GNU G-Golf

Edition 0.1.0, revision 1, for use with GNU G-Golf 0.1.0

The GNU G-Golf Developpers
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Preface

This manual describes how to use G-Golf. It relates particularly to G-Golf version 0.1.0.

Contributors to this Manual

Like G-Golf itself, the G-Golf reference manual is a living entity. Right now, the contributor to this manual is:

- David Pirotte

who is also the author and maintainer of G-Golf.

You are most welcome to join and help. Visit G-Golf’s web site at http://www.gnu.org/software/g-golf/ to find out how to get involved.

Join the GNU Project

GNU G-Golf is part of the GNU Operating System, developed by the GNU Project.

If you are the author of an awesome program and want to join us in writing Free (libre) Software, please consider making it an official GNU program and become a GNU Maintainer. You can find instructions on how to do this here (https://www.gnu.org/help/evaluation.html).

You don’t have a program to contribute? Look at all the other ways you may help (https://www.gnu.org/help/help.html).

To learn more about Free (libre) Software, you can read and please share this page (https://gnu.org/philosophy/free-sw.html).

The G-Golf License

GNU G-Golf is Free Software. GNU G-Golf is copyrighted, not public domain, and there are restrictions on its distribution or redistribution:

- GNU G-Golf and supporting files are published under the terms of the GNU Lesser General Public License version 3 or later. See the file LICENSE.
- This manual is published under the terms of the GNU Free Documentation License (see Appendix A [GNU Free Documentation License], page 138).

You must be aware there is no warranty whatsoever for GNU G-Golf. This is described in full in the license.

I. Introduction

About G-Golf

GNU G-Golf
GNOME: (Guile Object Library for).
Description
G-Golf is a Guile\footnote{GNU Guile (http://www.gnu.org/software/guile) \an interpreter and compiler for the Scheme (http://schemers.org) programming language.} Object Library for GNOME (https://www.gnome.org/).

G-Golf low level API comprises a binding to - (most of) the GObject Introspection (https://developer.gnome.org/stable/gi) and (some of) the GObject (https://developer.gnome.org/gobject/stable/) and Glib (https://developer.gnome.org/glib/stable/) libraries, as well as additional (G-Golf) utilities - used to import GObject libraries and build their corresponding G-Golf high level API.

Note: to be precise, G-Golf imports (and depends on the existence of) a Typelib (https://gi.readthedocs.io/en/latest) - a binary, readonly, memory-mappable database containing reflective information about a GObject library.

G-Golf high level API makes (imported) GObject classes and methods available using GOOPS, the Guile Object Oriented System (see Section “GOOPS” in The GNU Guile Reference Manual).

G-Golf is a tool to develop modern graphical applications.

Savannah
GNU G-Golf also has a project page on Savannah (https://savannah.gnu.org/projects/g-golf).

Obtaining and installing G-Golf
GNU G-Golf can be obtained from the following archive site http://ftp.gnu.org/gnu/g-golf/.
The file will be named g-golf-version.tar.gz. The current version is 0.1.0, so the file you should grab is:

http://ftp.gnu.org/gnu/g-golf/g-golf-0.1.0.tar.gz

Dependencies
GNU G-Golf needs the following software to run:

- Autoconf >= 2.69
- Automake >= 1.14
- Makeinfo >= 6.6
- Guile (http://www.gnu.org/software/guile) >= 2.0.14 [allows 2.2 3.0]
- Guile-Lib (http://www.nongnu.org/guile-lib) >= 0.2.5
- Glib-2.0 (https://developer.gnome.org/glib/stable/) >= 2.48.0
- Gobject-2.0 (https://developer.gnome.org/gobject/stable/) >= 2.48.0
- GObject-Introspection-1.0 (https://developer.gnome.org/stable/gi) >= 1.48.0

Install from the tarball
Assuming you have satisfied the dependencies, open a terminal and proceed with the following steps:

cd <download-path>
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```
tar zxf g-golf-0.1.0.tar.gz
    cd g-golf-0.1.0
    ./configure [--prefix=/your/prefix] [--with-guile-site=yes]
    make
    make install
```

Happy G-Golf ([http://www.gnu.org/software/g-golf/](http://www.gnu.org/software/g-golf/))!

Install from the source


There are currently 2 [important] branches: master and devel. G-Golf ([http://www.gnu.org/software/g-golf/](http://www.gnu.org/software/g-golf/)) stable branch is master, developments occur on the devel branch.

So, to grab, compile and install from the source, open a terminal and:

```
git clone git://git.savannah.gnu.org/g-golf.git
    cd g-golf
    ./autogen.sh
    ./configure [--prefix=/your/prefix] [--with-guile-site=yes]
    make
    make install
```

The above steps ensure you’re using G-Golf ([http://www.gnu.org/software/g-golf/](http://www.gnu.org/software/g-golf/)) bleeding edge stable version. If you wish to participate to developments, checkout the devel branch:

```
git checkout devel
```

Happy hacking!

Notes:

1. The default and --prefix installation locations for source modules and compiled files (in the absence of --with-guile-site=yes) are:

   ```
   $(datadir)/g-golf
   $(libdir)/g-golf/guile/$(GUILE_EFFECTIVE_VERSION)/site-ccache
   ```

   If you pass --with-guile-site=yes, these locations become the Guile global site and site-ccache directories, respectively.

   The configure step reports these locations as the content of the sitedir and siteccachedir variables, respectively the source modules and compiled files install locations. After installation, you may consult these variables using pkg-config:

   ```
   pkg-config g-golf-1.0 --variable=sitedir
   pkg-config g-golf-1.0 --variable=siteccachedir
   ```

   You will need - unless you have used --with-guile-site=yes, or unless these locations are already 'known' by Guile - to define or augment your GUILE_LOAD_PATH and GUILE_COMPILE_PATH environment variables with these locations, respectively (or %load-path and
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2. G-Golf also installs its libg-golf.* library files, in $(libdir). The configure step reports its location as the content of the libdir variable, which depends on on the content of the prefix and exec_prefix variables (also reported). After installation, you may consult these variables using pkg-config:

```bash
pkg-config g-golf-1.0 --variable=prefix
pkg-config g-golf-1.0 --variable=exec_prefix
pkg-config g-golf-1.0 --variable=libdir
```

You will need - unless the $(libdir) location is already 'known' by your system - to either define or augment your $LD_LIBRARY_PATH environment variable, or alter the /etc/ld.so.conf (or add a file in /etc/ld.so.conf.d) and run (as root) ldconfig, so that G-Golf finds its libg-golf.* library files\(^3\).

3. To install G-Golf, you must have write permissions to the default or $(prefix) directory and its subdirs, as well as to both Guile's site and site-ccache directories if --with-guile-site=yes was passed.

4. Like for any other GNU Tool Chain compatible software, you may install the documentation locally using make install-info, make install-html and/or make install-pdf.

5. Last but not least :), G-Golf comes with a test-suite, which we recommend you to run (especially before [Reporting Bugs], page 5):

```bash
make check
```

Contact Information

Mailing list

G-Golf uses Guile's mailing lists:

- guile-user@gnu.org is for general user help and discussion.
- guile-devel@gnu.org is used to discuss most aspects of G-Golf, including development and enhancement requests.

Please use ‘G-Golf - ’ to precede the subject line of G-Golf related emails, thanks!

You can (un)subscribe to the one or both of these mailing lists by following instructions on their respective list information page (https://lists.gnu.org/mailman/listinfo/).

\(^2\) In this case, you may as well decide to either alter your $HOME/.guile personal file, or, if you are working in a multi-user environment, you may also opt for a global configuration. In this case, the file must be named init.scm and placed it here (evaluate the following expression in a terminal): guile -c "(display (%global-site-dir))(newline)".

\(^3\) Contact your administrator if you opt for the second solution but don't have write privileges on your system.
II. Using G-Golf

IRC

Most of the time you can find me on irc, channel #guile, #guix and #scheme on irc.libera.chat, #clutter and #introspection on irc.gnome.org, under the nickname david.

Reporting Bugs

G-Golf uses a bug control and manipulation mailserver. You may send your bugs report here:

- bug-g-golf@gnu.org

You can (un)subscribe to the bugs report list by following instructions on the list information page (https://lists.gnu.org/mailman/listinfo/bug-g-golf).

Further information and a list of available commands are available here (https://debbugs.gnu.org/server-control.html).

II. Using G-Golf

Before you start

Naming Conventions

G-Golf is, or at least tries to be, consistent in the way ‘things’ are being named, whether the functionality being ‘exposed’ is from an imported GNOME library or is part of a G-Golf’s core reference module.

 GNOME Libraries

When G-Golf imports a GNOME library, its classes, properties, methods, functions, types and constant are renamed, which is achieved by calling [g-name-class-name], page 124, and [g-name-name], page 124, appropriately.

As described in their respective documentation entry, as well as in the [Customizing G-Golf], page 10, section, G-Golf offers a way to either ignore or partially customize the renaming process.

- Classes

 GNOME libraries classes are imported as GOOPS classes (the Guile Object Oriented System, see Section “GOOPS” in The GNU Guile Reference Manual), and their respective name is given by the result of calling [g-name-class-name], page 124, for example:

  GtkWidget ⇒ <gtk-window>
  ClutterActor ⇒ <clutter-actor>
  WebKitWebView ⇒ <webkit-web-view>4

  ...
- Properties

GNOME libraries class properties are imported as GOOPS class slots, and their respective name is given by calling [g-name->name], page 124. Each property slot defines an init-keyword and an accessor, following G-Golf’s accessors naming conventions (See [GOOPS Notes and Conventions], page 7).

As an example, the `<gtk-label>` class has a label slot, with the #:label init-keyword and !label accessor.

- Methods

GNOME libraries methods are imported as GOOPS methods, the name of which is obtained by calling [g-name->name], page 124.

Unless otherwise specified (see [Customization Square], page 32, - GI Method Short Name Skip), as it imports a GI typelib, G-Golf creates a method short name for each imported method, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method long name.

For example, the `<gtk-label>` class, which defines a gtk-label-get-text method, would also define, using G-Golf’s default settings, an get-text method.

- Functions

GNOME libraries functions are imported as procedures, renamed by calling [g-name->name], page 124. For example:

```lisp
(gtk_window_new ⇒ gtk-window-new
clutter_actor_new ⇒ clutter-actor-new
...
```

- Enums, Flags and Boxed types

GNOME libraries enums, flags and boxed types are renamed by calling [g-name->name], page 124, (and cached, See [Cache Park], page 31, section).

Enum and flag type members are renamed by calling [g-name->name], page 124. To illustrate, here is an example:

```lisp
(use (g-golf)

(gi-import-by-name "Gtk" "WindowPosition")
⇒ $2 = #<<gi-enum> 5618c7a18090>

(describe $2)
⇒ #<<gi-enum> 5618c7a18090> is an instance of class <gi-enum>
⇒ Slots are:
  ⇒ enum-set = ((none . 0) (center . 1) (mouse . 2) (center-always . 3) (center-on-parent . 4))
  ⇒ g-type = 94664428197600
  ⇒ g-name = "GtkWindowPosition"
  ⇒ name = gtk-window-position
```

G-Golf Core Reference

- Procedures and Variables
G-Golf procedure names that bind a Glib, GObject or GObject Introspection functions (always) use the ‘original’ name, except that every _ (underscore) occurrence is replaced by a - (hyphens). For example:

\[
\text{g_main_loop_new} \\
\Rightarrow \text{[g-main-loop-new]}, \text{page 44}
\]

\[
\text{g_irepository_get_loaded_namespaces} \\
\Rightarrow \text{[g-irepository-get-loaded-namespaces], page 75}
\]

G-Golf also comes with its own set of procedures, syntax and variables, aimed at not just reading a typelib, but making its functionality available from Guile (http://www.gnu.org/software/guile). Naming those, whenever possible, is done following the ‘traditional way’ scheme name its procedures, syntax and variables. For example:

- procedure names that start with call-with-input-, call-with-output- followed by a Glib, GObject. Gdk or GI type, such as:

\[
\text{[call-with-input-typelib], page 77}
\]

- syntax names that start as with- followed by a Glib, GObject, Gdk or GI type, such as:

\[
\text{[with-gerror], page 113}
\]

When an ‘obvious’ name can’t be find ‘on its own’, or to avoid possible conflict outside G-Golf\(^5\), then the name starts using a g- prefix (when the procedure context is GNOME in general) or gi- prefix (when the procedure context is GI more specifically), and equally for variables, using %g- or %gi-.

### Types and Values

G-Golf variables that bind Glib, GObject and GI types and values use the same convention as for procedures, except that they always start with % and their original type names are transformed by the same rules that those applied when calling [g-studly-caps-expand], page 124.

For example, from the GIBaseInfo section:

\[
\text{GIInfoType} \\
\Rightarrow \text{[%gi-info-type], page 82}
\]

### GOOPS Notes and Conventions

G-Golf extensively uses GOOPS, the Guile Object Oriented System (see Section “GOOPS” in The GNU Guile Reference Manual), in a way that is largely inspired by Guile-Gnome (https://www.gnu.org/software/guile-gnome).

Here are some notes and the GOOPS conventions used by G-Golf.

- **Slots are not Immutable**

---

\(^5\) As an example, it would not be a good idea to use (the name) import for the G-Golf procedure that reads and build the interface for a GIR library, since it is an R6RS reserved word.
Except for virtual slots, there is currently no way to effectively prohibit (block) a user to mutate a goops class instance (one can always use `slot-set! instance slot-name value`).

However, you will find a few places in this manual using phrase excerpts like `instances of this <class> are immutable`, or `this <slot> is immutable`. In these contexts, what is actually meant is that these (instances or slots) are not meant to be mutated. Doing so is not only at your own risks, but likely to cause a crash.

- **Merging Generics**

In G-Golf, generic functions are always merged (see Section “Merging Generics” in *The GNU Guile Reference Manual*).

Users are (highly) recommended to do the same, in their repl, application/library modules and script(s). In its modules - those that import (oop goops) - G-Golf uses the following duplicate binding handler set:

```scheme
#:duplicates (merge-generics
 replace
 warn-override-core
 warn
 last)
```

In a repl or in scripts, these maybe set - after importing (oop goops) - by calling `default-duplicate-binding-handler`:

```scheme
(use-modules (oop goops))
(default-duplicate-binding-handler
 ' (merge-generics replace warn-override-core warn last))
```

G-Golf regular users should consider adding the above lines to their `$HOME/.guile` or, when working in a multi-user environment, should consider adding those lines the file named `init.scm` in the so-called Guile global site directory, here (evaluate the following expression in a terminal): `guile -c "(display (%global-site-dir))(newline)"`.

- **Accessors Naming Convention**

In G-Golf, all slots define an accessor (and no getter, no setter), the name of which is the `slot-name` prefixed using `!`. For example:

```scheme
(define-class <gtype-class> (<class>)
 (info #:accessor !info
     #:init-keyword #:info)
 ...)
```

The principal reasons are (not in any particular order):

---

6 Actually, to be complete, there is a way, which is to define the slot using `#:class <read-only-slot>`, but (a) it is undocumented and (b), it requires the use use of libguile to initialize the slot value, something that I don’t want to do in G-Golf. If you are interested by this (undocumented) feature for your own project though, I suggest you look for some examples in the Guile-Gnome (https://www.gnu.org/software/guile-gnome), source tree, where it is extensively used.

7 You need write privileges to add or modify this file, contact your system administrator if you’re not in charge of the system you are working on.
II. Using G-Golf

- It is a good idea, we think, to be able to visually (and somehow immediately) spot and distinct accessors from the rest of the scheme code your are looking at or working on.
- Accessors are exported, and with this convention, we almost certainly avoid all 'name clashes' with user namespaces, that otherwise would be extremely frequent.
- Users quite often want or even need to cash slot values in a closure. By using this ! prefixing convention, we leave users with the (quite usefull) possibility to name their local variables using the respective slot names.
- Accessors may always be used to mutate a slot value (except for virtual slots, for which you can 'block' that feature), like in (set! (!name an-actor) "Mike"). In scheme, it is a tradition to signal mutability by postfixing the procedure name using the ! character.
- Accessors are not procedures though, there are methods, and to effectively mutate a slot value, one must use set!. Therefore, prefixing makes sense (and preserves the first reason announced here, where posfixing would break it).
- We should also add that we are well aware that Java also prefixes its accessors, using a . as its prefix character, but GOOPS is radically different from Java in its design, and therefore, we really wanted another character.

Configuring Guile for G-Golf

The following description and content is shared and identical to the 'Merging Generics' heading of the previous section.

It is repeated it here, under its own section entry, so that it appears in the table of content and grab all users attention - those who do not follow our recommendation may void their warranty or poison their cat.

- Merging Generics

In G-Golf, generic functions are always merged (see Section “Merging Generics” in The GNU Guile Reference Manual).

Users are (highly) recommended to do the same, in their repl, application/library modules and script(s). In its modules - those that import (oop goops) - G-Golf uses the following duplicate binding handler set:

```scheme
#:duplicates (merge-generics replace warn-override-core warn last)
```

In a repl or in scripts, these maybe set - after importing (oop goops) - by calling `default-duplicate-binding-handler`:

```scheme
(use-modules (oop goops))
(default-duplicate-binding-handler)
```

---

8 Slot names tends to be extremely common, like name, color, ... and naming their respective accessor using the slot name would very likely provoke numerous name clashes with user variables, procedures and methods names.
II. Using G-Golf

'(merge-generics replace warn-override-core warn last))

G-Golf regular users should consider adding the above lines to their $HOME/.guile or, when working in a multi-user environment, should consider adding those lines the file named init.scm in the so-called Guile global site directory\(^9\), here (evaluate the following expression in a terminal): guile -c "(display (%global-site-dir))(newline)".

Customizing G-Golf

G-Golf offers a series of customization interfaces for the following domains: (●) **Name Transformation** - how things are being named as they are being imported; (●) **Strip Boolean Result** - should G-Golf elude (some) function and method call returned value when it is #t and raise an exception if the returned value is #f; (●) **Method Short Name** - should G-Golf create them or not; (●) **Syntax Name Protect** - how G-Golf should address syntax name ‘clash’ against method short name.

- **Name Transformation**

When G-Golf imports a GNOME library, its classes, properties, methods, functions, types and constants are renamed (See [Naming Conventions], page 5), mainly to (a) avoid ‘Camel Case’ (https://en.wikipedia.org/wiki/Camel_case), (b) surround class names by '<' '>' and (c) replace '_' (underscore) occurrences using the '-' (hyphen) character instead.

G-Golf offers - through a series of interfaces to get, check, add, remove and reset two (distinct) associative lists - a way to either ignore or partially customize the renaming process.

See [Customization Square], page 32, - **GI Name Transformation**.

- **Strip Boolean Result**

Some GI typelib functions and methods that (1) have at least one 'inout or 'out argument(s) and (2) return either #t or #f, solely to indicate that the function or method call was successful or not.

G-Golf offers - through a series of interfaces to get, check, add, remove and reset a list of such function or methods names - to instead elude the function or method returned value when it is #t and raise an exception if the returned value is #f.

See [Customization Square], page 32, - **GI Strip Boolean Result**.

- **Method Short Name**

By default, as it imports a GI typelib, G-Golf creates a method short name for each imported method, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long name.

Users may change this default and skip the method short name creation step, either individually or for all GI imported methods.

See [Customization Square], page 32, - **GI Method Short Name Skip**.

- **Syntax Name Protect**

\(^9\) You need write privileges to add or modify this file, contact your system administrator if you’re not in charge of the system you are working on.
When G-Golf creates a method short name, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long name, it may lead to a ‘name clash’, with an already defined procedure or syntax.

Both type of ‘name clash’ need to be addressed, which G-Golf does, automatically, but special care must be taken when that happens against a syntax name, a process that you may custom to your own taste.

See [Customization Square], page 32, - GI Syntax Name Protect.

### Getting Started with G-Golf

G-Golf will let you import and work with any GObject-Introspectable GNOME library\(^\text{10}\). Since we need to make a choice among so many, to guide new comers and get them started with G-Golf, let’s pick-up Gtk (https://developer.gnome.org/gtk4/stable/), and show how to Create interfaces that users just love (https://gtk.org/).

Please note that in the entire course of the G-Golf manual, unless otherwise specified, examples are based on and use Gtk-4.0 (https://developer.gnome.org/gtk4/stable/), Gdk-4.0 (https://developer.gnome.org/gdk4/stable/) and Gsk-4.0 (https://developer.gnome.org/gsk4/stable) - which is new and only available with Gtk-4.0.


We shall complete this brief introduction mentioning that the GNOME team wrote a guide to help Migrating from GTK 3.x to GTK 4 (https://developer.gnome.org/gtk4/stable/gtk-migrating-3-to-4.html).

### Hello World!

Following the tradition, let’s first see how the often seen ‘Hello World!’ familiar, minimal, friendly greeting program looks like in G-Golf:

```g-std
;; Load Gtk
(use-modules g-golf)
(gi-import "Gtk")

