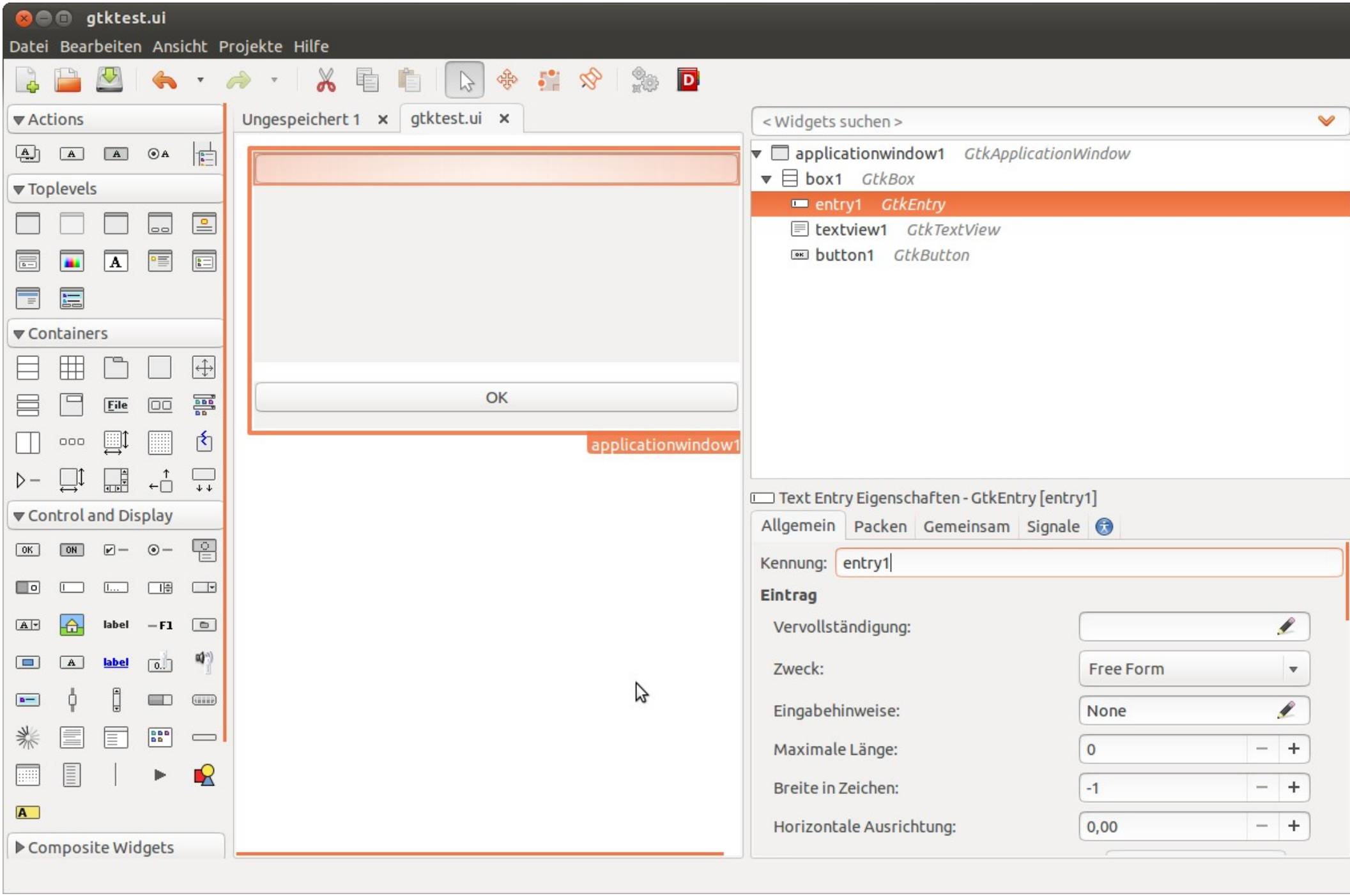
  http://www.micahcarrick.com/gtk-glade-tutorial-part-1.html