;; When the application is launched...
(define (activate app)
  ;; - Create a new window and a new button
  (let ((window (make <gtk-application-window>
                     #:title "Hello"
                     #:application app))
        (button (make <gtk-button>
                  #:label "Hello, World!")
        )))
  ;; - Which closes the window when clicked
  (connect button
             'clicked
             (lambda (b
```
Providing you successfully installed G-Golf, you may run the above code in a Guile REPL (Read Evaluate Print Loop)\textsuperscript{11}, which as described in its comments, starts the application, resulting in opening a (small) window named ‘Hello’, with one button named ‘Hello, World!’, that will close the window when clicked.

Example 1

Wonderful! But you probably rightfully think that it was a bit slow. This is not because G-Golf nor Guile are slow, but because the Gtk namespace is absolutely huge, and although we only use a few components, we asked to import the all namespace. We will see how to only selectively import the namespace components we need in the next section, but let’s first try the following, (a) close the window and (b) re-evaluate the last expression:

\begin{verbatim}
(let ((app (make <gtk-application>
    #:application-id "com.example.GtkApplication")))
  (connect app 'activate activate)
  (run app 0 '()))
\end{verbatim}

Great! Now, the application was launched instantaneously. Since everything it needs was already imported, the time it takes to execute the code is nearly identical to the time it would take to execute the same code from C - if you accurately measure the execution time in both situation, you would see a difference in the results, but small enough that it is safe to declare it imperceptible.

It would be beyond the scope of this introduction to describe the \texttt{<gtk-application> / g-application-run} instance creation and run mechanism in detail, for this, please consult and carefully read their respective entries in the Gtk (https://developer.gnome.org/gtk4/stable/GtkApplication.html) and Gio (https://developer.gnome.org/gio/stable/GApplication.html) reference manuals.

The GNOME team also maintains a wiki called HowDoI (https://wiki.gnome.org/HowDoI), and two pages are dedicated to this subject: HowDoI GtkApplication (https://wiki.gnome.org/HowDoI/GtkApplication) and HowDoI GtkApplication/CommandLine (https://wiki.gnome.org/HowDoI/GtkApplication/CommandLine).

This said, let’s just make a few hopefully useful comments to newcomers:

\textsuperscript{11} If you haven’t done so, please read the [Configuring Guile for G-Golf], page 9, \textit{Merging Generics} and configure your repl as proposed, before to run the example.
II. Using G-Golf

- as you can see, we do not need to call `gtk-init`, it is done automatically (more on this in the GtkApplication (https://developer.gnome.org/gtk4/stable/GtkApplication.html) section of the Gtk Reference Manual);

- the `#:application-id` init-keyword is optional, although recommended, and when passed, the application ID must be valid (more on this below).

  - Is your application ID valid?


In G-Golf, you may check if your application ID is valid by calling `g-application-id-is-valid`, for example:

```lisp
(g-application-id-is-valid "com.example.GtkApplication")
⇒ #t

(g-application-id-is-valid "RedBear")
⇒ #f
```

If you pass an invalid application ID to a `<gtk-application>` instance creation, you’ll be noted with a message similar to this:

```
(process:30818): GLib-GIO-CRITICAL **: 21:58:52.700: g_application_set_application_id: assertion 'application_id == NULL || g_application_id_is_valid (application_id)' failed
```

- Great, but could we speed things up a little?

Yes we can! In the next section, as promised above, we will walk you through [Selective Import], page 13, used to reduce the time G-Golf has to spend importing the typelib(s) that your application requires.

Selective Import

To selectively import namespace components, use [gi-import-by-name], page 19, which takes two arguments, a namespace and a (component) name. Let’s try on our minimal ‘Hello World!’ example and see how it goes. All we need to do, is to substitute the `gi-import "Gtk"` call by the following expression:

```lisp
(for-each (lambda (name)
            (gi-import-by-name "Gtk" name))
      ('("Application"
         "ApplicationWindow"
         "Button"))
```

With this change, everything else kept equal, if you (quit and) restart Guile, evaluate the updated ‘Hello World!’ example code, you will notice how the elapse time before the application window appears is now substantially reduced, compared to the version that

---

12 After you at least import either directly (gi-import-by-name "Gio" "Application"), or (gi-import-by-name "Gtk" "Application"), which triggers the appropriate Gio imports, as described in the next section.
II. Using G-Golf

imports the all Gtk namespace. Substantially reduced but . . . not instantaneous: well, that is expected!

Although we only import a few Gtk namespace components, three GObject classes in this example, G-Golf will import those classes, their interface(s) if any, methods, enums, flags . . . and do the same for their parent class, recursively. For those three classes only, G-Golf actually has to import (and dynamically define) tens of classes, interfaces, enums, flags . . . as well as hundreds of methods and procedures.

G-Golf will also import classes, interfaces and their dependencies (enums, flags . . . recursively as well . . .) from other namespace if necessary. We already have an illustration of this, both with the original example and the change we just made: although we do not explicitly import the GApplication class from the Gio namespace, G-Golf did that for us, and so we may call run - which is the short method name for g-application-run - as if we did manually import it.

Both the namespace and name arguments are case sensitive. The name argument is used to retrieve the typelib [Base Info], page 79, that holds the metadata of the introspectable library element it represents. Although there are a some exceptions, it is generally derived from and obtained by dropping the namespace prefix (without its version number if any) out of the original name. Here are a few more examples, organized by namespace:

```
Gtk
- GtkWidget -> Window
  gtk_init -> init
  gtk_main -> main
  gtk_main_quit -> main_quit
...

WebKit2
- WebView
  WebKitWebView -> WebView
  WebKitLoadEvent -> LoadEvent
...
```

- Cool, selective import, but what about scripting?

Right! The 'Hello World!' example we have presented so far can only be run interactively. In the next section, we will see how we may turn it - and any other example or application - so it can be run as a script.

**Scripting**

A Guile script is simply a file of Scheme code with some ‘extra information at the beginning’ which tells the OS (operating system) how to invoke Guile, and then tells Guile how to handle the Scheme code.

- **Invoking Guile**

It would be beyond the scope of this manual to expose the numerous ways one can define and invoke a Guile script, for a complete description of the subject, see Section “Guile Scripting” in The GNU Guile Reference Manual.

In G-Golf, both provided examples and in this manual, we use the so called ‘for maximum portability' scripting technique, which is to invoke the shell to execute guile with specified command line arguments.
Here is what we do:

```sh
#!/bin/sh
# -*- mode: scheme; coding: utf-8 -*-
exec guile -e main -s "$0" "$@
!
```

In the above, the first line is to specify which shell will be used to interpret the (OS part of the) ‘extra information at the beginning’ of the script.

The second line is optional (and a comment from a shell point of view), that we use it to inform emacs (should you use emacs to edit the file) that despite the ‘extra information at the beginning’ (and the possible lack of filename extension in the script name), it should use the scheme mode as the script editing buffer mode.

The third line tells the shell to execute guile, with the following arguments:

- `-e main` after reading the script, apply main to command line arguments
- `-s "$0"` load the source code from "$0" (which by shell rules, is bound to the fullname of the script itself)
- "$@
  the command line arguments

Note that the top level script lines may contain other declaration(s), like environment variable definitions. Suppose you would like to be warned if your script uses any deprecated guile functionality. In this case, you add the following `export GUILE_WARN_DEPRECATED="detailed"` declaration, before the `exec guile` ... call, like this:

```sh
#!/bin/sh
# -*- mode: scheme; coding: utf-8 -*-
export GUILE_WARN_DEPRECATED="detailed"
exec guile -e main -s "$0" "$@
!
```

---

**Extra Guile information**

Within the context of a G-Golf script, two other things must be taken care of - in addition to the `(use-modules (g-golf))` step - so that the script runs fine: (1) set-up Guile so that generic functions are merged; (2) import (all) typelib element(s) at `expand load eval` time.

In a repl or in scripts, (1) is achieved by importing the `oop goops` module and calling `default-duplicate-binding-handler`\(^{13}\).

In Guile, (2) is achieved by calling the `eval-when` syntax\(^{14}\).

Now, bear with us :), since (2) will define generic functions and/or add methods to existing generic functions, we must make sure the (1) not only preceeds (2), but also happens at `expand load eval` time.

---

\(^{13}\) As seen in [Configuring Guile for G-Golf], page 9, (and in [GOOPS Notes and Conventions], page 7, - 'Merging Generics').

With all the above in mind, here is how the extra Guile information looks like, for our ‘Hello World!’ script example:

```
(eval-when (expand load eval)
  (use-modules (oop goops))

  (default-duplicate-binding-handler
   '(merge-generics replace warn-overide-core warn last))

  (use-modules (g-golf))

  (for-each (lambda (name)
               (gi-import-by-name "Gtk" name))
             '("Application"
               "ApplicationWindow"
               "Box"
               "Label"
               "Button"))
```

- A Hello World! script

Let’s put all this together, and while doing this, enhance a little our original example.

Here is what we propose to do: (a) add a GtkLabel, (b) use a GtkBox and see how to declare its margins and orientation, (c) specify a default width and height for our application window, and (d) see how we can tell the label to horizontally and vertically expand, so it occupies the extra vertical space, while keeping the button to its minimal vertical size.

Joining (1), (2) and the small enhancement, our ‘Hello World!’ script now looks like this:

```
#!/bin/sh
# -*- mode: scheme; coding: utf-8 -*-
exec guile -e main -s "$0" "$@
!
```

```
(eval-when (expand load eval)
  (use-modules (oop goops))

  (default-duplicate-binding-handler
   '(merge-generics replace warn-overide-core warn last))

  (use-modules (g-golf))

  (for-each (lambda (name)
               (gi-import-by-name "Gtk" name))
             '("Application"
               "ApplicationWindow"
               "Box"
               "Label"
               "Button")))
```
II. Using G-Golf

(define (activate app)
  (let ((window (make <gtk-application-window>
                     #:title "Hello"
                     #:default-width 320
                     #:default-height 240
                     #:application app))
      (box (make <gtk-box>
             #:margin-top 6
             #:margin-start 12
             #:margin-bottom 6
             #:margin-end 6
             #:orientation 'vertical))
      (label (make <gtk-label>
              #:label "Hello, World!"
              #:hexpand #t
              #:vexpand #t))
      (button (make <gtk-button>
               #:label "Close")))

      (connect button 'clicked
                (lambda (b)
                    (close window)))

      (set-child window box)
      (append box label)
      (append box button)
      (show window)))

(define (main args)
  (let ((app (make <gtk-application>
                #:application-id "org.gtk.example")))
    (connect app 'activate activate)
    (let ((status (run app 0 '()))
          (exit status)))
    If you save the above in a file, say hello-world, then chmod a+x hello-world and launch the script, ./hello-world, here is what you'll get on the screen:

Example 2

- A last few comments

We need to make a last few comments, that also applies and will be further addressed in the next section.

Desktop Entry
II. Using G-Golf

If you are running a GNOME desktop, you probably noticed that in the GNOME menu bar, the application menu entry for our ‘Hello World!’ script is org.gtk.example (not Hello). This is because we’re missing a Desktop Entry. We will see how to create and install a Desktop Entry in the next section.

Command Line Arguments

As described in the first part of this section, we use the so called ‘for maximum portability’ scripting technique, and more precisely, the following incantation:

exec guile -e main -s "$0" "$@

In the above, the last argument refers to the the command line arguments. It is actually optional, but when used, they are passed to the main (entry point) script procedure.

However, as you may have noticed, we do not pass those (if any) to the Gtk application, which we launch using (run app 0 '()).

This is intentional: (a) we (want to) always use the same incantation to invoke Guile - and sometimes. may quickly hack something using additional debug args on the scheme side only . . .; (b) you may only pass those arguments to the Gtk application if you have defined the signal callback(s) to handle them.

If you pass the command line arguments to a Gtk application that does not define the appropriate signal callback procedure to handle them, you’ll get an error message in the terminal (and the application won’t be launched).

To illustrate, let’s change the g-application-run call of our script, so it becomes (run app (length args) args), then try to launch it, passing a few (fake) arguments, here is what happens:

./hello-world 1 2 3
-> (hello-world:216198): GLib-GIO-CRITICAL **: 22:26:41.135: This application can not open files.

And as mentioned above, the application is not launched.

Although scripts may (also) accept and pass command line argument(s) to the Gtk application or dialog they define, we will see how to handle those in the next section, [Building Applications], page 18.

Building Applications

G-Golf on Mobile Devices

Working with GNOME

Working with GNOME exposes, grouped by theme, the user interfaces to import and work with GObject-Introspectable GNOME libraries.

Please note that within the scope of the G-Golf manual in general, in the sections presented here in particular, we simply (as in merely and in the simplest possible way) exposes the scheme representation and G-Golf interfaces of the elements that are being addressed. For a deep(er) understanding of the original concepts, components and interfaces, you must refer to the upstream library documentation itself.

This is particularly true for the GLib Object System related sections. For a thorough understanding of the GLib Object System - its background, design goals, dynamic
type system, base class instantiation, memory management, properties, closures and signals messaging system - please consult the GObject - Type System Concepts (https://docs.gtk.org/gobject/concepts.html) of the GObject reference manual.

**Import**

G-Golf Import interfaces.

**Importing GNOME libraries.**

**Procedures**

[gi-import], page 19
[gi-import-by-name], page 19

**Description**

The G-Golf GIR namespace (Typelib) import interfaces.

**Procedures**

`gi-import namespace [#:version #f]`  
[Procedure]

Returns nothing.

Imports the `namespace` GIR Typelib and exports its interface. For example:

```
(use (g-golf
  (gi-import "Clutter"))
```

The `namespace` is a case sensitive string. It is an error to call this procedure using an invalid `namespace`.

The optional `#:version` keyword argument may be used to require a specific `namespace` version, otherwise, the latest will be used.

This procedure is certainly one of the first thing you will want to try and use, but it has a cost: you will not ‘feel it’ if the number of objects in `namespace` is relatively small, but importing the "Gtk" namespace, on a laptop equiped with a i5-2450M CPU 2.50GHz × 4 and 6GB of memory takes nearly 2 seconds.

So, either early in the development cycle, or when your application is more stable, at your best convenience, you may consider making a series of selective import instead, see [gi-import-by-name], page 19, here below.

`gi-import-by-name namespace name [#:version #f] [#:with-method #t]`  
[Procedure]

Returns the object or constant returned by [gi-import-info], page 135, called upon the GIBaseInfo `info` named `name` in `namespace`.

Obtains and imports the GIBaseInfo `info` named `name` in `namespace`. The `namespace` and `name` arguments are case sensitive. It is an error to call this procedure using an invalid `namespace` or `name`.

The optional `#:version` keyword argument may be used to require a specific `namespace` version, otherwise, the latest will be used.

The optional keyword `#:with-method` argument - which is #t by default - is passed to the `gi-import-enum`, `gi-import-flags` and `gi-import-struct`. When `#:with-
method is #f, then the enum, flags or struct info will be imported without their respective methods. This is likely to only be the case if/when you intend to selectively import an enum, flags or struct from GLib or GObject, which is what G-Golf itself does, for example, in the top level (g-golf) module:

\[(\text{gi-import-by-name "GLib" "IOChannel" #:with-method #f})\]

**Events**

G-Golf Events interfaces.
Handling events from the window system.

- **Special Note** -


For this reason, this section is split/organized in two subheading, namely ‘In Gdk-3.0’ and ‘In Gdk-4.0’, how creative :), that expose their respective G-Golf interfaces.

- **In Gdk-3.0**

In Gdk-3.0 ([https://developer.gnome.org/gdk3/stable](https://developer.gnome.org/gdk3/stable)), a GdkEvent contains a union of all of the event types. Data fields may be accessed either directly, direct access to GdkEvent structs, or using accessors (but not all data fields have an accessor).

In G-Golf however GdkEvent is a class, with an event slot - holding a pointer the Gdk event - all other slots are virtual and define an accessor, which is the only way users may retrieve data fields.

When G-Golf detects it is leading with GdkEvent from Gdk-3.0, while dynamically implementing the above, in addition, when applicable, it will also add some of the upstream GdkEvent accessor name to the GI Strip Boolean Result list. This is further detailed below, at the end of the section.

**Class**

[<gdk-event>], page 21
II. Using G-Golf

Accessors

[event], page 24
[axis], page 24
[button], page 24
[click-count], page 24
[coords], page 24
[device], page 24
[device-tool], page 24
[event-sequence], page 24
[event-type], page 24
[keycode], page 24
[keyval], page 24
[pointer-emulated], page 24
[root-coords], page 24
[scancode], page 24
[screen], page 24
[scroll-deltas], page 24
[scroll-direction], page 24
[seat], page 24
[source-device], page 24
[state], page 24
[time], page 24
[window], page 24
[keyname], page 25
[x], page 25
[y], page 25
[root-x], page 25
[root-y], page 25

Class

<gdk-event> [Class]

It is an instance of <class>.

Superclasses are:

<object>

Class Precedence List:

<gdk-event>
<object>
<top>

Direct slots are:

event

#:accessor !event
#:init-keyword #:event
II. Using G-Golf

A pointer to a GdkEvent.

axis
   #:accessor !axis
   #:allocation #:virtual

button
   #:accessor !button
   #:allocation #:virtual

click-count
   #:accessor !click-count
   #:allocation #:virtual

coords
   #:accessor !coords
   #:allocation #:virtual

device
   #:accessor !device
   #:allocation #:virtual

device-tool
   #:accessor !device-tool
   #:allocation #:virtual

event-sequence
   #:accessor !event-sequence
   #:allocation #:virtual

event-type
   #:accessor !event-type
   #:allocation #:virtual

keycode
   #:accessor !keycode
   #:allocation #:virtual

keyval
   #:accessor !keyval
II. Using G-Golf

#:allocation #:virtual

pointer-emulated

#:accessor !pointer-emulated
#:allocation #:virtual

root-coords

#:accessor !root-coords
#:allocation #:virtual

scancode

#:accessor !scancode
#:allocation #:virtual

screen

#:accessor !screen
#:allocation #:virtual

scroll-deltas

#:accessor !scroll-deltas
#:allocation #:virtual

scroll-direction

#:accessor !scroll-direction
#:allocation #:virtual

seat

#:accessor !seat
#:allocation #:virtual

source-device

#:accessor !source-device
#:allocation #:virtual

state

#:accessor !state
#:allocation #:virtual
II. Using G-Golf

```lisp
(time
  #:accessor !time
  #:allocation #:virtual)

(window
  #:accessor !window
  #:allocation #:virtual)

(keyname
  #:accessor !keyname
  #:allocation #:virtual)

(x
  #:accessor !x
  #:allocation #:virtual)

(y
  #:accessor !y
  #:allocation #:virtual)

(root-x
  #:accessor !root-x
  #:allocation #:virtual)

(root-y
  #:accessor !root-y
  #:allocation #:virtual)

(event (inst <gdk-event>)) [Accessor]

  Returns the content of the event slot for inst, a pointer to a GdkEvent.

!axis (inst <gdk-event>) [Accessor]
!button (inst <gdk-event>) [Accessor]
!click-count (inst <gdk-event>) [Accessor]
!coords (inst <gdk-event>) [Accessor]
!device (inst <gdk-event>) [Accessor]
!device-tool (inst <gdk-event>) [Accessor]
!event-sequence (inst <gdk-event>) [Accessor]
!event-type (inst <gdk-event>) [Accessor]
!keycode (inst <gdk-event>) [Accessor]
!keyval (inst <gdk-event>) [Accessor]
!pointer-emulated (inst <gdk-event>) [Accessor]
!root-coords (inst <gdk-event>) [Accessor]
!scancode (inst <gdk-event>) [Accessor]
```
II. Using G-Golf

!screen (inst <gdk-event>)  [Accessor]
!scroll-deltas (inst <gdk-event>)  [Accessor]
!scroll-direction (inst <gdk-event>)  [Accessor]
!seat (inst <gdk-event>)  [Accessor]
!source-device (inst <gdk-event>)  [Accessor]
!state (inst <gdk-event>)  [Accessor]
!time (inst <gdk-event>)  [Accessor]
!window (inst <gdk-event>)  [Accessor]

Respectively returns the scheme representation of the content of the inst event (struct) element - referred to by its name. It is an error to call an accessor on a inst for which the event (struct) does not deliver the element.

Internally, each of the above <gdk-event> accessor calls the corresponding GdkEvent accessor, passing the content of the event slot. For example, lets see what happens when a user performs a left button (single) click upon a widget that tracks the 'button-press-event' signal callback:

```
(!button inst)  
⇒ (gdk-event-get-button (!event inst))  
⇒ 1
```

```
(!click-count inst)  
⇒ (gdk-event-get-click-count (!event inst))  
⇒ 1
```


To complete the above listed <gdk-event> virtual slots and accessors automatically provided by introspecting GdkEvent, G-Golf also defines a few additional rather convenient virtual slots and accessors:

!keyname (inst <gdk-event>)  [Accessor]

Returns the key (symbol) name that was pressed or released.

Note that there is actually no such element in any (gdk) event. This accessor calls gdk-keyval-name on the keyval of the event). Here is what happens if a user press the 'a' keyboard key in a widget that tracks the 'key-press-event' signal callback:

```
(!keyname inst)  
⇒ (gdk-keyval-name (!keyval inst))  
⇒ (gdk-keyval-name (gdk-event-get-keyval inst))  
⇒ a
```

!x (inst <gdk-event>)  [Accessor]
!y (inst <gdk-event>)  [Accessor]
!root-x (inst <gdk-event>)  [Accessor]
!root-y (inst <gdk-event>)  [Accessor]

Respectively returns the x, y, root-x and root-y coordinate for inst.
The result is simply obtained by destructuring and selecting one of the ![coords], page 24, and ![root-coords], page 24, list values, respectively.

**Strip Boolean Result**

If you are not (yet) familiar with the concept we are dealing with here, make sure you visit and read the [Customization Square], page 32, - GI Strip Boolean Result section of the manual.

When G-Golf detects it is leading with GdkEvent from Gdk-3.0, while dynamically implementing the ![<gdk-event>], page 21, class and its accessors, it will add the following names to the GI Strip Boolean Result list:

- gdk-event-get-axis
- gdk-event-get-button
- gdk-event-get-click-count
- gdk-event-get-coords
- gdk-event-get-keycode
- gdk-event-get-keyval
- gdk-event-get-root-coords
- gdk-event-get-scroll-deltas
- gdk-event-get-scroll-direction
- gdk-event-get-state

**In Gdk-4.0**

In Gdk-4.0 (https://developer.gnome.org/gdk4/stable/), GdkEvent is a class\(^{15}\). GdkEvent structs are opaque and immutable. Direct access to GdkEvent structs is no longer possible in GTK 4. All event fields have accessors.

In G-Golf - as in Gdk-4.0 GdkEvent is a class - no special treatment is performed anymore. In particular, no virtual slot is defined and users must access the GdkEvent structs data fields using the accessors provided by Gdk-4.0.

**GObject**

G-Golf GObject interfaces.
The G-Golf integration with the GLib Object System.

**Special Note**

For completion, this section exposes the definition of the classes and metaclasses involved in the G-Golf integration of the GLib Object System. From a (strict) user point of view however, these are actually G-Golf internals and, unless you are interested of course, might be ignored.

What you actually really need to know, as a G-Golf user, is mostly (a) the upstream reference manual of the GNOME library(ies) you intend to use, (b) how to program in Guile Scheme of course, and (c) the basics of the Guile Object Oriented System.

\(^{15}\) From a GI point of view - internally, it is a C struct.
It doesn’t hurt if you are, or if you are willing to become one, but we would like to emphasize
that you do not need to be a Guile Object Oriented System expert to use G-Golf. What
you need to know, with that respect, is somehow largely covered by the [Getting Started
with G-Golf], page 11, sections, the description of this (and related) sections and in the
examples that come with G-Golf.

Classes

[gobject>, page 28
[ginterface>, page 28
[gobject-class>, page 28
[gtype-class>, page 29
[gtype-instance>, page 30

Procedures, Accessors and Methods

[gobject-class?], page 30
[!info], page 29
[!derived], page 29
[!namespace], page 29
[!g-type], page 29
[!g-name (2)], page 29
[!g-class], page 29
[!g-inst], page 30
[unref], page 30

Description

GObject\(^{16}\) is the GLib Object System.


All the GNOME libraries that use the GLib type system inherit from GObject (https://developer.gnome.org/gobject/stable/gobject-The-Base-Object-Type.html), the base object type, which provides methods for object construction and destruction, property access methods, and signal support.

\(^{16}\) The name GObject, depending on the context, can actually be used and refer to the GLib Object System (https://developer.gnome.org/gobject/stable/) language system as a all, or be used and refer to the fundamental type implementation, the base object type (https://developer.gnome.org/gobject/stable/gobject-The-Base-Object-Type.html), upon which GNOME libraries object hierarchies are based.

\(^{17}\) The name GType, depending on the context, can actually be used and refer to the The GLib Dynamic Type System (https://developer.gnome.org/gobject/stable/chapter-gtype.html), or be used and refer to the type it denotes, a unique ID (Identifier) - an unsigned-long to be precise.
G-Golf uses GOOPS\textsuperscript{18} and defines the [gobject], page 28, class, from which all imported GNOME libraries inherit, as their class hierarchy is being built in Guile Scheme.

**Classes**

\texttt{<gobject>}

The base class of the GLib Object System.

It is an instance of [gobject-class], page 28.

Superclasses are:

\texttt{<gtype-instance>}

Class Precedence List:

\begin{verbatim}
  <gobject>
  <gtype-instance>
  <object>
  <top>
\end{verbatim}

(No direct slot)

\texttt{<ginterface>}

The base class for GLib’s interface types. Not derivable in Scheme.

It is an instance of [gobject-class], page 28.

Superclasses are:

\texttt{<gtype-instance>}

Class Precedence List:

\begin{verbatim}
  <ginterface>
  <gtype-instance>
  <object>
  <top>
\end{verbatim}

(No direct slot)

\texttt{<gobject-class>}

The metaclass of the [gobject], page 28, and [ginterface], page 28, classes.

It is an instance of \texttt{<class>}.

Superclasses are:

\texttt{<gtype-class>}

Class Precedence List:

\begin{verbatim}
  <gobject-class>
  <gtype-class>
  <class>
\end{verbatim}

\textsuperscript{18} The Guile Object Oriented System (see Section “GOOPS” in The GNU Guile Reference Manual). If you haven’t done so already, please make sure you read both the [Naming Conventions], page 5, and [GOOPS Notes and Conventions], page 7, sections.
II. Using G-Golf

<object>
<top>
(No direct slot)

<gttype-class> [Class]
The metaclass of all GType classes. Ensures that GType classes have an info slot, holding a pointer to either a GIOBJECTINFO or a GIINTERFACEINFO.

It is an instance of <class>.

Superclasses are:

<class>

Class Precedence List:

<gttype-class>
<class>
<object>
<top>

Direct slots are:

info 
#:accessor !info
#:init-keyword #:info

derived 
#:accessor !derived
#:init-keyword #:derived
#:init-value #f
A class is derived when it is user defined (not imported), and inherit a [gobject], page 28, subclass.

namespace 
#:accessor !namespace

g-type 
#:accessor !g-type

g-name 
#:accessor !g-name

g-class 
#:accessor !g-class

The #:info #:init-keyword is mandatory, other slots are initialized automatically. All slots are immutable (to be precise, they are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

!info (inst <gttype-class>) [Accessor]
!derived (inst <gttype-class>) [Accessor]
II. Using G-Golf

**!namespace** (inst <gtype-class>)  
[Accessor]

**!g-type** (inst <gtype-class>)  
[Accessor]

**!g-name** (inst <gtype-class>)  
[Accessor]

**!g-class** (inst <gtype-class>)  
[Accessor]

Returns the content of their respective slot for inst.

**<gtype-instance>**  
[Class]

The root class of all instantiable GType classes. Adds a slot, g-inst, to instances, which holds a pointer to the C value.

It is an instance of [gtype-class], page 29.

Superclasses are:

<object>

Class Precedence List:

<gtype-instance>
<object>
<top>

Direct slots are:

**g-inst** #:accessor !g-inst

The g-inst slot is initialized automatically and immutable (to be precise, it is not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

**!g-inst** (inst <gtype-instance>)  
[Accessor]

Returns the content of the g-inst slot for instance.

**unref** (inst <gtype-instance>)  
[Method]

Returns nothing.

This method calls [g-object-unref], page 59, on the g-inst of instance.

When the reference count for the g-inst reaches 0 (zero), it sets the g-inst slot value for instance to #f and removes instance from the %g-inst-cache.

Note that it used to be mandatory to call this method upon unreachable instances, so that their memory could be freed by the next gc (garbage collector) occurrence, but this is not the case anymore, as auto gc of unreachable <gobject> instances is a now feature [since August 2021].

**Procedures**

**gobject-class?** val  
[Procedure]

Returns #t if val is a class and if [gobject>, page 28, is a member of its class precedence list. Otherwise, it returns #f.
II. Using G-Golf

G-Golf Valley

Cache Park
Cache Park - Accessing G-Golf caches.

Procedures

[gi-cache-show], page 31
[gi-cache-ref], page 31

Variables

[%gi-cache], page 32

Description

G-Golf has and uses a cache ‘mechanism’ - actually several, but only one is (partially) exposed to users (and with reserves, see below), also referred to as G-Golf main cache - not only for internal needs, but also to avoid reconstructing things ‘on-the-fly’ unnecessarily, such as already imported [<gi-enum>], page 117, [<gi-flags>], page 119, and [<gi-struct>], page 120, instances.

G-Golf main cache exposed functionality is ‘access only’ - users should not (never) attempt to change its content - and its design is not (yet) ‘set in stone’, so interfaces here exposed, may (have to be) change(d).

So, keeping the above reserves in mind, G-Golf main cache current data structure is composed of two nested association lists, to which we refer using m-key (main key) and s-key (secondary key).

Procedures

gi-cache-show m-key #f

[Procedure]
Returns nothing.
Displays the content of G-Golf main cache. If m-key (main key) is #f (the default), it displays the list of the main keys present in the cache. Otherwise, it retrieves the content of the main cache for m-key and displays its content if any, or -- is empty -- if none.

gi-cache-ref m-key s-key

[Procedure]
Returns a [%gi-cache], page 32, entry or #f.
Obtains and returns the [%gi-cache], page 32, entry for m-key and s-key, or #f if none is found.

Remember that you may (always) view the list of main and secondary key names (which is ‘dynamic’, depending on what you have imported) by calling [gi-cache-show], page 31, (without or with an m-key arg appropriately), but as a user, the two most important m-key are 'enum and 'flags, so you may check their member names, or bind their instance locally.

Main key names are given by G-Golf. Secondary key names are always the result of calling [g-name->name], page 124, upon the ‘object’ original name.
For example, let’s import, then retrieve and visualize the content of the GtkPositionType (enum) type:

```
(use (g-golf)
(gi-import-by-name "Gtk" "PositionType")
⇒ $2 = #<gi-enum> 7ff938938b40>

(gi-cache-ref 'enum 'gtk-position-type)
⇒ $3 = #<gi-enum> 7ff938938b40>

(describe $3)
⊣ #$<gi-enum> 7ff938938b40> is an instance of class <gi-enum>
⊣ Slots are:
 ⊣ enum-set = ((left . 0) (right . 1) (top . 2) (bottom . 3))
 ⊣ g-type = 94673466933568
 ⊣ g-name = "GtkPositionType"
 ⊣ name = gtk-position-type
```

**Variables**

%gi-cache

Holds a reference the the G-Golf main cache, which as said earlier, currently is composed of two nested association lists.

**Customization Square**

Customization Square - G-Golf customization functionality.
Procedures and Syntax

[g-name-transform-exception], page 34
[g-name-transform-exception?], page 34
[g-name-transform-exception-add], page 34
[g-name-transform-exception-remove], page 34
[g-name-transform-exception-reset], page 34
[g-studly-caps-expand-token-exception], page 34
[g-studly-caps-expand-token-exception?], page 35
[g-studly-caps-expand-token-exception-add], page 35
[g-studly-caps-expand-token-exception-remove], page 35
[g-studly-caps-expand-token-exception-reset], page 35
[gi-strip-boolean-result], page 36
[gi-strip-boolean-result?], page 36
[gi-strip-boolean-result-add], page 36
[gi-strip-boolean-result-remove], page 36
[gi-strip-boolean-result-reset], page 36
[gi-method-short-name-skip], page 37
[gi-method-short-name-skip?], page 37
[gi-method-short-name-skip-all], page 37
[gi-method-short-name-skip-add], page 37
[gi-method-short-name-skip-remove], page 37
[gi-method-short-name-skip-reset], page 37
[syntax-name-protect-prefix], page 38
[syntax-name-protect-prefix-set], page 38
[syntax-name-protect-prefix-reset], page 38
[syntax-name-protect-postfix], page 38
[syntax-name-protect-postfix-set], page 38
[syntax-name-protect-postfix-reset], page 38
[syntax-name-protect-renamer], page 38
[syntax-name-protect-renamer-set], page 38
[syntax-name-protect-renamer-reset], page 38
[syntax-name-protect-reset], page 38

Description
Welcome to the G-Golf Customization Square.

This section is organized per customization theme: (-) GI Name Transformation; (-) GI Strip Boolean Result; (-) GI Method Short Name Skip and (-) GI Syntax Name Protect.

GI Name Transformation
In this corner of the square, we expose how you may customize G-Golf with respect to GI Name Transformation that occurs when importing GNOME libraries.

When G-Golf imports a GNOME library, its classes, properties, methods, functions, types and constants are renamed (See [Naming Conventions], page 5), mainly to (a) avoid ‘Camel Case (https://en.wikipedia.org/wiki/Camel_case), (b) surround class names by ‘<’ ‘>’ and (c) replace ‘_’ (underscore) occurrences using the ‘-’ (hyphen) character.
As the context of name transformation is GNOME in general, as opposed to GI more specifically, (all) procedures involved are named using a \texttt{g}- prefix.

Here is a summary of how the name transformation happens:

- Class names are obtained by calling \texttt{[g-name->class-name]}, page 124, which calls \texttt{[g-name->name]}, page 124;

- \texttt{[g-name->name]}, page 124, first calls \texttt{[g-name-transform-exception?]}, page 34, and returns its value if it found one, otherwise, it calls \texttt{[g-studly-caps-expand]}, page 124;

- \texttt{[g-studly-caps-expand]}, page 124, which does the core of the job, uses \texttt{[g-studly-caps-expand-token-exception?]}, page 35, to specially treat its listed token exceptions.

\textbf{g-name-transform-exception} \hfill [Procedure]

Returns an alist.

Obtains and returns the list of GI name transform exception \texttt{(key . value)} pairs. Both \texttt{key} and \texttt{value} are strings.

The GI name transform exception alist is never empty, as it is initialized and always kept to at least contain the \texttt{'("GObject" . "gobject")} pair\textsuperscript{19}.

As a consequence \texttt{<gobject>}, page 28, (as opposed to \texttt{<g-object>}) is the G-Golf class name for the base class of the GLib Object System.

This only affects the class name though - any procedure or method name that comes from the \texttt{"GObject"} namespace is transformed using the \texttt{g-object} prefix, as the upstream library prefix is \texttt{g_object}.

\textbf{g-name-transform-exception?} \texttt{key} \hfill [Procedure]

Returns \texttt{#t} if \texttt{key} is a key member of the GI name transform exception alist. Otherwise, it returns \texttt{#f}.

\textbf{g-name-transform-exception-add} \texttt{key value} \hfill [Procedure]

Returns nothing.

Add (remove) a \texttt{(key . value)} pair to (from) the GI name transform exception alist.

\textbf{g-name-transform-exception-reset} \hfill [Procedure]

Returns nothing.

This procedure resets the GI name transform exception alist to its default value - which is to contain the single \texttt{'("GObject" . "gobject")} pair.

\textbf{g-studly-caps-expand-token-exception} \hfill [Procedure]

Returns an alist.

\textsuperscript{19} This is the only name for which G-Golf maintains compatibility with Guile-GNOME (which has a long list of exceptions)....
Obtains and returns the list of GI studly caps expand token exception (key . value) pairs. Both key and value are strings.

The GI studly caps expand token exception alist is never empty, as it is initialized and always kept to at least contain the '("WebKit" . "webkit") pair.

**g-studly-caps-expand-token-exception? key**  
Returns #t if key is a key member of the GI studly caps expand token exception alist. Otherwise, it returns #f.

**g-studly-caps-expand-token-exception-add key value**  
**g-studly-caps-expand-token-exception-remove key**  
**g-studly-caps-expand-token-exception-reset**  
These procedures add (remove) a (key . value) pair to (from) the GI studly caps expand token exception alist.

**GI Strip Boolean Result**

In this corner of the square, we expose how you may customize G-Golf with respect to GI Strip Boolean Result, which addresses the problem of typelib functions and methods that (1) have at least one 'inout or 'out argument(s) and (2) return either #t or #f, solely to indicate that the function or method call was successful or not.

The default G-Golf behavior, when there is at least one 'inout or 'out argument(s), is to return multiple values. The first returned value is the function or method result, followed by the 'inout and 'out values, in order of appearance in the function or method call.

G-Golf also offers - through a series of interfaces to get, check, add, remove and reset a list of such function or methods names - to instead elude the function or method returned value when it is #t and raise an exception if the returned value is #f.

Here is a concrete example, for the "Clutter" namespace and the clutter-color-from-string procedure:

```scheme
,use (g-golf)
(gi-import "Clutter")

(clutter-color-from-string "Blue")
⇒ $2 = #t
⇒ $3 = (0 0 255 255)
```

And call it with an undefined color name:

```scheme
(clutter-color-from-string "Bluee")
⇒ $4 = #f
⇒ $5 = (0 0 0 0)
```
Now, let’s add `clutter-color-from-string` to the list of GI functions and methods for which we wish to elude the result of the call from the returned value(s), then experiment the above calls and see how G-Golf changed the way it handles the results:

```scheme
(gi-strip-boolean-result-add clutter-color-from-string)
```

```scheme
(clutter-color-from-string "Blue")
⇒ $7 = (0 0 255 255)
```

As expected, if we call it with an undefined color name, it will raise an exception:

```scheme
(clutter-color-from-string "Bluee")
⊣
ice-9/boot-9.scm:1686:16: In procedure raise-exception:
⊣
clutter-color-from-string " failed."
⊣
Entering a new prompt. Type ‘,bt’ for a backtrace or ‘,q’ to continue.
```

G-Golf default is that the list of GI functions and methods for which to elude the result of the call from the returned value(s) is empty. It is a user responsibility to fill it appropriately, for each namespace they are importing.

**gi-strip-boolean-result**

[Procedure]

Returns a (possibly empty) list of (symbol) name(s).

Obtains and returns the list of GI functions and methods for which G-Golf will elude the result of the call from the returned value(s).

**gi-strip-boolean-result? name**

[Procedure]

Returns `#t` if `name` is a member of the list of GI functions and methods for which G-Golf will elude the result of the call from the returned value(s). Otherwise, it returns `#f`.

**gi-strip-boolean-result-add name ...**

[Syntax]

Add (remove) the names to (from) the list of GI functions and methods for which G-Golf will elude the result of the call from the returned value(s).

**gi-strip-boolean-result-reset**

[Procedure]

 Resets the list of GI functions and methods for which G-Golf will elude the result of the call from the returned value(s) to the empty list.

**GI Method Short Name Skip**

In this corner of the square, we expose how you may customize G-Golf with respect to GI Method Short Name, more specifically, whether you wish to skip the method short name creation, and doing so individually or for all GI imported methods.

By default, as it imports a GI typelib, G-Golf creates a method short name for each imported method, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long name.

Note that the raised exception message and formatting depends on the version of guile you are using. Fwiw, this example was produced using GNU Guile 3.0.8.
For example, the `<gtk-label>` class, which defines the `gtk-label-get-text` method, would also define, using G-Golf’s default settings, the `get-text` method. To be more precise, G-Golf would create (if it does not exist) or reuse (if it exists) the `get-text` generic function, make and add a method with its specializer(s), in this case `<gtk-label>`.

Now, let’s add `gtk-label-get-text` to the list of the GI methods for which we wish to skip the short name creation step. In this case, as G-Golf imports the `GtkLabel` class, it would only create the `gtk-label-get-text` method, but not the `get-text` method anymore.

```lisp
(gi-method-short-name-skip) [Procedure]
Returns a (possibly empty) list of (symbol) name(s).
Obtains and returns the list of GI method long name for which G-Golf will skip the
method short name creation step.
```

```lisp
(gi-method-short-name-skip? name) [Procedure]
Returns #t if name is a member of the list of GI method long name for which G-Golf
will skip the method short name creation step. Otherwise, it returns #f.
```

```lisp
(gi-method-short-name-skip-all) [Procedure]
Returns nothing.
Sets the GI method short name skip creation step to ’all.
```

```lisp
(gi-method-short-name-skip-add name . . .) [Syntax]
(gi-method-short-name-skip-remove name . . .) [Syntax]
Add (remove) the names to (from) the list of GI method long name for which G-Golf
will skip the method short name creation step.
```

```lisp
(gi-method-short-name-skip-reset) [Procedure]
Resets the list of GI method long name for which G-Golf will skip the method short
name creation step to the empty list.
```

**GI Syntax Name Protect**

In this corner of the square, we expose how you may customize G-Golf with respect to *GI Syntax Name Protect*.

When G-Golf creates a method short name, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long name, it may lead to a *name clash*, with an already defined procedure or syntax.

GI methods are added to their respective generic function, which is created if it does not already exist. When a generic function is created, G-Golf checks if the name is used, and when it is bound to a procedure, the procedure is *captured* into an unspecialized method, which is added to the newly created generic function.

However, when the name is used but its variable value is a syntax, the above can’t be done and the name must be *protected*, which is what `[syntax-name->method-name]`, page 125, does\(^{21}\), using a renamer, or by adding a prefix, a postfix or both to its (symbol) name argument.

\(^{21}\) Users should normally not call this procedure - except for testing purposes, if/when they customize its default settings - it is appropriately and automatically called by G-Golf when importing a GI typelib.
G-Golf defines the following interfaces to get, set and reset the syntax name protect prefix, postfix and renamer, of which at least one must be set.

- **syntax-name-protect-prefix** [Procedure]
- **syntax-name-protect-prefix-set** prefix [Procedure]
- **syntax-name-protect-prefix-reset** [Procedure]
  Respectively get, set and reset the syntax name protect prefix. Its default value is #f.

- **syntax-name-protect-postfix** [Procedure]
- **syntax-name-protect-postfix-set** postfix [Procedure]
- **syntax-name-protect-postfix-reset** [Procedure]
  Respectively get, set and reset the syntax name protect postfix. Its default value is '='_ (the symbol _).

- **syntax-name-protect-renamer** [Procedure]
- **syntax-name-protect-renamer-set** renamer [Procedure]
- **syntax-name-protect-renamer-reset** [Procedure]
  Respectively get, set and reset the syntax name protect renamer. Its default value is '='_ (the symbol _).
  The syntax name protect renamer, unless set to #f, must be a procedure that takes a (symbol) name as its single argument, and return a ‘none clashing’ (symbol) name.

- **syntax-name-protect-reset** [Procedure]
  This procedure will conveniently reset all three syntax name protect prefix, postfix and renamer to their default value, which are:
  
  - [syntax-name-protect-prefix], page 38, #f
  - [syntax-name-protect-postfix], page 38, '='_ (the symbol _)
  - [syntax-name-protect-renamer], page 38, #f

**VFunc Alley**

VFunc Alley - VFunc G-Golf support.

- **Special Notes**

For completion, this section exposes the definition of the [vfunc], page 40, class and [vfunc], page 41, syntax, involved in the G-Golf integration of the (GLib Object System) VFunc. From a (strict) user point of view however, these are actually G-Golf internals and, unless you are interested of course, might be ignored.

In the GObject documentation, the terminology (mostly) used is virtual public/private method or simply virtual method. In the GI (GObject Introspection) documentation how-
ever, the structure representing a virtual method is named a `GIVFuncInfo` and the description says it represents a virtual function. The GI core functionality also uses the `vfunc` or `vfunc-info` prefix, infix or postfix terms, depending on the context.

### Class

```<vfunc>`, page 40

### Syntaxes and Accessors

- `define-vfunc`, page 40
- `vfunc`, page 41
- `!specializer`, page 41
- `!name_______`, page 41
- `!g-name_______`, page 41
- `!long-name-prefix`, page 41
- `!gf-long-name?`, page 41
- `!info__`, page 41
- `!callback`, page 41

### Description

Welcome to the VFunc G-Golf Alley.