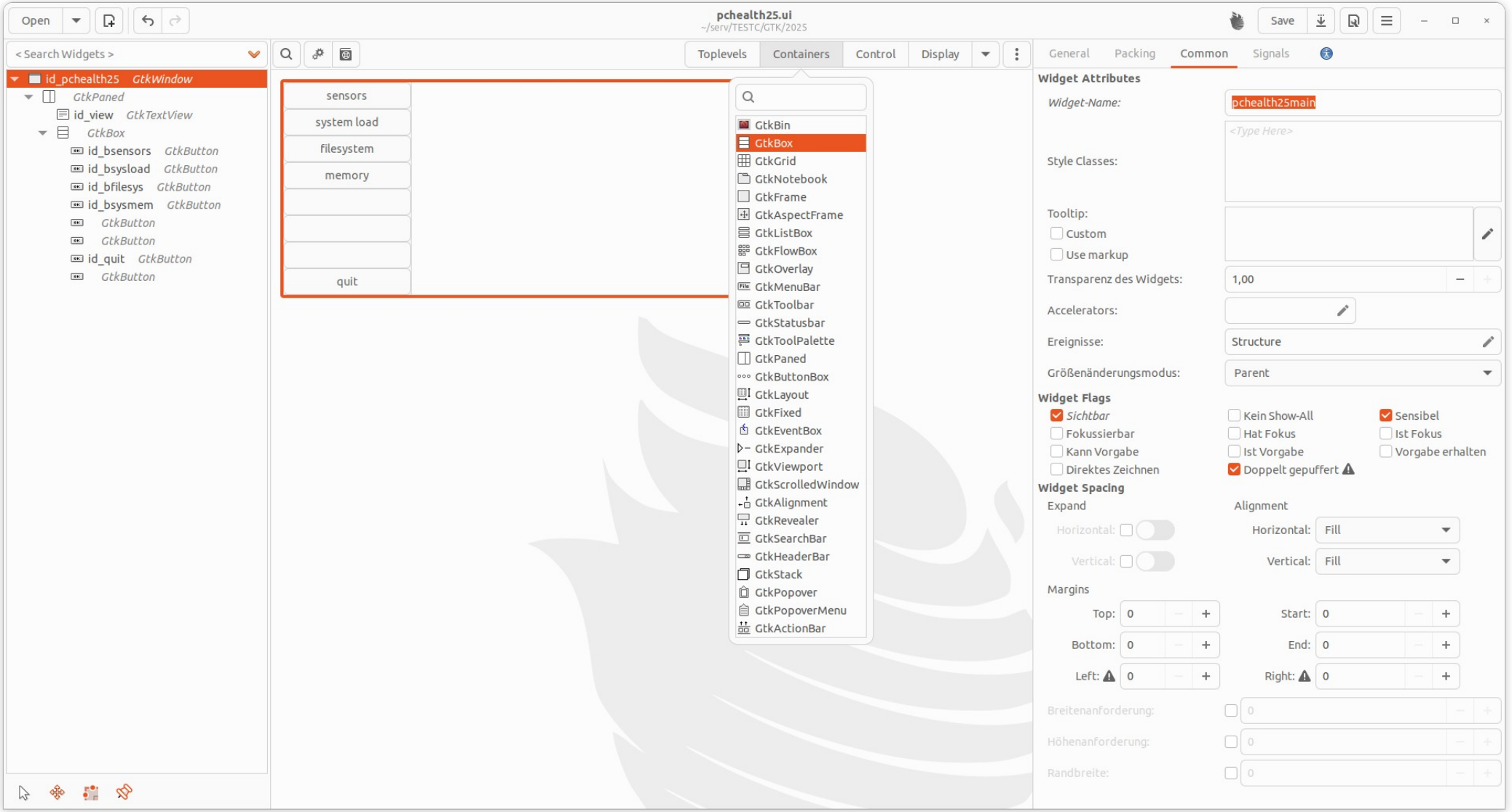
  (Versionsprobleme gtk+2.0 / gtk+3.0)
- Die gespeicherte Datei liegt in xml vor, sie hat die Extension .glade, .ui oder .xml.
  - `gcc -Wall -g -o tutorial main.c `pkg-config --cflags --libs gtk+-3.0` -export-dynamic`
- Das c-Programm ähnelt dem von Folie 13




```c
static void
print_hello (GtkWidget *widget,
             gpointer   data)
{
  g_print ("%s\n",(char*)data);
}
```