Let’s first recap :-) GObject (the GLib Object System) offers different ways to define object and interface methods and extend them, well introduced and described in the GObject Tutorial ([https://docs.gtk.org/gobject/tutorial.html](https://docs.gtk.org/gobject/tutorial.html)):

- non-virtual public methods
- virtual public methods
- virtual private methods
- non-virtual private methods

Of those four, virtual public methods and virtual private methods maybe overridden, through the use of a mechanism that involves the creation of a C closure and the setting of its pointer in the corresponding GObject or Interface class struct.

In G-Golf, this is implemented by the `define-vfunc`, page 40, syntax, which must be used to define a VFunc (virtual method). From a user perspective, `define-vfunc` is very much like `define-method` (See Section “Methods and Generic Functions” in [The GNU Guile Reference Manual](https://www.gnu.org/software/guile/manual/html_node/Methods-and-Generic-Functions.html)).

Here is an example, which defines a GObject subclass that inherits the GdkPaintable interface, then overrides the `get_flags` VFunc, one of its numerous virtual methods:

```lisp
(define-class <solitaire-peg> (<gobject> <gdk-paintable>)
  (i #:accessor !i #:init-keyword #:i)
  (j #:accessor !j #:init-keyword #:j))

(define-vfunc (get-flags-vfunc (self <solitaire-peg>))
  '(size contents))
```
The only difference, from a user point of view and as you can see in the example above, is that define-vfunc imposes one (or two, depending on the context) additional constraint(s) to the VFunc name, fully described in the [define-vfunc], page 40, definition.

**Class**

<func>

The base class of all virtual method.

It is an instance of <class>. Superclasses are:

<meth>

Class Precedence List:

<func>  
<meth>  
<object>  
<top>

Direct slots are:

- specializer  
  #:accessor !specializer
- name  
  #:accessor !name
- g-name  
  #:accessor !g-name
- long-name-prefix  
  #:accessor !long-name-prefix
- gf-long-name?  
  #:accessor !gf-long-name?
- info  
  #:accessor !info
- callback  
  #:accessor !callback

All direct slots are initialized automatically and immutable (to be precise, they are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

**Syntaxes and Accessors**

**define-vfunc** (generic parameter ...) body ...  

Defines a vfunc (a specialized method) for the generic function generic with parameters parameters and body body ... .

- generic is a generic function, and the following constraints apply to the generic function name:
  - the generic function name is valid if it is the scheme representation of a VFunc (name) that exists for at least one of the instance specializer superclasses, followed
by the \texttt{-\textbf{vfunc}} postfix\textsuperscript{22}.

- if more than one instance specializer superclasses has a VFunc name, then the scheme name must be a so-called long name\textsuperscript{23}, followed by the \texttt{-\textbf{vfunc}} postfix\textsuperscript{24}.

If \texttt{generic} is a variable which is not yet bound to a generic function object, the expansion of \texttt{define-vfunc} will include a call to \texttt{define-generic}.

Each \texttt{parameter} must be either a symbol or a two-element list (\texttt{(symbol class)}). The symbols refer to variables in the body forms that will be bound to the parameters supplied by the caller when calling this method. The \texttt{classes}, if present, specify the possible combinations of parameters to which this method can be applied.

\texttt{body} \ldots are the bodies of the vfunc definition.

\texttt{vfunc (parameter \ldots body \ldots)} \hfill \texttt{[Syntax]}

Makes a vfunc (a specialized method) whose specializers are defined by the classes in \texttt{parameters} and whose procedure definition is constructed from the \texttt{parameter} symbols and \texttt{body} forms.

The \texttt{parameter} and \texttt{body} parameters should be as for \texttt{[define-vfunc]}, page 40.

\begin{verbatim}
!specializer inst [Accessor]
!name inst [Accessor]
!g-name inst [Accessor]
!long-name-prefix inst [Accessor]
!gf-long-name? inst [Accessor]
!info inst [Accessor]
!callback inst [Accessor]
\end{verbatim}

Returns the content of their respective slot for \texttt{inst} (a \texttt{<\textbf{vfunc}>} instance).

\section*{III. G-Golf Core Reference}

\textsuperscript{22} This is because most of the cases, in the upstream lib, the VFunc is a virtual public method, that is, both a method and a VFunc exist that use the same name. When that happens, the upstream lib method normally has the same arity and definition (spec), and it 'just' calls the VFunc - however, it is (unfortunately) not guaranteed to always be the case, hence all GI lang bindings impose a specific VFunc naming convention. Pygobject for example imposes to use a \texttt{do-} prefix. In G-Golf, we opted for a \texttt{-\textbf{vfunc}} postfix.

\textsuperscript{23} It must be prefixed using the scheme representation name of the GObject or Interface that owns the Vfunc, followed by - (hyphen), i.e. \texttt{gdk-paintable-get-flags-vfunc} is the valid \texttt{define-vfunc} long name for the \texttt{get-flags} virtual method of the GdkPaintable interface.

\textsuperscript{24} Otherwise, it would be impossible to determine which iface or object class struct the *-vfunc user code is meant to override. Consider \texttt{(define-class <foo> \texttt{(gobject <bar> <baz>)})}, with both \texttt{<bar>} and \texttt{<baz>} defining a get\_flags VFunc: in this context \texttt{(define-vfunc (get-flags-vfunc \texttt{(self <foo>))}) is an invalid definition, as it is not possible for G-Golf to determine if it is the \texttt{<bar>} or the \texttt{<baz>} iface class struct VFunc that must be overridden. In such cases, the user must pass a method long name, i.e. \texttt{(define-vfunc \texttt{(bar-get-flags-vfunc \texttt{(self <foo>))}})} or \texttt{(define-vfunc \texttt{(baz-get-flags-vfunc \texttt{(self <foo>))}})} ...).
Overview

Structure and Naming Conventions

G-Golf Core Reference modules and documentation structure and naming conventions are based, whenever it is possible, on the structure and naming conventions of the corresponding GNOME library.

To illustrate, let’s look at a few GLib, GObject and GObject Introspection sections and corresponding G-Golf sections and modules naming examples:

**Glib**

Memory Allocation
[Memory Allocation], page 43,
(g-golf glib mem-alloc)

The Main Event Loop
[The Main Event Loop], page 44,
(g-golf glib main-event-loop)

... 

**GObject**

Type Information
(https://developer.gnome.org/gobject/stable/gobject-Type-Information.html)
[Type Information], page 54,
(g-golf gobject type-info)

GObject
[GObject], page 58,
(g-golf gobject gobject)

Enumeration and Flag Types
[Enumeration and Flag Types], page 60,
(g-golf gobject enum-flags)

... 

**GObject Introspection**

GIRepository
[Repository], page 74,
(g-golf gi repository)

common types
[Common Types], page 77,
(g-golf gi common-types)
Glib

G-Golf Glib modules are defined in the glib subdirectory, such as (g-golf glib main-event-loop).

Where you may load these modules individually, the easiest way to use G-Golf Glib is to import its main module, which imports and re-exports the public interface of (oop goops), (system foreign), all G-Golf support and G-Golf Glib modules:

```
(use-modules (g-golf glib))
```

G-Golf Glib low level API modules correspond to a Glib section, though they might be some exception in the future.

Memory Allocation

G-Golf Glib Memory Allocation low level API.

Memory Allocation — general memory-handling

Procedures

- [g-malloc], page 43
- [g-malloc0], page 43
- [g-free], page 43
- [g-memdup], page 44

Description

These functions provide support for allocating and freeing memory.


Procedures

- **g-malloc** `n-bytes`  
  Returns a pointer to the allocated memory, or `#f`.  
  Allocates `n-bytes` of memory. If `n-bytes` is 0 it returns `#f`. When using `g-malloc0`, the allocated memory is initialized to 0.

- **g-free** `mem`  
  Returns nothing.  
  Frees the memory pointed to by `mem`.  

Support to the G-Golf Core Reference modules themselves, or additional functionality to G-Golf as a all, is organized and located in other (none GNOME library based) modules, such as (g-golf support ...). g-golf override ...

[Base Info], page 79,  
(g-golf gi base-info)

...
III. G-Golf Core Reference

The Main Event Loop

G-Golf Glib Main Event Loop low level API.

The Main Event Loop — manages all available sources of events

Procedures

[g-main-loop-new], page 44
[g-main-loop-run], page 45
[g-main-loop-ref], page 45
[g-main-loop_unref], page 45
[g-main-loop-quit], page 45
[g-main-context-new], page 45
[g-main-context-default], page 45
[g-timeout-source-new], page 45
[g-timeout-source-new-seconds], page 45
[g-idle-source-new], page 46
[g-source-ref-count], page 46
[g-source-ref], page 46
[g-source_unref], page 46
[g-source-free], page 46
[g-source-attach], page 46
[g-source-destroy], page 46
[g-source-is-destroyed?], page 46
[g-source-set-priority], page 47
[g-source-get-priority], page 47
[g-source-remove], page 47

Description

The main event loop manages all the available sources of events for GLib and GTK+ applications. These events can come from any number of different types of sources such as file descriptors (plain files, pipes or sockets) and timeouts. New types of event sources can also be added using g-source-attach.


Procedures

Note: in this section, the loop, context and source arguments are [must be] pointers to a GMainLoop, a GMainContext and a GSource respectively.

g-main-loop-new [context #f] [is-running? #f] [Procedure]

Returns a pointer to a new GMainLoop.

Creates a new GMainLoop structure.

\[ Procedure \]

\textbf{g-memdup mem n-bytes}

Returns a pointer to the allocated memory, or \#f.

Allocates \textit{n-bytes} of memory and copies \textit{n-bytes} into it from \textit{mem}. If \textit{mem} is the \texttt{null-pointer} or \textit{n-bytes} is 0 it returns \#f.
The context must be a pointer to a GMainContext of #f, in which case the default context is used. When is-running? is #t, it indicates that the loop is running. This is not very important since calling g-main-loop-run will set this to #t anyway.

\textbf{g-main-loop-ref loop} \\
Returns loop. \\
Increases the loop reference count by one.

\textbf{g-main-loop-unref loop} \\
Returns nothing. \\
Decreases the loop reference count by one. If the result is zero, free the loop and free all associated memory.

\textbf{g-main-loop-run loop} \\
Returns nothing. \\
Runs a main loop until [g-main-loop-quit], page 45, is called on the loop. If this is called for the thread of the loop’s GMainContext, it will process events from the loop, otherwise it will simply wait.

\textbf{g-main-loop-quit loop} \\
Returns nothing. \\
Stops a GMainLoop from running. Any calls to [g-main-loop-run], page 45, for the loop will return. \\
Note that sources that have already been dispatched when g-main-loop-quit is called will still be executed.

\textbf{g-main-context-new} \\
Returns a pointer. \\
Creates and returns a (pointer to a) new GMainContext structure.

\textbf{g-main-context-default} \\
Returns a pointer. \\
Returns the global default main context. This is the main context used for main loop functions when a main loop is not explicitly specified, and corresponds to the ‘main’ main loop.

\textbf{g-timeout-source-new interval} \\
Returns a pointer. \\
Creates and returns (a pointer to a) new (timeout) GSource. \\
The source will not initially be associated with any GMainContext and must be added to one with [g-source-attach], page 46, before it will be executed. \\
The timeout interval is in milliseconds.

\textbf{g-timeout-source-new-seconds interval} \\
Returns a pointer. \\
Creates and returns (a pointer to a) new (timeout) GSource.
The source will not initially be associated with any `GMainContext` and must be added to one with `g-source-attach`, page 46, before it will be executed. The timeout interval is in seconds.

**g-idle-source-new**

Returns a pointer.

Creates and returns (a pointer to) a new (idle) `GSource`.

The source will not initially be associated with any `GMainContext` and must be added to one with `g-source-attach`, page 46, before it will be executed. Note that the default priority for idle sources is 200, as compared to other sources which have a default priority of 300.

**g-source-ref-count source**

Returns an integer.

Obtains and returns the reference count of `source`.

**g-source-ref source**

Returns `source`.

Increases the `source` reference count by one.

**g-source-unref source**

Returns nothing.

Decreases the `source` reference count by one. If the resulting reference count is zero the source and associated memory will be destroyed.

**g-source-free source**

Returns nothing.

Calls `g-source-destroy`, page 46, and decrements the reference count of `source` to 0 (so `source` will be destroyed and freed).

**g-source-attach source context**

Returns an integer.

Adds `source` to `context` so that it will be executed within that context.

Returns the ID (greater than 0) for the `source` within the `context`.

Remove it by calling `g-source-destroy`, page 46.

**g-source-destroy source**

Returns nothing.

Removes `source` from its `GMainContext`, if any, and mark it as destroyed. The source cannot be subsequently added to another context. It is safe to call this on sources which have already been removed from their context.

This does not unref `source`: if you still hold a reference, use `g-source-unref` to drop it.

**g-source-is-destroyed? source**

Returns `#t` if `source` has been destroyed. Otherwise, it returns `#f`.

Once a source is destroyed it cannot be un-destroyed.
g-source-set-priority source priority  [Procedure]
Returns nothing.
Sets the source priority. While the main loop is being run, a source will be dispatched if it is ready to be dispatched and no sources at a higher (numerically smaller) priority are ready to be dispatched.
A child source always has the same priority as its parent. It is not permitted to change the priority of a source once it has been added as a child of another source.

g-source-get-priority source priority  [Procedure]
Returns an integer.
Obtains and returns the source priority.

g-source-remove id  [Procedure]
Returns #t.
Removes the source with the given id from the default main context. You must use [g-source-destroy], page 46, for sources added to a non-default main context.
It is an error to attempt to remove a non-existent source.
Source IDs can be reissued after a source has been destroyed. This could lead to the removal operation being performed against the wrong source, unless you are cautious.
For historical reasons, this procedure always returns #t.

IO Channels
G-Golf Glib IO Channels low level API.
IO Channels — portable support for using files, pipes and sockets

Procedures
[g-io-channel-unix-new], page 47
[g-io-channel-ref], page 48
[g-io-channel-unref], page 48
[g-io-create-watch], page 48

Types and Values
[%g-io-condition], page 48

Description
The GIOChannel data type aims to provide a portable method for using file descriptors, pipes, and sockets, and integrating them into the main event loop. Currently, full support is available on UNIX platforms, support for Windows is only partially complete.


Procedures
Note: in this section, the fd, channel and condition arguments are [must be] respectively an integer (a ‘valid’ file descriptor), a pointer to a GIOChannel and a list of one or more [%g-io-condition], page 48, flags.
**III. G-Golf Core Reference**

- **g-io-channel-unix-new** *fd*  
  Returns a pointer.  
  Creates and returns a pointer to a new GIOChannel for *fd* (file descriptor). On UNIX systems this works for plain files, pipes, and sockets.  
  The newly created GIOChannel has a reference count of 1.  
  The default encoding for GIOChannel is UTF-8. If your application is reading output from a command using via pipe, you may need to set the encoding to the encoding of the current locale (FIXME - still missing a binding to g_io_channel_set_encoding).

- **g-io-channel-ref** *channel*  
  Returns *channel*.  
  Increments the *channel* reference count.

- **g-io-channel-unref** *channel*  
  Returns nothing.  
  Decrements the *channel* reference count.

- **g-io-create-watch** *channel* *condition*  
  Returns a pointer.  
  Creates and returns a pointer to a GSource that’s dispatched when condition is met for the given *channel*. For example, if condition is ‘(in), the source will be dispatched when there’s data available for reading.

**Types and Values**

- **%g-io-condition**  
  An instance of <gi-flag>, who’s members are the scheme representation of the GIOCondition flags:  
  - *g-name*: GIOCondition  
  - *name*: gio-condition  
  - *enum-set*:  
    - **in**: There is data to read.  
    - **out**: Data can be written (without blocking).  
    - **pri**: There is urgent data to read.  
    - **err**: Error condition.  
    - **hup**: Hung up (the connection has been broken, usually for pipes and sockets).  
    - **nval**: Invalid request. The file descriptor is not open.

**Miscellaneous Utility Functions**

G-Golf Glib Miscellaneous Utility Functions low level API.  
Miscellaneous Utility Functions - a selection of portable utility functions
III. G-Golf Core Reference

Procedures

- [g-get-prgname], page 49
- [g-set-prgname], page 49
- [g-get-system-data-dirs], page 49
- [g-get-system-config-dirs], page 50

Description

These are portable utility functions.

Procedures

g-get-prgname

[Procedure]
Returns the name of the program, or #f if it has not been set yet.

Obtains and returns the name of the program. This name should not be localized, in contrast to g-get-application-name.

If you are using GApplication, the program name is set in g-application-run.

g-set-prgname name

[Procedure]
Returns nothing.

Sets the name of the program to name. This name should not be localized, in contrast to g-set-application-name.

If you are using GApplication, the program name is set in g-application-run.

Note that for thread-safety reasons this function can only be called once.

g-get-system-data-dirs

[Procedure]
Returns an ordered list of base directories in which to access system-wide application data.

On UNIX platforms this is determined using the mechanisms described in the XDG Base Directory Specification (http://www.freedesktop.org/Standards/basedir-spec). In this case the list of directories retrieved will be XDG_DATA_DIRS.

On Windows it follows XDG Base Directory Specification if XDG_DATA_DIRS is defined. If XDG_DATA_DIRS is undefined, the first elements in the list are the Application Data and Documents folders for All Users. (These can be determined only on Windows 2000 or later and are not present in the list on other Windows versions.) See documentation for CSIDL_COMMON_APPDATA and CSIDL_COMMON_DOCUMENTS.

Then follows the "share" subfolder in the installation folder for the package containing the DLL that calls this function, if it can be determined.

Finally the list contains the "share" subfolder in the installation folder for GLib, and in the installation folder for the package the application’s .exe file belongs to.

The installation folders above are determined by looking up the folder where the module (DLL or EXE) in question is located. If the folder’s name is "bin", its parent is used, otherwise the folder itself.
Note that on Windows the returned list can vary depending on where this function is called.

**g-get-system-config-dirs**
[Procedure]

Returns an ordered list of base directories in which to access system-wide configuration information.

On UNIX platforms this is determined using the mechanisms described in the XDG Base Directory Specification (http://www.freedesktop.org/Standards/basedir-spec). In this case the list of directories retrieved will be `XDG_CONFIG_DIRS`.

On Windows it follows XDG Base Directory Specification if `XDG_CONFIG_DIRS` is defined. If `XDG_CONFIG_DIRS` is undefined, the directory that contains application data for all users is used instead. A typical path is `C:\Documents and Settings\All Users\Application Data`. This folder is used for application data that is not user specific. For example, an application can store a spell-check dictionary, a database of clip art, or a log file in the `CSIDL_COMMON_APPDATA` folder. This information will not roam and is available to anyone using the computer.

**UNIX-specific utilities and integration**

G-Golf Glib UNIX-specific utilities and integration low level API.

UNIX-specific utilities and integration — pipes, signal handling.

**Procedures**

[g-unix-fd-source-new], page 50

**Description**

Most of GLib is intended to be portable; in contrast, this set of functions is designed for programs which explicitly target UNIX, or are using it to build higher level abstractions which would be conditionally compiled if the platform matches `G_OS_UNIX`.

**Procedures**

Note: in this section, the `fd` and `condition` arguments are [must be] respectively an integer (a ‘valid’ file descriptor) and a list of one or more [%g-io-condition], page 48, flags.

**g-unix-fd-source-new**

`fd condition`  
[Procedure]

Returns a pointer.

Creates and returns a pointer to a new GSource to watch for a particular IO condition on `fd`.

The source will never close the file descriptor, you must do it yourself.

**Doubly-Linked Lists**

G-Golf Glib Doubly-Linked Lists low level API.

Doubly-Linked Lists — linked lists that can be iterated over in both directions
Procedures

[g-list-data], page 51
[g-list-next], page 51
[g-list-prev], page 51
[g-list-free], page 51
[g-list-length], page 51
[g-list-nth-data], page 51

Description

The `GList` structure and its associated functions provide a standard doubly-linked list data structure.

Each element in the list contains a piece of data, together with pointers which link to the previous and next elements in the list. Using these pointers it is possible to move through the list in both directions (unlike the singly-linked `GSList`, which only allows movement through the list in the forward direction).


Procedures

**g-list-data** *g-list*

Returns a pointer.

Obtains and returns a pointer to the data in *g-list*, or any integer value, in which case, it is the responsibility of the caller to apply the appropriate type conversion procedure.

**g-list-next** *g-list*

Returns a pointer or #f.

Obtains and returns the next element in *g-list*, or #f if there are no more elements.

**g-list-prev** *g-list*

Returns a pointer or #f.

Obtains and returns the previous element in *g-list*, or #f if there are no previous element.

**g-list-free** *g-list*

Returns nothing.

Frees all of the memory used by *g-list*.

**g-list-length** *g-list*

Returns an integer.

Obtains and returns the number of elements in *g-list*. This function iterates over the whole list to count its elements.

**g-list-nth-data** *g-list n*

Returns a pointer or #f.
Obtains and returns a pointer to the data of the $n$-th element of $g$-list. This iterates over the list until it reaches the $n$-th position. If $n$ is off the end of $g$-list, it returns #f.

Singly-Linked Lists

G-Golf Glib Singly-Linked Lists low level API.
Singly-Linked Lists — Linked lists that can be iterated over in one direction

Procedures

- **g-slist-data** $g$-list:
  Returns a pointer.
  Obtains and returns a pointer to the data in $g$-list, or any integer value, in which case, it is the responsibility of the caller to apply the appropriate type conversion procedure.

- **g-slist-next** $g$-list:
  Returns a pointer or #f.
  Obtains and returns the next element in $g$-list, or #f if there are no more elements.

- **g-slist-append** $g$-list data:
  Returns a pointer.
  Adds data - which is (must be) a pointer - to the end of $g$-list and returns a pointer to the (possibly new) start of the list (so make sure you store the new value).
  Note that [g-slist-append], page 52, has to traverse the entire list to find the end, which is inefficient when adding multiple elements. A common idiom to avoid the
inefficiency is to prepend the elements and reverse the list when all elements have been added.

\textbf{g-slist-prepend} \textit{g-slist data} \hspace{1em} [Procedure]

\begin{itemize}
  \item Returns a pointer.
  \item Adds \textit{data} - which is (must be) a pointer - to the start of \textit{g-slist} and returns a pointer to the (possibly new) start of the list (so make sure you store the new value).
\end{itemize}

\textbf{g-slist-free} \textit{g-slist} \hspace{1em} [Procedure]

\begin{itemize}
  \item Returns nothing.
  \item Frees all of the memory used by \textit{g-slist}.
\end{itemize}

\textbf{g-slist-length} \textit{g-slist} \hspace{1em} [Procedure]

\begin{itemize}
  \item Returns an integer.
  \item Obtains and returns the number of elements in \textit{g-slist}. This function iterates over the whole list to count its elements.
\end{itemize}

\textbf{g-slist-nth-data} \textit{g-slist n} \hspace{1em} [Procedure]

\begin{itemize}
  \item Returns a pointer or \#f.
  \item Obtains and returns a pointer to the data of the \textit{n}-th element of \textit{g-slist}. This iterates over the list until it reaches the \textit{n}-th position. If \textit{n} is off the end of \textit{g-slist}, it returns \#f.
\end{itemize}

\section*{Quarks}

G-Golf Glib Quarks low level API.

Quarks — a 2-way association between a string and a unique integer identifier.

\subsection*{Procedures}

\begin{itemize}
  \item [g-quark-from-string], page 53
  \item [g-quark-to-string], page 53
\end{itemize}

\subsection*{Description}

Quarks are associations between strings and integer identifiers. Given either the string or the GQuark identifier it is possible to retrieve the other.

\subsection*{Procedures}

\textbf{g-quark-from-string} \textit{str} \hspace{1em} [Procedure]

\begin{itemize}
  \item Returns an integer.
  \item Obtains and returns the GQuark identifying the string given by \textit{str}. If the string does not currently have an associated GQuark, a new GQuark is created, using a copy of the string.
\end{itemize}

\textbf{g-quark-to-string} \textit{g-quark} \hspace{1em} [Procedure]

\begin{itemize}
  \item Returns a string.
  \item Obtains and returns the string associated with the GQuark given by \textit{g-quark}.
\end{itemize}
GObject
G-Golf GObject modules are defined in the `gobject` subdirectory, such as `(g-golf gobject enum-flags)`.

Where you may load these modules individually, the easiest way to use G-Golf is to import its main module, which imports and re-exports the public interface of (oop goops), (system foreign), all G-Golf support and G-Golf GObject modules:

```lisp
(use-modules (g-golf gobject))
```

G-Golf GObject low level API modules correspond to a GObject section, though they might be some exception in the future.

Type Information
G-Golf GObject Type Information low level API.
Type Information — The GLib Runtime type identification and management system

Procedures

- `[g-type->symbol]`, page 55
- `[symbol->g-type]`, page 55
- `[g-type-name]`, page 55
- `[g-type-from-name]`, page 55
- `[g-type-parent]`, page 55
- `[g-type-is-a]`, page 55
- `[g-type-class-ref]`, page 55
- `[g-type-class-peek]`, page 56
- `[g-type-class-unref]`, page 56
- `[g-type-interface-peek]`, page 56
- `[g-type-query]`, page 56
- `[g-type-register-static-simple]`, page 56
- `[g-type-add-interface-static]`, page 56
- `[g-type-fundamental]`, page 56
- `[g-type-ensure]`, page 56

Types and Values

- `[%g-type-fundamental-flags]`, page 57
- `[%g-type-fundamental-types]`, page 57

Object Hierarchy

```
gpointer
   +— GType
```

Description

The `GType` API is the foundation of the GObject system. It provides the facilities for registering and managing all fundamental data types, user-defined object and interface types.
Please read the Type Information (https://developer.gnome.org/gobject/stable/gobject-Type-Information.html) section from the GObject reference manual for a complete description.

Procedures

**g-type->symbol**  
*type*  
Returns a symbol.

Get the symbol that correspond to the type ID *g-type*. Note that this function (like all other GType API) cannot cope with invalid type IDs. It accepts validly registered type ID, but randomized type IDs should not be passed in and will most likely lead to a crash.

**symbol->g-type**  
*symbol*  
Returns a type ID.

Get the type ID for *symbol*. Note that this function (like all other GType API) cannot cope with invalid type ID symbols. It accepts validly registered type ID symbol, but randomized type IDs should not be passed in and will most likely lead to a crash.

**g-type-name**  
*type*  
Returns a string.

Get the unique name that is assigned to *g-type*, a type ID. Note that this function (like all other GType API) cannot cope with invalid type IDs. It accepts validly registered type ID, but randomized type IDs should not be passed in and will most likely lead to a crash.

**g-type-from-name**  
*name*  
Returns a type ID or #f.

Obtains and returns the type ID for the given type *name*, or #f if no type has been registered under this *name* (this is the preferred method to find out by name whether a specific type has been registered yet).

**g-type-parent**  
*type*  
Returns a GType.

Returns the direct parent type for *g-type*. If *g-type* has no parent, i.e. is a fundamental type, 0 is returned.

**g-type-is-a**  
*type* is-a-g-type  
Returns #t if *g-type* is a is-a-g-type.

If is-a-g-type is a derivable type, check whether *g-type* is a descendant of is-a-g-type. If is-a-g-type is an interface, check whether *g-type* conforms to it.

**g-type-class-ref**  
*type*  
Returns a pointer.

Obtains and returns a pointer to the GTypeClass structure for *g-type* (a GObject class GType). The reference count of the class is incremented, and the class is ‘created’ (instanciated) if/when it doesn’t exist already.
**III. G-Golf Core Reference**

**g-type-class-peek g-type**

Returns a pointer.

Obtains and returns a pointer to the GTypeClass structure for g-type (a GObject class GType). The reference count of the class isn’t incremented. As a consequence, this function may return #f - if the class of the type passed in does not currently exist (hasn’t been referenced before).

**g-type-class-unref g-class**

Returns nothing.

Decrements the reference count for g-class (a pointer to a GTypeClass structure). Once the last reference count of a class has been released, it may be finalized by the type system. Attempting to further dereference a finalized class is invalid.

**g-type-interface-peek g-class iface-type**

Returns a pointer of #f.

Obtains and returns the (a pointer to) GTypeInterface structure for iface-type if implemented by g-class, Otherwise. it returns #f.

**g-type-query g-type**

Returns a list.

Obtains and returns the (g-type type-name class-size instance-size) list for g-type.

**g-type-register-static-simple parent-type type-name class-size class-init-func instance-size instance-init-func flags**

Returns a new type ID.

Registers type-name as the name of a new static type derived from parent-type. The value of flags determines the nature (e.g. abstract or not) of the type. It works by filling a GTypeInfo struct and calling g_type_register_static.

**g-type-add-interface-static g-type iface-type iface-info**

Returns nothing.

Adds iface-type to the static g-type. The information contained in the GInterfaceInfo structure pointed to by iface-info is used to manage the relationship.

If iface-info is #f, a new GInterfaceInfo structure is made, with iface-init-func and iface-finalize-func set to no-op procedures, and iface-data set to the %null-pointer (this is only meant to be used for testing and debugging purposes).

**g-type-fundamental g-type**

Returns a type ID.

Extracts the fundamental type ID portion for g-type.

**g-type-ensure g-type**

Returns nothing.

Ensures that the indicated g-type has been registered with the type system, and that its _class_init method has been run.
Types and Values

%g-type-fundamental-flags [Instance Variable of <gi-enum>]
Bit masks used to check or determine specific characteristics of a fundamental type.

An instance of <gi-enum>, who’s members are the scheme representation of the GTypeFundamentalFlags:

  g-name: GTypeFundamentalFlags
  name: g-type-fundamental-flags
  enum-set:

    classed   Indicates a classed type
    instantiable
               Indicates an instantiable type (implies classed)
    derivable  Indicates a flat derivable type
    deep-derivable  Indicates a deep derivable type (implies derivable)

%g-type-fundamental-types [Instance Variable of <gi-enum>]
An instance of <gi-enum>, who’s members are the scheme representation of the GType obtained from the fundamental types defined using G_TYPE_MAKE_FUNDAMENTAL, which starts with G_TYPE_INVALID and ends with G_TYPE_OBJECT.

  g-name: #f25

  name: g-type-fundamental-types
  enum-set:

    invalid An invalid GType used as error return value in some functions which return a GType.
    none A fundamental type which is used as a replacement for the C void return type.

    interface The fundamental type from which all interfaces are derived.
    char The fundamental type corresponding to gchar. It is unconditionally an 8-bit signed integer. This may or may not be the same type a the C type "gchar".
    uchar The fundamental type corresponding to guchar.
    boolean The fundamental type corresponding to gboolean.
    int The fundamental type corresponding to gint.

25 There is no corresponding enum in GObject. These fundamental types (in GObject) are defined using a macro, G_TYPE_MAKE_FUNDAMENTAL, that applies bitwise arithmetic shift given by G_TYPE_FUNDAMENTAL_SHIFT (which we also have to apply, to get to the type ID for the fundamental number x).
The fundamental type corresponding to guint.

The fundamental type corresponding to glong.

The fundamental type corresponding to guulong.

The fundamental type corresponding to gint64.

The fundamental type corresponding to guint64.

The fundamental type from which all enumeration types are derived.

The fundamental type from which all flags types are derived.

The fundamental type corresponding to gfloat.

The fundamental type corresponding to gdouble.

The fundamental type corresponding to nul-terminated C strings.

The fundamental type corresponding to gpointer.

The fundamental type from which all boxed types are derived.

The fundamental type from which all [GParamSpec], page 66, types are derived.

The fundamental type for [GObject_], page 58.

GObject
G-Golf GObject low level API.
GObject — The base object type

Procedures

[g-object-class-find-property], page 59
[g-object-new], page 59
[g-object-new-with-properties], page 59
[g-object-ref], page 59
[g-object-unref], page 59
[g-object-ref-sink], page 59
[g-object-ref-count], page 60
[g-object-is-floating], page 60
[g-object-type], page 60
[g-object-type-name], page 60
[g-object-get-property], page 60
[g-object-set-property], page 60

Object Hierarchy

GObject
  +— GBinding
  +— GInitiallyUnowned
  +— GTypeModule
Description

**GObject** is the fundamental type providing the common attributes and methods for all object types in GTK+, Pango and other libraries based on GObject. The GObject class provides methods for object construction and destruction, property access methods, and signal support.


Procedures

Note: in this section, unless otherwise specified, the *object* argument is [must be] a pointer to a **GObject** (instance).

**g-object-class-find-property g-class name**  
[Procedure]  
Returns a pointer or #f.  
Obtains and returns (a pointer to) the GParamSpec for *name*, or #f if *g-class* (a pointer to a GObjectClass) doesn’t have a property of that *name*.

**g-object-new gtype**  
[Procedure]  
Returns a pointer.  
Creates and returns a (pointer to) a new instance of a GObject subtype *gtype*. All properties are set to their default values.

**g-object-new-with-properties gtype n-prop names g-values**  
[Procedure]  
Returns a pointer.  
Creates and returns a (pointer to) a new instance of a GObject subtype *gtype*. The other arguments are *n-prop* the number of properties, *names* a pointer to an array of pointers to strings with the names of each property to be set and *values* an array of GValue containing the values of each property to be set.  
Properties that are not explicitly specified are set to their default values.

**g-object-ref object**  
[Procedure]  
Returns a pointer.  
Increases the reference count of *object*.

**g-object-unref object**  
[Procedure]  
Returns nothing.  
Decreases the reference count of *object*. When its reference count drops to 0, the object is finalized (i.e. its memory is freed).  
If the pointer to the GObject may be reused in future (for example, if it is an instance variable of another object), it is recommended to clear the pointer to NULL rather than retain a dangling pointer to a potentially invalid GObject instance. Use g-clear-object for this.

**g-object-ref-sink object**  
[Procedure]  
Returns a pointer.
If *object* has a floating reference, then this call ‘assumes ownership’ of the floating reference, converting it to a normal reference by clearing the floating flag while leaving the reference count unchanged.

If *object* is not floating, then this call adds a new normal reference increasing the reference count by one.

**g-object-ref-count** *object*  
Returns an integer.

Obtains and returns the (public GObject struct field) ref_count value for *object*.

**g-object-is-floating** *object*  
Returns #t if *object* has a floating reference, otherwise it returns #f.

**g-object-type** *object*  
Returns the *GType* (the type id) for *object*.

**g-object-type-name** *object*  
Returns the *GType* name for *object*.

**g-object-get-property** *object* property [g-type #f]  
Returns the *property* value for *object*.

The *property* argument is (must be) a pointer to a valid GIPROPERTYINFO (*property* must point to one of the properties infos of the class of *object*). The g-type argument must be a valid *GType* value. If #f, which is the default, [gi-property-g-type], page 108, is called.

**g-object-set-property** *object* property value [g-type #f]  
Returns value.

Sets the *object* property to value. The *property* argument is (must be) a pointer to a valid GIPROPERTYINFO (*property* must point to one of the properties infos of the class of *object*). The g-type argument must be a valid *GType* value. If #f, which is the default, [gi-property-g-type], page 108, is called.

**Enumeration and Flag Types**

G-Golf GObject Enumeration and Flag Types low level API.

**Description**

The GLib type system provides fundamental types for enumeration and flags types. (Flags types are like enumerations, but allow their values to be combined by bitwise or). A registered enumeration or flags type associates a name and a nickname with each allowed value. When an enumeration or flags type is registered with the GLib type system, it can be used as value type for object properties.

**Boxed Types**

G-Golf GObject Boxed Types low level API.

Boxed Types — A mechanism to wrap opaque C structures registered by the type system.
Procedures

[g-boxed-free], page 61
[g-strv-get-type], page 61

Description

GBoxed is a generic wrapper mechanism for arbitrary C structures. The only thing the type system needs to know about the structures is how to copy them (a GBoxedCopyFunc) and how to free them (a GBoxedFreeFunc) — beyond that they are treated as opaque chunks of memory.


Procedures

g-boxed-free  g-type pointer  [Procedure]
   Returns nothing.
   Frees the boxed structure at pointer, which is of type g-type.

g-strv-get-type  [Procedure]
   Returns a GType.
   Registers (unless already registered) the GStrv GLib type in GObject and returns its GType, the GType for a boxed type holding a NULL-terminated array of strings. This procedure must have been called at least once before (g-type-from-name "GStrv") calls may be honoured.

Generic Values

G-Golf GObject Generic Values low level API.
Generic values — A polymorphic type that can hold values of any other type.

Procedures

[g-value-size], page 62
[g-value-new], page 62
[g-value-init], page 62
[g-value-unset], page 62

Object Hierarchy

GBoxed
   +— GValue

Description

The GValue structure is basically a variable container that consists of a type identifier and a specific value of that type. The type identifier within a GValue structure always determines the type of the associated value. To create a undefined GValue structure, simply call [g-value-new], page 62, which create a zero-filled GValue structure. To create and initialize a GValue, use the [g-value-init], page 62, procedure. A GValue cannot be used until it is
initialized. The basic type operations (such as freeing and copying) are determined by the GTypeValueTable associated with the type ID stored in the GValue.


Procedures

\textbf{g-value-size} \hspace{4em} [Procedure]

Returns an integer.

Obtains and returns the size of a GValue.

\textbf{g-value-new} \hspace{4em} [Procedure]

Returns a pointer to a GValue.

Creates and returns (a pointer to) an empty (uninitialized) GValue.

\textbf{g-value-init g-type} \hspace{4em} [Procedure]

Returns a pointer to a GValue.

Creates and initializes a GValue with the default value for g-type, which can either be an integer - a GType static or dynamic value, or a symbol - a member of the [%g-type-fundamental-types], page 57.

\textbf{g-value-unset g-value} \hspace{4em} [Procedure]

Returns nothing.

Clears the current value in g-value (if any) and ‘unsets’ the type. This releases all resources associated with g-value. An unset GValue is the same as an uninitialized (zero-filled) GValue structure.

Parameters and Values

G-Golf GObject Parameters and Values low level API.
Parameters and Values — Standard Parameter and Value Types
Procedures

[g-value-type], page 63
[g-value-type-tag], page 63
[g-value-type-name], page 63
[g-value-ref], page 64
[g-value-set!], page 64
[g-value-get-boolean], page 64
[g-value-set-boolean], page 64
[g-value-get-int], page 64
[g-value-set-int], page 64
[g-value-get-uint], page 64
[g-value-set-uint], page 64
[g-value-get-float], page 64
[g-value-set-float], page 65
[g-value-get-double], page 65
[g-value-set-double], page 65
[g-value-get-enum], page 65
[g-value-set-enum], page 65
[g-value-get-flags], page 65
[g-value-set-flags], page 65
[g-value-get-string], page 65
[g-value-set-string], page 65
[g-value-get-param], page 65
[g-value-set-param], page 66
[g-value-get-boxed], page 66
[g-value-set-boxed], page 66
[g-value-get-pointer], page 66
[g-value-set-pointer], page 66
[g-value-get-object], page 66
[g-value-set-object], page 66
[g-value-get-variant], page 66

Description

GValue provides an abstract container structure which can be copied, transformed and compared while holding a value of any (derived) type, which is registered as a GType with a GTypeValueTable in its GTypeInfo structure. Parameter specifications for most value types can be created as GParamSpec derived instances, to implement e.g. GObject properties which operate on GValue containers.

Parameter names need to start with a letter (a-z or A-Z). Subsequent characters can be letters, numbers or a '-' . All other characters are replaced by a '-' during construction.

Procedures and Methods

Note: in this section, the g-value argument is [must be] a pointer to a GValue.

\begin{align*}
g\text{-value-type} & \quad g\text{-value} \quad \text{[Procedure]} \\
g\text{-value-type-tag} & \quad g\text{-value} \quad \text{[Procedure]}
\end{align*}
g-value-type-name g-value  
Returns an integer, a symbol or a string, respectively.
Obtains and returns the GType, the GType tag (see [g-type-fundamental-types], page 57) or the GType name (see [g-type-name], page 55, for g-value, respectively.

g-value-ref g-value  
Returns the content of g-value.
Obtains and returns the content of g-value. Supported GType (their scheme representation) for g-value are: boolean, uint, int, float, double, enum, flags, string, boxed, pointer, object, interface.

g-value-set! g-value value  
Returns nothing.
Sets the content of g-value to value. Supported GType (their scheme representation) for g-value are: boolean, uint, int, float, double, enum, flags, string, boxed, pointer, object, interface.
Note that this procedure cannot cope with invalid values (the type of value must correspond to the GType for g-value, otherwise it will most likely lead to a crash.

g-value-get-boolean g-value  
Returns #t or #f.
Obtains the content of g-value and returns #f if it is 0, otherwise it returns #t.

g-value-set-boolean g-value val  
Returns nothing.
Sets the content of g-value to 0 if val is #f, otherwise sets the content to 1.

g-value-get-int g-value  
Returns an integer.
Obtains and returns the content of g-value.

g-value-set-int g-value int  
Returns nothing.
Sets the content of g-value to int.

g-value-get-uint g-value  
Returns an unsigned integer.
Obtains and returns the content of g-value.

g-value-set-uint g-value uint  
Returns nothing.
Sets the content of g-value to uint.

g-value-get-float g-value  
Returns a float.
Obtains and returns the content of g-value.
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\textbf{g-value-set-float} \textit{g-value float}  
[Procedure]  
Returns nothing.  
Sets the content of \textit{g-value} to \textit{float}.

\textbf{g-value-get-double} \textit{g-value}  
[Procedure]  
Returns a double.  
Obtains and returns the content of \textit{g-value}.

\textbf{g-value-set-double} \textit{g-value double}  
[Procedure]  
Returns nothing.  
Sets the content of \textit{g-value} to \textit{double}.

\textbf{g-value-get-enum} \textit{g-value}  
[Procedure]  
Returns a symbol.  
Obtains and returns the (registered) enum type info symbol for \textit{g-value}.

\textbf{g-value-set-enum} \textit{g-value (id <integer>)}  
[Method]  
\textbf{g-value-set-enum} \textit{g-value (sym <symbol>)}  
[Method]  
Returns nothing.  
Sets the content of \textit{g-value} to \textit{id}, or to the id corresponding to \textit{sym} respectively. The \textit{id} or the \textit{sym} must be valid (as in being a valid member of the (registered) enum type info for \textit{g-value}), otherwise an exception is raised.

\textbf{g-value-get-flags} \textit{g-value}  
[Procedure]  
Returns a list.  
Obtains and returns the (registered) list of flags for \textit{g-value}.

\textbf{g-value-set-flags} \textit{g-value (val <integer>)}  
[Method]  
\textbf{g-value-set-flags} \textit{g-value (flags <list>)}  
[Method]  
Returns nothing.  
Sets the content of \textit{g-value} to \textit{val}, or to the value given by calling [flags->integer], page 119, upon the list of \textit{flags}, respectively. The \textit{val} or the \textit{flags} must be valid (as in being a valid member of the (registered) gi-flags type for \textit{g-value}), otherwise an exception is raised.

\textbf{g-value-get-string} \textit{g-value}  
[Procedure]  
Returns a string or \texttt{#f}.  
Obtains and returns the content of \textit{g-value}, a string or \texttt{#f} if the \textit{g-value} content is the \texttt{%null-pointer}.

\textbf{g-value-set-string} \textit{g-value str}  
[Procedure]  
Returns nothing.  
Sets the content of \textit{g-value} to \textit{str}.

\textbf{g-value-get-param} \textit{g-value}  
[Procedure]  
Returns a (pointer to) \texttt{GParamSpec} or \texttt{#f}.
Obtains and returns the content of \texttt{g-value}, a (pointer to) \texttt{GParamSpec} or \texttt{#f} if the \texttt{g-value} content is the \texttt{null-pointer}.

\texttt{g-value-set-param} \texttt{g-value param} \hfill [Procedure]

Returns nothing.