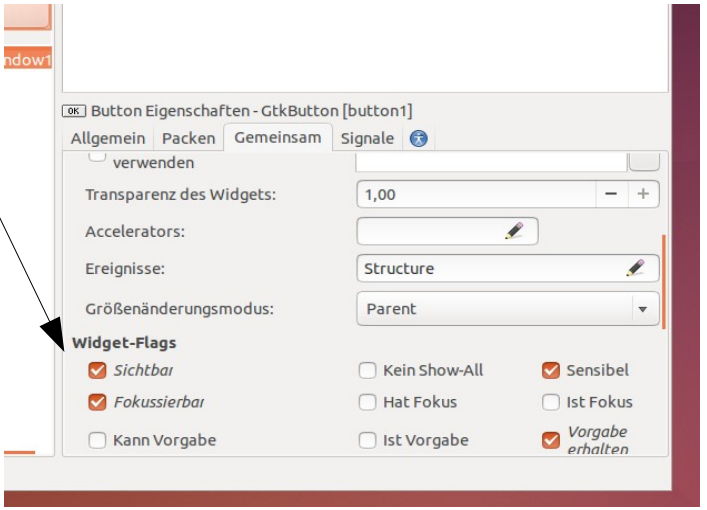
```c
int main (int   argc,
      char *argv[])
{
  GtkWidget *window;
  GtkWidget *grid;
  GtkWidget *button;

  gtk_init (&argc, &argv);
  window = gtk_window_new (GTK_WINDOW_TOPLEVEL);
  gtk_window_set_title (GTK_WINDOW (window), "Grid");
  g_signal_connect (window, "destroy", G_CALLBACK (gtk_main_quit), NULL);
  gtk_container_set_border_width (GTK_CONTAINER (window), 10);
  grid = gtk_grid_new ();
  gtk_container_add (GTK_CONTAINER (window), grid);
  button = gtk_button_new_with_label ("Button 1");
  g_signal_connect (button, "clicked", G_CALLBACK (print_hello), "Hello 1");
  gtk_grid_attach (GTK_GRID (grid), button, 0, 0, 1, 1);
  button = gtk_button_new_with_label ("Button 2");
  g_signal_connect (button, "clicked", G_CALLBACK (print_hello), "Hello 2");
  gtk_grid_attach (GTK_GRID (grid), button, 1, 0, 1, 1);
  button = gtk_button_new_with_label ("Quit");
  g_signal_connect (button, "clicked", G_CALLBACK (gtk_main_quit), NULL);
  gtk_grid_attach (GTK_GRID (grid), button, 0, 1, 2, 1);
  gtk_widget_show_all (window);
  gtk_main ();
  return 0;
}
```


gtktest.ui
Datei Bearbeiten Ansicht Projekte Hilfe
Actions
Toplevels
Containers
Control and Display
Composite Widgets
Ungespeichert 1
gtktest.ui
OK
applicationwindow1
< Widgets suchen >
applicationwindow1 GtkApplicationWindow
box1 GtkBox
entry1 GtkEntry
textview1 GtkTextView
button1 GtkButton
Text Entry Eigenschaften - GtkEntry [entry1]
Allgemein
Packen
Gemeinsam
Signale
Kennung: entry1
Eintrag
Vervollständigung:
Zweck: Free Form
Eingabehinweise: None
Maximale Länge: 0
Breite in Zeichen: -1
Horizontale Ausrichtung: 0,00