Sets the content of \texttt{g-value} to \texttt{param}.

\texttt{g-value-get-boxed} \texttt{g-value} \hfill [Procedure]

Returns either a list of values, or a pointer.

Obtains and returns the content of \texttt{g-value}. If the boxed type [\texttt{is-opaque?}], page 121, or [\texttt{is-semi-opaque?}], page 121, it \texttt{blindingly} returns the boxed instance \texttt{g-value} pointer. Otherwise, the boxed instance is \texttt{decoded}, and a list of its field values is returned.

\texttt{g-value-set-boxed} \texttt{g-value boxed} \hfill [Procedure]

Returns nothing.

Sets the content of \texttt{g-value} to \texttt{boxed}. If the boxed type [\texttt{is-opaque?}], page 121, or [\texttt{is-semi-opaque?}], page 121, then \texttt{boxed} is (supposed to be) a pointer, used to \texttt{blindingly} set \texttt{g-value}. Otherwise, the boxed instance is (supposed to be) a list of values, that are \texttt{encoded}, and its (newly created) pointer is used to set \texttt{g-value}.

\texttt{g-value-get-pointer} \texttt{g-value} \hfill [Procedure]

Returns a pointer.

Obtains and returns the content of \texttt{g-value}.

\texttt{g-value-set-pointer} \texttt{g-value pointer} \hfill [Procedure]

Returns nothing.

Sets the content of \texttt{g-value} to \texttt{pointer}.

\texttt{g-value-get-object} \texttt{g-value} \hfill [Procedure]

Returns a pointer.

Obtains and returns the content of \texttt{g-value}.

\texttt{g-value-set-object} \texttt{g-value object} \hfill [Procedure]

Returns nothing.

Sets the content of \texttt{g-value} to \texttt{object} (a pointer to a \texttt{GObject} instance) and increases the \texttt{object} reference count.

\texttt{g-value-get-variant} \texttt{g-value} \hfill [Procedure]

Returns a pointer or \texttt{#f}.

Obtains and returns content of a variant \texttt{g-value}, or \texttt{#f} (may be NULL).

\texttt{GParamSpec}

G-Golf \texttt{GObject} \texttt{GParamSpec} low level API.

\texttt{GParamSpec} — Metadata for parameter specifications.
Procedures

[gi-g-param-spec-show], page 67
[g-param-spec-type], page 68
[g-param-spec-type-name], page 68
[g-param-spec-get-default-value], page 68
[g-param-spec-get-name], page 68
[g-param-spec-get-nick], page 68
[g-param-spec-get-blurb], page 68
[g-param-spec-get-flags], page 68

Types and Values

[%g-param-flags], page 68

Description

GParamSpec is an object structure that encapsulates the metadata required to specify pa-
rameters, such as e.g. GObject properties.

Procedures

Note: in this section, the p-spec argument is [must be] a pointer to a GParamSpec.

gi-g-param-spec-show p-spec

Returns nothing.  
Obtains and displays the following informations about the interface pointed to by
p-spec:

,use (g-golf)
  (g-irepository-require "Gtk" #:version "4.0")
⇒ $2 = #<pointer 0x55ae43d74a60>

(gi-import-by-name "Gtk" "Label")
⇒ $3 = #<<gobject-class> <gtk-label> 7f1a75436a50>

(!g-class <gtk-label>)
⇒ $4 = #<pointer 0x55ae43deb0c0>

(g-object-class-find-property $4 "css-classes")
⇒ $5 = #<pointer 0x55ae43d9d510>

(gi-g-param-spec-show $5)

- #<pointer 0x55ae43d9d510> is a (pointer to a) GParamSpec:
  - name: "css-classes"
  - nick: "CSS Style Classes"
  - blurb: "List of CSS classes"
  - g-type: 94206951022032
  - g-type-name: "GStrv"
Note that the last item, \texttt{g-strv} is not part of the \texttt{GParamSpec} structure. It is obtained (and used by G-Golf internally by calling \texttt{[g-name->name]}, page 124, \texttt{g-type-name}).

\texttt{g-param-spec-type} \texttt{p-spec} \hfill [Procedure]
\texttt{g-param-spec-type-name} \texttt{p-spec} \hfill [Procedure]

Returns an integer or a (symbol) name, respectively.

Obtains and returns the \texttt{GType} or the \texttt{GType} (symbol) name for \texttt{p-spec}, respectively.

\texttt{g-param-spec-get-default-value} \texttt{p-spec} \hfill [Procedure]

Returns a pointer.

Obtains and returns the \texttt{p-spec} default value as pointer to a \texttt{GValue}, which will remain valid for the life of \texttt{p-spec} and must not be modified.

\texttt{g-param-spec-get-name} \texttt{p-spec} \hfill [Procedure]
\texttt{g-param-spec-get-nick} \texttt{p-spec} \hfill [Procedure]
\texttt{g-param-spec-get-blurb} \texttt{p-spec} \hfill [Procedure]

Returns a string.

Obtains and returns the name, nickname or short description for \texttt{p-spec}, respectively.

\texttt{g-param-spec-get-flags} \texttt{p-spec} \hfill [Procedure]

Returns a (possibly empty) list.

Obtains and returns a list of the combination of [\texttt{\%g-param-flags}], page 68, that applies to \texttt{p-spec}.

**Types and Values**

\texttt{\%g-param-flags} \hfill [Instance Variable of <\texttt{gi-enum}>]

An instance of <\texttt{gi-enum}>, who’s members are the scheme representation of the \texttt{GParamFlags}:

\begin{verbatim}
type-name: GParamFlags
name: g-param-flags
enum-set:
  readable  the parameter is readable
  writable  the parameter is writable
  readable writable  alas for readable writable
  construct  the parameter will be set upon object construction
  construct-only  the parameter can only be set upon object construction
\end{verbatim}
lax-validation
upon parameter conversion, strict validation is not required

static-name
the string used as name when constructing the parameter is
guaranteed to remain valid and unmodified for the lifetime
of the parameter. Since 2.8

private internal

static-nick
the string used as nick when constructing the parameter is
guaranteed to remain valid and unmodified for the lifetime
of the parameter. Since 2.8

static-blurb
the string used as blurb when constructing the parameter is
guaranteed to remain valid and unmodified for the lifetime
of the parameter. Since 2.8

explicit-notify
calls to g_object_set_property for this property will not
automatically result in a ‘notify’ signal being emitted: the
implementation must call g_object_notify themselves in
case the property actually changes. Since: 2.42

deprecated
the parameter is deprecated and will be removed in a future
version. A warning will be generated if it is used while run-
ing with G_ENABLE_DIAGNOSTIC=1. Since 2.26

Closures
G-Golf GObject Closures low level API.

Closures - Functions as first-class objects

Procedures
[g-closure-size], page 70
[g-closure-ref-count], page 70
[g-closure-ref], page 70
[g-closure-sink], page 70
[g-closure-unref], page 70
[g-closure-free], page 71
[g-closure-invoker], page 71
[g-closure-add-invalidate-notifier], page 71
[g-closure-new-simple], page 71
[g-closure-set-marshals], page 71
[g-source-set-closure], page 71
Object Hierarchy

GBoxed
  +— GClosure

Description

A GClosure represents a callback supplied by the programmer. It will generally comprise a function of some kind and a marshaller used to call it. It is the responsibility of the marshaller to convert the arguments for the invocation from GValues into a suitable form, perform the callback on the converted arguments, and transform the return value back into a GValue.


Procedures

Note: in this section, the closure, marshal, source and function arguments are [must be] pointers to a GClosure, a GSource, a GClosureMarshal and a GClosureNotify respectively.

`g-closure-size`  
Returns an integer.  
Obtains and returns the size (the number of bytes) that a GClosure occupies in memory.

`g-closure-ref-count closure`  
Returns an integer.  
Obtains and returns the reference count of closure.

`g-closure-ref closure`  
Returns a pointer.  
Increments the reference count of closure, to force it staying alive while the caller holds a pointer to it.

`g-closure-sink closure`  
Returns nothing.  
Takes over the initial ownership of closure. Each closure is initially created in a ‘floating’ state, which means that the initial reference count is not owned by any caller. `[g-closure-sink]`, page 70, checks to see if the object is still floating, and if so, unsets the floating state and decreases the reference count. If the closure is not floating, `[g-closure-sink]`, page 70, does nothing.

Because `[g-closure-sink]`, page 70, may decrement the reference count of closure (if it hasn’t been called on closure yet) just like `[g-closure-unref]`, page 70, `[g-closure-ref]`, page 70, should be called prior to this function.

`g-closure-unref closure`  
Returns nothing.
Decrements the reference count of closure after it was previously incremented by the same caller. If no other callers are using closure, then it will be destroyed and freed.

**g-closure-free** closure

Returns nothing.

Decrements the reference count of closure to 0 (so closure will be destroyed and freed).

**g-closure-invoke** closure return-value n-param param-vals invocation-hit

Returns nothing.

Invokes the closure, i.e. executes the callback represented by the closure.

The arguments are closure (a pointer to a GClosure), return-value (a pointer to a GValue), n-param (the length of the param-vals array), param-vals (a pointer to an array of GValue) and invocation-hit (a context dependent invocation hint).

**g-closure-add-invalidate-notifier** closure data function

Returns nothing.

Registers an invalidation notifier which will be called when the closure is invalidated with **g-closure-invalidate**. Invalidation notifiers are invoked before finalization notifiers, in an unspecified order.

The data argument is (must be) a pointer to the notifier data (or #f).

**g-closure-new-simple** size data

Returns a pointer.

Allocates a structure of the given size and initializes the initial part as a GClosure. The data (if any) are used to initialize the data fields of the newly allocated GClosure. The returned value is a floating reference (a pointer) to a new GClosure.

**g-closure-set-marshal** closure marshal

Returns nothing.

Sets the closure marshaller to marshal.

**g-source-set-closure** source closure

Returns nothing.

Set the source callback to closure.

If the source is not one of the standard GLib types, the closure_callback and closure_marshal fields of the GSourceFuncs structure must have been filled in with pointers to appropriate functions.

### Signals

G-Golf GObject Signals low level API.

Signals — A means for customization of object behaviour and a general purpose notification mechanism
III. G-Golf Core Reference

Procedures

[g-signal-query], page 72
[g-signal-lookup], page 73
[g-signal-list-ids], page 73
[g-signal-parse-name], page 73

Types and Values

[&g-signal-flags], page 73

Description

The basic concept of the signal system is that of the emission of a signal. Signals are introduced per-type and are identified through strings. Signals introduced for a parent type are available in derived types as well, so basically they are a per-type facility that is inherited.


Procedures

g-signal-query id

[Procedure]

Returns a list.

Obtains and returns a list composed of the signal id, name, interface-type\(^\text{26}\), flags, return-type, number of arguments and their types. For example\(^\text{27}\):

```plaintext
,use (g-golf)
(gi-import "Clutter")

(make <clutter-actor>)
⇒ $2 = #<<clutter-actor> 565218c88a80>

(!g-type (class-of $2))
⇒ $3 = 94910597864000

(g-signal-list-ids $3)
⇒ $4 = (5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30)

(g-signal-query 20)
⇒ $5 = (20 "enter-event" 94910597864000 (run-last) boolean 1 (boxed))
```

As you may have noticed, the signal query argument(s) list does not include the instance (and its type) upon which the signal is called, but both at C level and within the context of GCallback, callbacks must assume that the instance upon which a signal is called is always the first argument of the callback.

---

\(^{26}\) Within this context, the interface-type is the GType of the GObject subclass the signal is ‘attached to’ - knowing that signals are inherited.

\(^{27}\) At least one GObject subclass instance must have been created prior to attempt to query any of its class signal(s).
g-signal-lookup name g-type

Returns an integer.

Obtains and returns the signal’s identifying integer, given the name of the signal and the object g-type it connects to. If a signal identifier can’t be find for the given name and g-type, an exception is raised.

g-signal-list-ids g-type

Returns a list of integers.

Obtains and returns the list of signal’s identifying integers for g-type (Note that at least one g-type instance must have been created prior to attempt to list or query signal’s identifying integers for a given g-type).

g-signal-parse-name detailed-signal g-type [force-detail-quark #t]

Returns two integer values.

Obtains and returns the signal-id and a detail corresponding to detailed-signal for g-type. The detailed-signal can be passed as a symbol or a string. When force-detail-quark is #t it forces the creation of a GQuark for the detail.

If the signal name could not successfully be parsed, it raises an exception.

Types and Values

%g-signal-flags

The signal flags are used to specify a signal’s behaviour, the overall signal description outlines how especially the RUN flags control the stages of a signal emission.

An instance of <gi-enum>, who’s members are the scheme representation of the GSignalFlags:

- g-name: GSignalFlags
- name: g-signal-flags
- enum-set:
  - run-first
    - Invoke the object method handler in the first emission stage.
  - run-last
    - Invoke the object method handler in the third emission stage.
  - run-cleanup
    - Invoke the object method handler in the last emission stage.
  - no-recurse
    - Signals being emitted for an object while currently being in emission for this very object will not be emitted recursively, but instead cause the first emission to be restarted.
  - detailed
    - This signal supports ":detail" appendices to the signal name upon handler connections and emissions.
  - action
    - Action signals are signals that may freely be emitted on alive objects from user code via g-signal-emit and friends, without the need of being embedded into extra code that performs pre or post emission adjustments on the object. They
can also be thought of as object methods which can be called generically by third-party code.

**no-hooks** No emissions hooks are supported for this signal.

**must-collect** Varargs signal emission will always collect the arguments, even if there are no signal handlers connected. Since 2.30.

**deprecated** The signal is deprecated and will be removed in a future version. A warning will be generated if it is connected while running with `G_ENABLE_DIAGNOSTIC=1`. Since 2.32.

### GObject Introspection

G-Golf GObject Introspection modules are defined in the `gi` subdirectory, such as `(g-golf gi repository)`.

Where you may load these modules individually, the easiest way to use G-Golf GObject Introspection is to import the `g-golf` module, which imports and re-exports the public interface of all modules used and defined by G-Golf (for a complete list, visit its source definition):

```lisp
(use-modules (g-golf))
```

Most G-Golf GObject Introspection modules correspond to a GObject Introspection (manual) section, but there are some exceptions, such as `init` and `utils` ...

### Repository

G-Golf Introspection Repository low level API.

GIRepository — GObject Introspection repository manager.

#### Procedures

- `[g-irepository-get-default], page 75`
- `[g-irepository-get-dependencies], page 75`
- `[g-irepository-get-loaded-namespaces], page 75`
- `[g-irepository-get-n-infos], page 75`
- `[g-irepository-get-info], page 75`
- `[g-irepository-enumerate-versions], page 75`
- `[g-irepository-get-typelib-path], page 75`
- `[g-irepository-require], page 76`
- `[g-irepository-get-c-prefix], page 76`
- `[g-irepository-get-shared-library], page 76`
- `[g-irepository-get-version], page 76`
- `[g-irepository-find-by-gtype], page 76`
- `[g-irepository-find-by-name], page 76`

#### Description

GIRepository is used to manage repositories of namespaces. Namespaces are represented on disk by type libraries (.typelib files).
Object Hierarchy

 GOBJECT
  |...
   GIRepository

Procedures

Note: in this section, when the #:repository optional keyword argument is passed, it is [must be] a pointer to a GIRepository. Its default value is #f, the scheme representation for NULL, meaning the singleton process-global default GIRepository (see [g-irepository-get-default], page 75).

**g-irepository-get-default**

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns a pointer to the singleton process-global default GIRepository.</td>
</tr>
</tbody>
</table>

GOBJECT Introspection does not currently support multiple repositories in a particular process, but this procedure is provided in the unlikely eventuality that it would become possible.

All G-Golf low level API procedures on GIRepository also accept an optional #:repository keyword argument which defaults to #f, meaning this singleton process-global default GIRepository.

**g-irepository-get-dependencies namespace [#:repository #f]**

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns a list of all (transitive) versioned dependencies for namespace. Returned string are of the form namespace-version.</td>
</tr>
</tbody>
</table>

Note: The namespace must have already been loaded using a procedure such as g-irepository-require before calling this procedure.

**g-irepository-get-loaded-namespaces [#:repository #f]**

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return the list of currently loaded namespaces.</td>
</tr>
</tbody>
</table>

**g-irepository-get-n-infos namespace [#:repository #f]**

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns the number of metadata entries in namespace. The namespace must have already been loaded before calling this procedure.</td>
</tr>
</tbody>
</table>

**g-irepository-get-info namespace index [#:repository #f]**

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns a pointer to a particular metadata entry in the given namespace.</td>
</tr>
</tbody>
</table>

The namespace must have already been loaded before calling this procedure. See g-irepository-get-n-infos to find the maximum number of entries.

index is a 0-based offset into namespace for entry.

**g-irepository-enumerate-versions namespace [#:repository #f]**

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returns a (possibly empty) list.</td>
</tr>
</tbody>
</table>

Obtains and returns an unordered (possibly empty) list of versions (either currently loaded or available) for namespace in repository.

**g-irepository-get-typelib-path namespace [#:repository #f]**

<table>
<thead>
<tr>
<th>Procedure</th>
</tr>
</thead>
</table>
| Returns the full path to the typelib file namespace was loaded from, if loaded. If namespace is not loaded or does not exist, it will return #f. If the typelib for namespace was included in a shared library, it returns the special string "<builtin>".

**g-irepository-require** namespace [#:version #f] [#:repository #f]  
Returns a pointer a GITypelib structure, if the Typelib file for namespace exists. Otherwise, it raises an error.

Force the namespace to be loaded if it isn’t already. If namespace is not loaded, this procedure will search for a ".typelib" file using the repository search path. In addition, a version version of namespace may be specified. If version is not specified, the latest will be used.

**g-irepository-get-c-prefix** namespace [#:repository #f]  
Returns the "C prefix", or the C level namespace associated with the given introspection namespace. Each C symbol starts with this prefix, as well each GType in the library.

Note: The namespace must have already been loaded using a procedure such as g-irepository-require before calling this procedure.

**g-irepository-get-shared-library** namespace [#:repository #f]  
Returns a list of paths to the shared C libraries associated with the given namespace. There may be no shared library path associated, in which case this procedure will return an empty list.

**g-irepository-get-version** namespace [#:repository #f]  
Returns the loaded version associated with the given namespace.

Note: The namespace must have already been loaded using a procedure such as g-irepository-require before calling this procedure.

**g-irepository-find-by-gtype** gtype [#:repository #f]  
Returns a pointer to a GIBaseInfo representing metadata about gtype, or #f.

Searches all loaded namespaces for a particular GType. Note that in order to locate the metadata, the namespace corresponding to the type must first have been loaded. There is currently no mechanism for determining the namespace which corresponds to an arbitrary GType - thus, this procedure will operate most reliably when you know the GType to originate from be from a loaded namespace.

**g-irepository-find-by-name** namespace name [#:repository #f]  
Returns a pointer to a GIBaseInfo representing metadata about type, or #f.

Searches for a particular entry in namespace. Before calling this function for a particular namespace, you must call g-irepository-require once to load the namespace, or otherwise ensure the namespace has already been loaded.

**Typelib**

G-Golf Typelib low level API.

GITypelib — Layout and accessors for typelib.
Procedures

[g-golf-typelib-new], page 77
[call-with-input-typelib], page 77
[g-typelib-new-from-memory], page 77
[g-typelib-free], page 77
[g-typelib-get-namespace], page 77

Description

TODO.

Procedures

Note: in this section, the typelib argument is [must be] a pointer to a GITypelib.

**g-golf-typelib-new file**

Returns a pointer to a new GITypelib.

*file* must be a valid typelib filename.

This procedure actually sets things up and calls [g-typelib-new-from-memory], page 77.

**call-with-input-typelib file proc**

Returns the value(s) returned by *proc*.

*file* must be a valid typelib filename. Makes a new GITypelib by calling (g-golf-typelib-new file) and calls (proc typelib) with the resulting GITypelib.

When *proc* returns, the GITypelib is free’d by calling g-typelib-free. Otherwise the [Glib - C] memory chunk might not be free’d automatically, though the scheme pointer returned by g-golf-typelib-new will be garbage collected in the usual way if not otherwise referenced.

**g-typelib-new-from-memory pointer size gerror**

Returns a pointer to a new GITypelib.

*pointer* must be the address of a memory chunk containing the typelib, *size* is the number of bytes of the memory chunk containing the typelib, and *gerror* a pointer to a GError.

Creates a new GITypelib from a memory location. The memory block pointed to by typelib will be automatically g_free()d when the repository is destroyed.

**g-typelib-free typelib**

Returns nothing.

Free a GITypelib.

**g-typelib-get-namespace typelib**

Returns the namespace of *typelib*.

Common Types

G-Golf Common Types low level API.

common types - TODO
III. G-Golf Core Reference

Procedures

[g-type-tag-to-string], page 78

Types and Values

[%gi-type-tag], page 78
[%gi-array-type], page 79

Procedures

g-type-tag-to-string type-tag

[Procedure]

Returns a string or #f.

Obtains the string representation for type-tag or #f if it does not exist (note that in this case, the upstream function returns "unknown").

type-tag can either be an id or a symbol, a member of the enum-set of [%gi-type-tag], page 78.

Types and Values

%gi-type-tag

[Instance Variable of <gi-enum>]

An instance of <gi-enum>, who’s members are the type tag of a GTypeInfo:

  g-name: GTypeInfo
  name: gi-type-tag
  enum-set:
    void
    boolean
    int8
    uint8
    int16
    uint16
    int32
    uint32
    int64
    uint64
    float
    double
    gtype
    utf8
    filename
    array
    interface
    glist
    gslist
    ghash
    error
    unichar
\texttt{%\texttt{gi-array-type}} \quad \text{[Instance Variable of \texttt{<gi-enum>}]}

An instance of \texttt{<gi-enum>}, who’s members are the type of array in a \texttt{GITypeInfo}:

\begin{verbatim}
  g-name: GIArrayType
  name: gi-array-type
  enum-set:
    c
    array
    ptr-array
    byte-array
\end{verbatim}

**Version Information**

G-Golf GIRepository Version Information low level API.

Version Information - Procedures to check the GIRepository version.

**Procedures**

\begin{verbatim}
[gi-version], page 79
[gi-effective-version], page 79
[gi-major-version], page 79
[gi-minor-version], page 79
[gi-micro-version], page 79
[gi-check-version], page 79
\end{verbatim}

**Description**

Procedures to check the GIRepository version.

**Procedures**

\begin{verbatim}
gi-version
gi-effective-version
[Procedure]
gi-major-version \texttt{[as-integer? \#f]} \quad \text{[Procedure]}
gi-minor-version \texttt{[as-integer? \#f]} \quad \text{[Procedure]}
gi-micro-version \texttt{[as-integer? \#f]} \quad \text{[Procedure]}
\end{verbatim}

Returns a string describing GIRepository full version number, effective version number, major, minor or micro version number, respectively.

The last three procedures will return the major, minor or micro version number as an integer if the optional \texttt{as-integer?} argument is \texttt{\#t}.

\begin{verbatim}
gi-check-version \texttt{major\ minor\ micro} \quad \text{[Procedure]}
\end{verbatim}

Returns \texttt{\#t} if the GIRepository version is the same as or newer than the \texttt{major\ minor\ micro} passed-in version.

**Base Info**

G-Golf Base Info low level API.

\texttt{GIBaseInfo} — Base struct for all GITypeLib structs.
Procedures

[g-base-info-ref], page 80
[g-base-info-unref], page 81
[g-base-info-equal], page 81
[g-base-info-get-type], page 81
[g-base-info-get-typelib], page 81
[g-base-info-get-namespace], page 81
[g-base-info-get-name], page 81
[g-base-info-get-attribute], page 81
[g-base-info-iterate-attributes], page 81
[g-base-info-get-container], page 81
[g-base-info-is-deprecated], page 81

Types and Values

[%gi-info-type], page 82

Struct Hierarchy

GIBaseInfo
  +— GIArgInfo
  +— GICallableInfo
  +— GIConstantInfo
  +— GIFieldInfo
  +— GIPROPERTYINFO
  +— GIRegisteredTypeInfo
  +— GITypeInfo

Description

GIBaseInfo is the common base struct of all other *Info structs accessible through the
GIRepository API.

Most GIRepository APIs returning a GIBaseInfo is actually creating a new struct, in
other words, [g-base-info-unref], page 81, has to be called when done accessing the data.
GIBaseInfos are normally accessed by calling either [g-repository-find-by-name], page 76,
[g-repository-find-by-gtype], page 76, or [g-repository-get-info], page 75.

Example: Getting the Button of the Gtk typelib

```
use (g-golf gi)
(g-repository-require "Gtk")
(g-repository-find-by-name "Gtk" "Button")
⇒ $4 = #<pointer 0x20e0000>
... use button info ...
(g-base-info-unref $4)
```

Procedures

Note: in this section, the info, info1 and info2 arguments are [must be] pointers to a
GIBaseInfo.
g-base-info-ref info
Returns the same info.
Increases the reference count of info.

g-base-info-unref info
Returns nothing.
Decreases the reference count of info. When its reference count drops to 0, the info is freed.

g-base-info-equal info1 info2
Returns #t if and only if info1 equals info2.
Compared two GIBaseInfo.
Using pointer comparison is not practical since many functions return different instances of GIBaseInfo that refers to the same part of the typelib: use this procedure instead to do GIBaseInfo comparisons.

g-base-info-get-type info
Returns the info type of info.

g-base-info-get-typelib info
Returns a pointer to the GITypelib the info belongs to.

g-base-info-get-namespace info
Returns the namespace of info

g-base-info-get-name info
Returns the name of info or #f if it lacks a name.
What the name represents depends on the GIInfoType of the info. For instance for GIFunctionInfo it is the name of the function.

g-base-info-get-attribute info name
Returns the value of the attribute or #f if not such attribute exists.

g-base-info-iterate-attributes info proc
Returns nothing.
Iterate and calls proc over all attributes associated with this node. proc must be a procedure of two arguments, the name and the value of the attribute.

g-base-info-get-container info
Returns a pointer to a GIBaseInfo.
The container is the parent GIBaseInfo. For instance, the parent of a GIFunctionInfo is an GIOBJECTInfo or GIInterfaceInfo.

g-base-info-is-deprecated info
Returns #t if deprecated.
Obtain whether info represents a metadata which is deprecated or not.
Types and Values

%gi-info-type [Instance Variable of <gi-enum>]
An instance of <gi-enum>, who’s members are the scheme representation of the type of a GIBaseInfo struct:
  g-name: GIInfoType
  name: gi-info-type
  enum-set:
    invalid
    function
    callback
    struct
    boxed
    enum
    flags
    object
    interface
    constant
    error-domain
    union
    value
    signal
    vfunc
    property
    field
    arg
    type
    unresolved

Callable Info
G-Golf Callable Info low level API.
GICallableInfo — Struct representing a callable.

Procedures

  [g-callable-info-get-n-args], page 83
  [g-callable-info-get-arg], page 83
  [g-callable-info-get-caller-owns], page 83
  [g-callable-info-get-instance-ownership-transfer], page 83
  [g-callable-info-get-return-type], page 83
  [g-callable-info-is-method], page 83
  [g-callable-info-may-return-null], page 84
  [g-callable-info-create-closure], page 84

Struct Hierarchy

  GIBaseInfoInfo
  +— GICallableInfo
III. G-Golf Core Reference

+— GIFunctionInfo
+— GICallbackInfo
+— GISignalInfo
+— GIVFuncInfo

Description

GICallableInfo represents an entity which is callable. Examples of callable are: functions (GIFunctionInfo), virtual functions, (GIVFuncInfo), callbacks (GICallbackInfo).

A callable has a list of arguments (GIArgInfo), a return type, direction and a flag which decides if it returns null.

Procedures

Note: in this section, the info argument is [must be] a pointer to a GICallableInfo.

**g-callable-info-get-n-args info**

[Procedure]

Returns the number of arguments this info expects.

Obtain the number of arguments (both IN and OUT) for this info.

**g-callable-info-get-arg info n**

[Procedure]

Returns a pointer to the nth GIArgInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-callable-info-get-caller-owns info**

[Procedure]

Returns a GITransfer enumerated value.

See whether the caller owns the return value of this callable. See [%gi-transfer], page 105, for the list of possible values.

**g-callable-info-get-instance-ownership-transfer info**

[Procedure]

Returns a GITransfer enumerated value.

Obtains the ownership transfer for the instance argument. See [%gi-transfer], page 105, for the list of possible values.

**g-callable-info-get-return-type info**

[Procedure]

Returns a pointer to the GITypeInfo.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-callable-info-is-method info**

[Procedure]

Returns #t if the callable info is a method, otherwise it return #f.

Determines if the callable info is a method. For GIVFuncInfo and GISignalInfo, this is always true. Otherwise, this looks at the GI_FUNCTION_IS_METHOD flag on the GIFunctionInfo.

Concretely, this function returns whether [g-callable-info-get-n-args], page 83, matches the number of arguments in the raw C method. For methods, there is one more C argument than is exposed by introspection: the ‘self’ or ‘this’ object.
g-callable-info-may-return-null info [Procedure]
Returns #t if the callable info could return NULL.
See if a callable could return NULL.

g-callable-info-create-closure info ffi-cif ffi-closure-callback user-data [Procedure]
Returns the ffi-closure or #f on error.
The return value should be freed by calling g-callable-info-destroy-closure.

Function Info
G-Golf Function Info low level API.
GIFunctionInfo — Struct representing a function.

Procedures

[gi-function-info-is-method?], page 84
[g-function-info-get-flags], page 85
[g-function-info-get-property], page 85
[g-function-info-get-symbol], page 85
[g-function-info-get-vfunc], page 85
[g-function-info-invoke], page 85

Types and Values

[%g-function-info-flags], page 86

Struct Hierarchy

GIBaseInfoInfo
  +— GICallableInfo
    +— GIFunctionInfo
    +— GISignalInfo
    +— GIVFuncInfo

Description
GIFunctionInfo represents a function, method or constructor. To find out what kind of
type an entity a GIFunctionInfo represents, call [g-function-info-get-flags], page 85.
See also [Callable Info], page 82, for information on how to retrieve arguments and other
metadata.

Procedures

Note: in this section, the info argument is [must be] a pointer to a GIFunctionInfo.

gi-function-info-is-method? info [flags #f] [Procedure]
Returns #t if info is a method, that is if is-method is a member of the info flags.
Otherwise, it returns #f.
The optional flags argument, if passed, must be the list of the function info flags as returned by [g-function-info-get-flags], page 85.
**g-function-info-get-flags info**  
[Procedure]  
Returns a list of [g-function-info-flags], page 86.  
Obtain the GFunctionInfoFlags for info.

**g-function-info-get-property info**  
[Procedure]  
Returns a pointer or #f.  
Obtains the GPropertyInfo associated with info. Only GFunctionInfo with the flag is-getter or is-setter have a property set. For other cases, #f will be returned.  
The GPropertyInfo must be freed by calling [g-base-info-unref], page 81, when done.

**g-function-info-get-symbol info**  
[Procedure]  
Returns a string.  
Obtain the ‘symbol’ of the function\(^{28}\).

**g-function-info-get-vfunc info**  
[Procedure]  
Returns a pointer or #f.  
Obtains the GVFuncInfo associated with info. Only GFunctionInfo with the flag wraps-vfunc has its virtual function set. For other cases, #f will be returned.  
The GVFuncInfo must be freed by calling [g-base-info-unref], page 81, when done.

**g-function-info-invite info in-args n-in out-args n-out r-val error**  
[Procedure]  
Returns #t if the function has been invoked, #f if an error occurred.  
Invokes the function described in info with the given arguments. Note that inout parameters must appear in both argument lists. The arguments are:

- **info**: a pointer to a GFunctionInfo describing the function to invoke.
- **in-args**: a pointer to an array of GIArguments, one for each in and inout parameter of info. If there are no in parameter, in-args must be the %null-pointer.
- **n-in**: the length of the in-args array.
- **out-args**: a pointer to an array of GIArguments, one for each out and inout parameter of info. If there are no out parameter, out-args must be the %null-pointer.
- **n-out**: the length of the out-args array.
- **r-val**: a pointer to a GIArguments, the return location for the return value of the function. If the function returns void, r-val must be the %null-pointer.

---

\(^{28}\) As you have noticed already, since g-function-info-get-symbol returns a string, in the Glib, GObject and GObject Introspection worlds, symbol has a different meaning then in the Lisp/Scheme worlds. However, since the procedure is part of the G-Golf low-level API, we decided to keep its name as close as the original name as possible, which in Glib terms is the name of the exported function, ‘suitable to be used as an argument to g_module_symbol()’
a pointer to a newly allocated (and ‘empty’) GError (the recommended way for procedure calls that need such a pointer is to ‘surround’ the call using [with-gerror], page 113).

Types and Values

%g-function-info-flags  [Instance Variable of <gi-flags>]

An instance of [<gi-flags>], page 119, who’s members are the scheme representation of the GIFunctionInfoFlags:

- g-name: GIFunctionInfoFlags
- name: gi-function-info-flags
- enum-set:
  - is-method
    - Is a method.
  - is-constructor
    - Is a constructor.
  - is-getter
    - Is a getter of a GIPROPERTYInfo.
  - is-setter
    - Is a setter of a GIPROPERTYInfo.
  - wraps-vfunc
    - Represent a virtual function.
  - throws
    - The function may throw an error.

Signal Info

G-Golf Signal Info low level API.
GISignalInfo — Struct representing a signal.

Procedures

[g-signal-info-get-flags], page 87

Description

GISignalInfo represents a signal. It’s a sub-struct of GICallableInfo and contains a set of flags and a class closure.

See also [Callable Info], page 82, for information on how to retrieve arguments and other metadata from the signal.

Struct Hierarchy

GIBaseInfoInfo
  +— GICallableInfo
    +— GIFunctionInfo
    +— GISignalInfo
    +— GIVFuncInfo
III. G-Golf Core Reference

Procedures
Note: in this section, the info argument is [must be] a pointer to a GISignalInfo.

**g-signal-info-get-flags info**  
Returns a list of [g-signal-flags], page 73.  
Obtain the flags for this signal info. See [g-signal-flags], page 73, for more information about possible flag values.

VFunc Info
G-Golf VFunc Info low level API.
GIVFuncInfo — Struct representing a virtual function

Procedures

- [g-vfunc-info-get-flags], page 87
- [g-vfunc-info-get-offset], page 87
- [g-vfunc-info-get-signal], page 87
- [g-vfunc-info-get-invoker], page 88

Types and Values

- [gi-vfunc-info-flags], page 88

Description
GIVFuncInfo represents a virtual function.

A virtual function is a callable object that belongs to either a [Object Info], page 94, or a [Interface Info], page 99.

Procedures
Note: in this section, the info argument is [must be] a pointer to a GIVFuncInfo.

**g-vfunc-info-get-flags info**  
Returns a (possibly empty) list.  
Obtains and returns the flags for the virtual function info. See [gi-vfunc-info-flags], page 88, for the possible flag values.

**g-vfunc-info-get-offset info**  
Returns an offset or #f.  
Obtains and returns the offset of the virtual function in the class struct. The value #f indicates that the offset is unknown.

**g-vfunc-info-get-signal info**  
Returns a pointer or #f.  
Obtains and returns a signal (a pointer to a Signal Info, page 86) for the virtual function if one is set. The signal comes from the object or interface to which this virtual function belongs.
g-vfunc-info-get-invoker info

Returns a pointer or #f.

If this virtual function has an associated invoker method, this procedure will return it (a pointer to a [Function Info], page 84). An invoker method is a C entry point.

Not all virtuals will have invokers.

The GIFunctionInfo, if one was returned, must be freed by calling [g-base-info-unref], page 81,

Types and Values

%gi-vfunc-info-flags

An instance of <gi-flags>, page 119, who’s members are the scheme representation of the flags of a GIVFuncInfo:

  g-name: GIVFuncInfoFlags
  name: gi-vfunc-info-flags
  enum-set:
    must-chain-up
    must-override
    must-not-override
    throws

Registered Type Info

G-Golf Registered Type Info low level API.
GIRegisteredTypeInfo — Struct representing a struct with a GType.

Procedures

[g-registered-type-info-name], page 89
[g-registered-type-info-get-type-name], page 89
[g-registered-type-info-get-type-init], page 89
[g-registered-type-info-get-g-type], page 89

Struct Hierarchy

GIBaseInfo
  +— GIRegisteredTypeInfo
    +— GIEnumInfo
    +— GIInterfaceInfo
    +— GIObjectInfo
    +— GIStructInfo
    +— GIUnionInfo

Description

GIRegisteredTypeInfo represents an entity with a GType associated. Could be either a GIEnumInfo, GIInterfaceInfo, GIObjectInfo, GIStructInfo or a GIUnionInfo.

A registered type info struct has a name and a type function.
Procedures

Note: in this section, the info argument is [must be] a pointer to a GIRegisteredTypeInfo.

\[\text{gi-registered-type-info-name info} \]  
Returns a type name.

Some registered type are not ‘registered’, and calling [g-registered-type-info-get-type-name], page 89, returns #f\(^{29}\).

Even though they are ‘unnamed’, some are present in their typelib, like "GLib" "SpawnFlags", or "GObject" "ParamFlags", and may be imported - sometimes manually, sometimes automatically.

In G-Golf, imported GIRegisteredTypeInfo must have a unique name, since it is used as the secondary key in its cache ‘mechanism’ (See [Cache Park], page 31).

Obtains and returns a unique name for info. If [g-registered-type-info-get-type-name], page 89, returns a name, that name is returned. Otherwise, it returns a name composed of the namespace and name for info.

Here is an example, to illustrate:

\[
\text{(g-irepository-find-by-name "GObject" "ParamFlags")} \\
\Rightarrow 2 = \text{#<pointer 0x5654c59ee4f0>} \\
\text{(g-registered-type-info-get-type-name 2)} \\
\Rightarrow 3 = \#f \\
\text{(gi-registered-type-info-name 2)} \\
\Rightarrow 4 = "GObjectParamFlags" \\
\text{(g-name->name 4)} \\
\Rightarrow 5 = g-object-param-flags
\]

\[\text{g-registered-type-info-get-type-name info} \]  
Returns the type name.

Obtain the type name of the struct within the GObject type system. This name can be passed to g_type_from_name to get a GType.

\[\text{g-registered-type-info-get-type-init info} \]  
Returns the name of the type init function.

Obtain the type init function for info. The type init function is the function which will register the GType within the GObject type system. Usually this is not called by langauge bindings or applications.

\[\text{g-registered-type-info-get-g-type info} \]  
Returns the GType for info.

\(^{29}\) Another symptom for those is that if you call ([g-type-name], page 55, g-type), it returns "void".
Obtain the GType for this registered type or G_TYPE_NONE which has a special meaning. It means that either there is no type information associated with this info or that the shared library which provides the type_init function for this info cannot be called.

**Enum Info**

G-Golf Enum Info low level API.

GIEnumInfo — Structs representing an enumeration and its values.

**Procedures**

- [gi-enum-import], page 90
- [gi-enum-value-values], page 90
- [g-enum-info-get-n-values], page 90
- [g-enum-info-get-value], page 91
- [g-enum-info-get-n-methods], page 91
- [g-enum-info-get-method], page 91
- [g-value-info-get-value], page 91

**Struct Hierarchy**

- GIBaseInfo
  - GIRegisteredTypeInfo
    - GIEnumInfo

**Description**

GIEnumInfo represents an argument. An argument is always part of a GICallableInfo.

**Procedures**

Note: in this section, unless otherwise specified, the info argument is [must be] a pointer to a GIEnumInfo.

**gi-enum-import info**

[Procedure]

Returns a <gi-enum> instance.

Obtains the values this enumeration contains, then makes and returns a <gi-enum> instance.

**gi-enum-value-values info**

[Procedure]

Returns an alist.

Obtains and returns the list pairs (symbol . id) the enum GI definition pointed by info contains. If you think the name is strange, compare it with, for example [gi-struct-field-types], page 92: just like a GIStructInfo holds a list of pointers to GIFieldInfo from which we get the (field) type, aGIEnumInfo holds a list of pointers to GIValueInfo from which we get the (enum) value - which in the GI world is a name (a string) that we transform, in the scheme world, to a symbol.

**g-enum-info-get-n-values info**

[Procedure]

Returns the number of values.

Obtains the number of values this enumeration contains.
g-enum-info-get-value info index

[Procedure]

Returns a pointer to a GIValueInfo or #f if type tag is wrong.

Obtains a value for this enumeration. The GIValueInfo must be free’d using g-base-info-unref when done.

index is a 0-based offset into info for a value.

g-enum-info-get-n-methods info

[Procedure]

Returns the number of methods.

Obtains the number of methods this enumeration has.

g-enum-info-get-method info index

[Procedure]

Returns a pointer to a GIFunctionInfo or #f if type tag is wrong.

Obtains a method for this enumeration. The GIFunctionInfo must be free’d using g-base-info-unref when done.

index is a 0-based offset into info for a method.

g-value-info-get-value info

[Procedure]

Returns the enumeration value.

Obtains a value of the GIValueInfo.

info is [must be] a pointer to a GIValueInfo.

Struct Info

G-Golf Struct Info low level API.

GIStructInfo — Structs representing a C structure.

Procedures

[gi-struct-import], page 92
[gi-struct-field-desc], page 92
[gi-struct-field-types], page 92
[g-struct-info-get-alignment], page 92
[g-struct-info-get-size], page 92
[g-struct-info-is-gtype-struct], page 92
[g-struct-info-is-foreign], page 92
[g-struct-info-get-n-fields], page 92
[g-struct-info-get-field], page 92
[g-struct-info-get-n-methods], page 93
[g-struct-info-get-method], page 93

Struct Hierarchy

GIBaseInfo
  +— GIRegisteredTypeInfo
  └— GIStructInfo

Description

GIStructInfo represents a generic C structure type.
A structure has methods and fields.

**Procedures**

Note: in this section, unless otherwise specified, the *info* argument is [must be] a pointer to a **GIStruct**.

**gi-struct-import** *info*  
[Procedure]  
Returns a `<gi-struct>` instance.  
Obtains the list of (field) types the C struct GI definition pointed by *info* contains, then makes and returns a `<gi-struct>` instance.

**gi-struct-field-desc** *info*  
[Procedure]  
Returns a list.  
Obtains and returns the list of (field) descriptions for *info*. A field description is a list: (name type-tag offset flags).

**gi-struct-field-types** *info*  
[Procedure]  
Returns a list.  
Obtains and returns the list of (field) types the C struct GI definition pointed by *info* contains.

**g-struct-info-get-alignment** *info*  
[Procedure]  
Returns an integer.  
Obtains and returns the required alignment for *info*.

**g-struct-info-get-size** *info*  
[Procedure]  
Returns an integer.  
Obtains and returns the total size of the structure specified *info*.

**g-struct-info-is-gtype-struct** *info*  
[Procedure]  
Returns #t or #f.  
Return true if the structure specified by *info* represents the "class structure" for some GObject or GInterface.

**g-struct-info-is-foreign** *info*  
[Procedure]  
Returns #t or #f.  
FIXME. No upstream documentation, though the procedure works.

**g-struct-info-get-n-fields** *info*  
[Procedure]  
Returns an integer.  
Obtains the number of fields for *info*.

**g-struct-info-get-field** *info* *n*  
[Procedure]  
Returns a pointer.  
Obtains and returns the *info* type information (a pointer to a **GFieldInfo**) for the field at the specified *n* index.  
The **GFieldInfo** must be freed by calling [g-base-info-unref], page 81, when done.
III. G-Golf Core Reference

\textbf{g-struct-info-get-n-methods} \textit{info} \hspace{1cm} \textbf{[Procedure]}

Returns an integer.