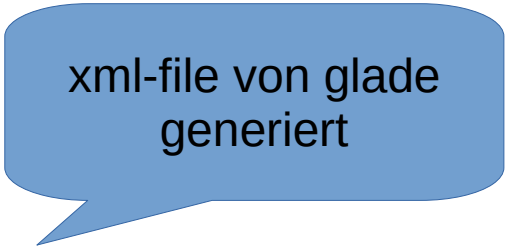

Open
pchealth25.ui
~/serv/TESTC/GTK/2025
Save
< Search Widgets >
id_pchealth25 GtkWindow
GtkPaned
id_view GtkTextView
GtkBox
id_bsensors GtkButton
id_bsysload GtkButton
id_bfilesys GtkButton
id_bsysmem GtkButton
GtkButton
GtkButton
id_quit GtkButton
GtkButton
Toplevels
Containers
Control
Display
sensors
system load
filesystem
memory
quit
GtkBin
GtkBox
GtkGrid
GtkNotebook
GtkFrame
GtkAspectFrame
GtkListBox
GtkFlowBox
GtkOverlay
GtkMenuBar
GtkToolbar
GtkStatusbar
GtkToolPalette
GtkPaned
GtkButtonBox
GtkLayout
GtkFixed
GtkEventBox
GtkExpander
GtkViewport
GtkScrolledWindow
GtkAlignment
GtkRevealer
GtkSearchBar
GtkHeaderBar
GtkStack
GtkPopover
GtkPopoverMenu
GtkActionBar
General
Packing
Common
Signals
Widget Attributes
Widget-Name:
pchealth25main
Style Classes:
<Type Here>
Tooltip:
Custom
Use markup
Transparenz des Widgets:
1,00
Accelerators:
Ereignisse:
Structure
Größenänderungsmodus:
Parent
Widget Flags
Sichtbar
Kein Show-All
Sensibel
Fokussierbar
Hat Fokus
Ist Fokus
Kann Vorgabe
Ist Vorgabe
Vorgabe erhalten
Direktes Zeichnen
Doppelt gepuffert
Widget Spacing
Expand
Horizontal:
Vertical:
Alignment
Horizontal:
Fill
Vertical:
Fill
Margins
Top:
0
Bottom:
0
Left:
0
Start:
0
End:
0
Right:
0
Breitenanforderung:
Höhenanforderung:
Randbreite:

Arbeitsschritte

- Applikationsfenster von Auswahl nach Arbeitsfläche ziehen
- Eigenschaften einstellen (wichtig: Gemeinsam (common) : sichtbar)
- Weitere Controlls und Layouts einfügen
- Speichern unter .ui, .xml oder .glade



```
// aus Tutorial http://www.micahcarrick.com/gtk-glade-tutorial-part-1.html

// gcc -Wall -g -o gtkfolie gtkFolie.c `pkg-config --cflags --libs gtk+-3.0` -export-dynamic

#include <gtk/gtk.h>

GtkBuilder      *builder;

void on_window_destroy (GtkWidget *object, gpointer user_data)
{
    gtk_main_quit ();
}
int main (int argc, char *argv[])
{
    GtkWidget       *window;
    gtk_init (&argc, &argv);

    builder = gtk_builder_new ();
    gtk_builder_add_from_file (builder, "gtktest.xml", NULL);
    window = GTK_WIDGET (gtk_builder_get_object (builder, "window"));

    gtk_widget_show (window);
    gtk_main ();
    return 0;
}
```



Daraus kann dann folgende main-function werden, wenn eventhandler verküpft werden:

```
int main (int argc, char *argv[])
{
    GtkWidget       *window;
    GtkWidget       *button;

    gtk_init (&argc, &argv);

    builder = gtk_builder_new ();
    gtk_builder_add_from_file (builder, "pchealth25.ui", NULL);
    window = GTK_WIDGET (gtk_builder_get_object (builder, "id_pchealth25"));
    g_signal_connect (window, "destroy", G_CALLBACK (gtk_main_quit), NULL);

    button = GTK_WIDGET(gtk_builder_get_object (builder, "id_bsensors"));
    g_signal_connect (button, "clicked", G_CALLBACK (content), (gpointer)"sensors");
       . . .

    button = GTK_WIDGET(gtk_builder_get_object (builder, "id_quit"));
    g_signal_connect (button, "clicked", G_CALLBACK (gtk_main_quit), NULL);

    gtk_widget_show (window);
    gtk_main ();
    return 0;
}
```

Id des Buttons

Funktion, die als callback-function Übergeben wird

Parameter für die callback-fuction

GTK3+

- Einführung:
  - https://developer.gnome.org/gtk3/stable/gtk-getting-started.html
- Glade(video)
  - https://www.youtube.com/watch?v=g-KDOH_uqPk
- Referenz
  - https://developer.gnome.org/gtk3/stable/
- Buildkommando für app. mit glade
  - gcc src/main.c -o gglade `pkg-config --cflags --libs gtk+-3.0` -export-dynamic