Obtains the number of methods for \textit{info}.

\textbf{g-struct-info-get-method} \textit{info} \textit{n} \hspace{1cm} \textbf{[Procedure]}

Returns a pointer.

Obtains and returns the \textit{info} type information (a pointer to a \textit{GIFunctionInfo}) for the method at the specified \textit{n} index.

The \textit{GIFunctionInfo} must be freed by calling \textit{[g-base-info-unref]}, page 81, when done.

\textbf{Union Info}

G-Golf Union Info low level API.

\textit{GIUnionInfo} — Struct representing a C union.

\textbf{Procedures}

[\textit{g-union-info-get-n-fields}], page 93
[\textit{g-union-info-get-field}], page 93
[\textit{g-union-info-get-n-methods}], page 94
[\textit{g-union-info-get-method}], page 94
[\textit{g-union-info-is-discriminated?}], page 94
[\textit{g-union-info-get-discriminator-offset}], page 94
[\textit{g-union-info-get-discriminator-type}], page 94
[\textit{g-union-info-get-discriminator}], page 94
[\textit{g-union-info-get-size}], page 94
[\textit{g-union-info-get-alignment}], page 94

\textbf{Description}

\textit{GIUnionInfo} represents a union type.

A union has methods and fields. Unions can optionally have a discriminator, which is a field deciding what type of real union fields is valid for specified instance.

\textbf{Struct Hierarchy}

\textit{GIBaseInfo}

\textarrow{\textit{GIRegisteredTypeInfo}}

\textarrow{\textit{GIUnionInfo}}

\textbf{Procedures}

Note: in this section, unless otherwise specified, the \textit{info} argument is [must be] a pointer to a \textit{GIUnionInfo}.

\textbf{g-union-info-get-n-fields} \textit{info} \hspace{1cm} \textbf{[Procedure]}

Returns an integer.

Obtains and returns the number of fields the \textit{info} union has.

\textbf{g-union-info-get-field} \textit{info} \textit{n} \hspace{1cm} \textbf{[Procedure]}

Returns a pointer.
Obtains and returns a pointer to the GIFieldInfo for info, given its n. The GIFieldInfo must be free’d by calling [g-base-info-unref], page 81, when done.

**g-union-info-get-n-methods info**  
Returns an integer.  
Obtains and returns the number of methods the info union has.

**g-union-info-get-method info n**  
Returns a pointer.  
Obtains and returns a pointer to the GIFunctionInfo for info, given its n, which must be free’d by calling [g-base-info-unref], page 81, when done.

**g-union-info-is-discriminated? info**  
Returns #t if info contains a discriminator field, otherwise it returns #f.

**g-union-info-get-discriminator-offset info**  
Returns an integer.  
Obtains and returns the offset of the discriminator field for info.

**g-union-info-get-discriminator-type info**  
Returns a pointer.  
Obtains and returns a pointer to the GITypeInfo for info, which must be free’d by calling [g-base-info-unref], page 81, when done.

**g-union-info-get-discriminator info n**  
Returns a pointer.  
Obtains and returns a pointer to the GIConstantInfo assigned for the info n-th union field - i.e. the n-th union field is the active one if discriminator contains this constant (value) - which must be free’d by calling [g-base-info-unref], page 81, when done.

**g-union-info-get-size info**  
Returns an integer.  
Obtains and returns the total size of the union specified by info.

**g-union-info-get-alignment info**  
Returns an integer.  
Obtains and returns the required alignment for info.

**Object Info**

G-Golf Object Info low level API.  
GIObjectInfo — Structs representing a GObject.
III. G-Golf Core Reference

Procedures

[g-object-show], page 95
[g-object-property-names], page 96
[g-object-method-names], page 96
[g-object-method-find-by-name], page 97
[g-object-info-get-abstract], page 97
[g-object-info-get-parent], page 97
[g-object-info-get-type-name], page 97
[g-object-info-get-type-init], page 97
[g-object-info-get-n-constants], page 97
[g-object-info-get-constant], page 97
[g-object-info-get-n-fields], page 97
[g-object-info-get-field], page 97
[g-object-info-get-n-interfaces], page 97
[g-object-info-get-interface], page 97
[g-object-info-get-n-methods], page 98
[g-object-info-get-method], page 98
[g-object-info-find-method], page 98
[g-object-info-get-n-properties], page 98
[g-object-info-get-property], page 98
[g-object-info-get-n-signals], page 98
[g-object-info-get-signal], page 98
[g-object-info-find-signal], page 98
[g-object-info-get-n-vfuncs], page 98
[g-object-info-get-vfunc], page 98
[g-object-info-get-class-struct], page 98

Struct Hierarchy

GIBaseInfo
   +— GIRegisteredTypeInfo
      +— GIOBJECTInfo

Description

This doesn't represent a specific instance of a GObject, instead this represent the object type (eg class).
A GObject has methods, fields, properties, signals, interfaces, constants and virtual functions.

Procedures

Note: in this section, unless otherwise specified, the info argument is [must be] a pointer to a GIOBJECTInfo.

gi-object-show info
   Returns nothing.
Obtains and displays the following informations about the object (and its parent) pointed to by info:

```
use (g-golf)
(g-irepository-require "Clutter")
⇒ $2 = #<pointer 0x56396a4f9f80>

(g-irepository-find-by-name "Clutter" "Actor")
⇒ $3 = #<pointer 0x56396a4f0c00>

(gi-object-show $3)
⊣ #<pointer 0x56396a4f0c00> is a (pointer to a) GIObjectInfo:
⊣ Parent:
⊣   namespace: "GObject"
⊣   name: "InitiallyUnowned"
⊣   g-type: 94804596757600
⊣   g-type-name: "GInitiallyUnowned"
⊣ Object:
⊣   namespace: "Clutter"
⊣   name: "Actor"
⊣   g-type: 94804596864480
⊣   g-type-name: "ClutterActor"
⊣   abstract: #f
⊣   n-constants: 0
⊣   n-fields: 4
⊣   n-interfaces: 4
⊣   n-methods: 238
⊣   n-properties: 82
⊣   n-signals: 26
⊣   n-vfuncts: 35
```

**gi-object-property-names info**  [Procedure]

Returns a (possibly empty) list. Obtains and returns the (possibly empty) list of the (untranslated) GI property names for info (see [g-name->name], page 124, to obtain their scheme representation).

**gi-object-method-names info**  [Procedure]

Returns a (possibly empty) list. Obtains and returns the (possibly empty) list of pairs of the (untranslated) GI method names for info (see [g-name->name], page 124, to obtain their scheme representation). Each pair is composed of the info [g-function-info-get-symbol], page 85, and [g-base-info-get-name], page 81, names.
III. G-Golf Core Reference

### Procedure

**gi-object-method-find-by-name info name**

Returns a pointer or #f.

Obtains and returns a pointer to the method GIFunctionInfo contained in `info`, for which `[g-function-info-get-symbol]`, page 85, is `string=` to `name`. If there is such method, it returns #f.

**g-object-info-get-abstract info**

Returns #t if the `info` object type is abstract.

Obtain if the object type is an abstract type, eg if it cannot be instantiated.

**g-object-info-get-parent info**

Returns a pointer or #f.

Obtains and returns a pointer to the `info`’s parent GIObjectInfo, or #f if `info` has no parent.

**g-object-info-get-type-name info**

Returns the name of the object type for `info`.

Obtain the name of the object class/type for `info`.

**g-object-info-get-type-init info**

Returns a function name (a string).

Obtain the function name which when called will return the GType function for which this object type is registered.

**g-object-info-get-n-constants info**

Returns the number of constants for `info`.

Obtain the number of constants that this object type has.

**g-object-info-get-constant info n**

Returns a pointer to the nth GIConstantInfo of `info`.

It must be freed by calling `[g-base-info-unref]`, page 81, when done accessing the data.

**g-object-info-get-n-fields info**

Returns the number of fields for `info`.

Obtain the number of fields that this object type has.

**g-object-info-get-field info n**

Returns a pointer to the nth GIFieldInfo of `info`.

It must be freed by calling `[g-base-info-unref]`, page 81, when done accessing the data.

**g-object-info-get-n-interfaces info**

Returns the number of interfaces for `info`.

Obtain the number of interfaces that this object type has.

**g-object-info-get-interface info n**

Returns a pointer to the nth GIInterfaceInfo of `info`.

It must be freed by calling `[g-base-info-unref]`, page 81, when done accessing the data.
g-object-info-get-n-methods info

Returns the number of methods for info.

Obtain the number of methods that this object type has.

g-object-info-get-method info n

Returns a pointer to the nth GIFunctionInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

g-object-info-find-method info name

Returns a pointer to a GIFunctionInfo or #f if there is no method available with that name.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

g-object-info-get-n-properties info

Returns the number of properties for info.

Obtain the number of properties that this object type has.

g-object-info-get-property info n

Returns a pointer to the nth GIPropertyInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

g-object-info-get-n-signals info

Returns the number of signals for info.

Obtain the number of signals that this object type has.

g-object-info-get-signal info n

Returns a pointer to the nth GISignalInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

g-object-info-find-signal info name

Returns a pointer to a GISignalInfo or #f if there is no signal available with that name.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

g-object-info-get-n-vfuncs info

Returns the number of vfuncs for info.

Obtain the number of vfuncs that this object type has.

g-object-info-get-vfunc info n

Returns a pointer to the nth GIVfuncInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

g-object-info-get-class-struct info

Returns a pointer to the nth GIStructInfo of info, or #f.

Every GObject has two structures: an instance structure and a class structure. This function returns a pointer to the info class structure.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.
Interface Info

G-Golf Interface Info low level API.
GIInterfaceInfo — Structs representing a GInterface.

Procedures

[gi-interface-import], page 99
[gi-interface-show], page 99
[g-interface-info-get-n-prerequisites], page 101
[g-interface-info-get-prerequisite], page 101
[g-interface-info-get-n-properties], page 101
[g-interface-info-get-property], page 101
[g-interface-info-get-n-methods], page 101
[g-interface-info-get-method], page 101
[g-interface-info-find-method], page 101
[g-interface-info-get-n-signals], page 101
[g-interface-info-get-signal], page 101
[g-interface-info-find-signal], page 102
[g-interface-info-get-n-vfuncs], page 102
[g-interface-info-find-vfunc], page 102
[g-interface-info-get-vfunc], page 102
[g-interface-info-get-n-constants], page 102
[g-interface-info-get-constant], page 102
[g-interface-info-find-iface-struct], page 102

Description

A GInterface has methods, properties, signals, constants, virtual functions and prerequisites.

Struct Hierarchy

GIBaseInfo
  +— GIRegisteredTypeInfo
    +— GIInterfaceInfo

Procedures

Note: in this section, unless otherwise specified, the info argument is [must be] a pointer to a GIInterfaceInfo.

gi-interface-import info  [Procedure]
Returns a list.
In the current version of G-Golf, interfaces are ‘opaques’. Returns a list composed of the 'interface (type-tag) symbol, the interface (scheme and symbol) name, g-name, g-type and #t (a boolean that means the type is confirmed). Here is an example:
(interface gtk-orientable "GtkOrientable" 94578771473520 #t)

gi-interface-show info  [Procedure]
Returns nothing.
Obtains and displays the following informations about the interface pointed to by info:

```scheme
(use (g-golf)
  (g-irepository-require "Gdk" #:version "4.0")
⇒ $2 = #<pointer 0x55649014c780>

(g-irepository-find-by-name "Gdk" "Paintable")
⇒ $3 = #<pointer 0x5564901531e0>

(gi-interface-show $3)
⊣ #<pointer 0x5564901531e0> is a (pointer to a) GIInterfaceInfo:
⊣
  | namespace: "Gdk"
  |   name: "Paintable"
  |   g-type: 93947637686432
  |   g-type-name: "GdkPaintable"
  | n-prerequisites: 0
  | n-properties: 0
  | n-methods: 10
  | n-signals: 2
  | n-vfuncs: 6
  | n-constants: 0
  | iface-struct: #<pointer 0x5571e38ec190>
  | iface-struct-name: "PaintableInterface"
  | Methods:
  | 0. #f
gdk-paintable-new-empty
  | 1. compute-concrete-size
gdk-paintable-compute-concrete-size
  | 2. get-current-image
gdk-paintable-get-current-image
  | 3. get-flags
gdk-paintable-get-flags
  | ...
  | VFuncs:
  | 0. get-current-image
gdk-paintable-get-current-image
  | 1. get-flags
```
2. get-intrinsic-aspect-ratio

3. get-intrinsic-height

4. get-intrinsic-width

5. snapshot

**g-interface-info-get-n-prerequisites** info

Returns the number of prerequisites for info.

Obtain the number of prerequisites for this interface type. A prerequisite is another interface that needs to be implemented for interface, similar to a base class for GObjects.

**g-interface-info-get-prerequisite** info n

Returns a pointer to the nth prerequisite for info.

The prerequisite as a GIBaseInfo. It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-get-n-properties** info

Returns the number of properties for info.

Obtain the number of properties that this interface type has.

**g-interface-info-get-property** info n

Returns a pointer to the nth GIPropertyInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-get-n-methods** info

Returns the number of methods for info.

Obtain the number of methods that this interface type has.

**g-interface-info-get-method** info n

Returns a pointer to the nth GIFunctionInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-find-method** info name

Returns a pointer to a GIFunctionInfo or #f if there is no method available with that name.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-get-n-signals** info

Returns the number of signals for info.

Obtain the number of signals that this interface type has.

**g-interface-info-get-signal** info n

Returns a pointer to the nth GISignalInfo of info.

It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.
### III. G-Golf Core Reference

#### Procedures

**g-interface-info-find-signal info name**  
Returns a pointer to a GISignalInfo or #f if there is no signal available with that name.  
It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-get-n-vfuncs info**  
Returns the number of vfuncs for info.  
Obtain the number of vfuncs that this interface type has.

**g-interface-info-get-vfunc info n**  
Returns a pointer to the nth GIVfuncInfo of info.  
It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-find-vfunc info name**  
Returns a pointer to a GIFunctionInfo or #f if there is no signal available with that name.  
It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-get-n-constants info**  
Returns the number of constants for info.  
Obtain the number of constants that this interface type has.

**g-interface-info-get-constant info n**  
Returns a pointer to the nth GIConstantInfo of info.  
It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

**g-interface-info-get-iface-struct info**  
Returns a pointer to a GIStructInfo for info, or #f.  
Obtains and returns the layout C structure associated with info. It must be freed by calling [g-base-info-unref], page 81, when done accessing the data.

#### Arg Info

G-Golf Arg Info low level API.  
GIArgInfo — Struct representing an argument.

**Procedures**

* [g-arg-info-get-closure], page 103  
* [g-arg-info-get-destroy], page 103  
* [g-arg-info-get-direction], page 103  
* [g-arg-info-get-ownership-transfer], page 103  
* [g-arg-info-get-scope], page 103  
* [g-arg-info-get-type], page 103  
* [g-arg-info-may-be-null], page 104  
* [g-arg-info-is-caller-allocates], page 104  
* [g-arg-info-is-optional], page 104  
* [g-arg-info-is-return-value], page 104  
* [g-arg-info-is-skip], page 104
Types and Values

[gi-direction], page 104
[gi-scope-type], page 104
[gi-transfer], page 105

Struct Hierarchy

GIBaseInfo
— GIArgInfo

Description

GIArgInfo represents an argument. An argument is always part of a GICallableInfo.

Procedures

Note: in this section, the info argument is [must be] a pointer to a GIArgInfo.

\[\text{g-arg-info-get-closure info}\] [Procedure]

Returns the index of the user data argument or -1 if there is none.

Obtains the index of the user data argument. This is only valid for arguments which are callbacks.

\[\text{g-arg-info-get-destroy info}\] [Procedure]

Returns the index of the GDestroyNotify argument or -1 if there is none.

Obtains the index of the GDestroyNotify argument. This is only valid for arguments which are callbacks.

\[\text{g-arg-info-get-direction info}\] [Procedure]

Returns a symbol.

Obtains and returns the [gi-direction], page 104, of the argument.

\[\text{g-arg-info-get-ownership-transfer info}\] [Procedure]

Returns a symbol.

Obtains and returns the [gi-transfer], page 105, for this argument.

\[\text{g-arg-info-get-scope info}\] [Procedure]

Returns a symbol.

Obtains and returns the [gi-scope-type], page 104, for this argument. The scope type explains how a callback is going to be invoked, most importantly when the resources required to invoke it can be freed.

\[\text{g-arg-info-get-type info}\] [Procedure]

Returns a pointer.

Obtains the GITypeInfo holding the type information for info. Free it using [g-base-info-unref], page 81, when done.
**g-arg-info-may-be-null info**  
Returns #t or #f.
Obtains if the type of the argument includes the possibility of NULL. For 'in' values this means that NULL is a valid value. For 'out' values, this means that NULL may be returned.

**g-arg-info-is-caller-allocates info**  
Returns #t or #f.
Obtain if the argument is a pointer to a struct or object that will receive an output of a function. The default assumption for out arguments which have allocation is that the callee allocates; if this is TRUE, then the caller must allocate.

**g-arg-info-is-optional info**  
Returns #t or #f.
Obtains if the argument is optional. For 'out' arguments this means that you can pass NULL in order to ignore the result.

**g-arg-info-is-return-value info**  
Returns #t or #f.
Obtains if the argument is a return value. It can either be a parameter or a return value.

**g-arg-info-is-skip info**  
Returns #t or #f.
Obtains if an argument is only useful in C.

**Types and Values**

%gi-direction  
An instance of <gi-enum>, who’s members are the scheme representation of the direction of a GIArgInfo:

- *g-name*: GIDirection
- *name*: gi-direction
- *enum-set*:
  - in: in argument.
  - out: out argument.
  - inout: in and out argument.

%gi-scope-type  
An instance of <gi-enum>, who’s members are the scheme representation of the scope of a GIArgInfo. Scope type of a GIArgInfo representing callback, determines how the callback is invoked and is used to decide when the invoke structs can be freed.

- *g-name*: GIScopeType
- *name*: gi-scope-type
- *enum-set*:
  - invalid: The argument is not of callback type.
The callback and associated user_data is only used during the call to this function.

The callback and associated user_data is only used until the callback is invoked, and the callback is invoked always exactly once.

The callback and and associated user_data is used until the caller is notified via the destroy_notify.

\%gi-transfer

The transfer is the exchange of data between two parts, from the callee to the caller. The callee is either a function/method/signal or an object/interface where a property is defined. The caller is the side accessing a property or calling a function. GITransfer specifies who’s responsible for freeing the resources after the ownership transfer is complete. In case of a containing type such as a list, an array or a hash table the container itself is specified differently from the items within the container itself. Each container is freed differently, check the documentation for the types themselves for information on how to free them.

An instance of \texttt{\langle gi-enum\rangle}, who’s members are the scheme representation of the GITransfer:

\begin{verbatim}
g-name: GITransfer
name: gi-transfer
enum-set:

nothing  transfer nothing from the callee (function or the type instance the property belongs to) to the caller. The callee retains the ownership of the transfer and the caller doesn’t need to do anything to free up the resources of this transfer

container  transfer the container (list, array, hash table) from the callee to the caller. The callee retains the ownership of the individual items in the container and the caller has to free up the container resources \texttt{g_list_free, g_hash_table_destroy}, \ldots of this transfer

everything  transfer everything, eg the container and its contents from the callee to the caller. This is the case when the callee creates a copy of all the data it returns. The caller is responsible for cleaning up the container and item resources of this transfer
\end{verbatim}

Constant Info

G-Golf Constant Info low level API.

\texttt{GIConstantInfo} — Struct representing a constant.
Procedures

- \texttt{g-constant-info-free-value}, page 106
- \texttt{g-constant-info-get-type}, page 106
- \texttt{g-constant-info-get-value}, page 106

Struct Hierarchy

GIBaseInfo
  \hspace{1em}+— GIConstantInfo

Description

GIConstantInfo represents a constant. A constant has a type associated which can be obtained by calling \texttt{g-constant-info-get-type}, page 106, and a value, which can be obtained by calling \texttt{g-constant-info-get-value}, page 106.

Procedures

Note: in this section, the info and value arguments are [must be] pointers to a GIConstantInfo and a GIArgument, respectively.

\begin{verbatim}
g-constant-info-free-value info value
  Returns nothing.
  Frees the value returned from \texttt{g-constant-info-get-value}, page 106.

[g-constant-info-get-type info]
  Returns a pointer.
  Obtains and returns a pointer to the GITypeInfo for info. Free it using \texttt{g-base-info-unref}, page 81, when done.

[g-constant-info-get-value info value]
  Returns an integer (the size of a constant).
  Obtains the value associated with info and store it in the value parameter, which must be allocated before passing it.
  
  The size of the constant value stored in argument will be returned. Free the value argument with \texttt{g-constant-info-free-value}, page 106.
\end{verbatim}

Field Info

G-Golf Field Info low level API.

GIFieldInfo — Struct representing a struct or union field.

Procedures

\begin{verbatim}
[g-field-info-get-flags], page 107
[g-field-info-get-offset], page 107
[g-field-info-get-type], page 107
\end{verbatim}
Struct Hierarchy

GIBaseInfo
  +--> GIFieldInfo

Description

A GIFieldInfo struct represents a field of a struct (see [Struct Info], page 91), union (see GIUnionInfo) or an object (see [Object Info], page 94). The GIFieldInfo is fetched by calling [g-struct-info-get-field], page 92, g-union-info-get-field or [g-object-info-get-field], page 97. A field has a size, type and a struct offset associated and a set of flags, which are currently readable or writable.

Procedures

Note: in this section, unless otherwise specified, the info argument is [must be] a pointer to a GIFieldInfo.

[g-field-info-get-flags info]
[Procedure]
Returns a (possibly empty) list.
Obtains and returns the flags for info, which currently are readable or writable.

[g-field-info-get-offset info]
[Procedure]
Returns an unsigned integer.
Obtains and returns the offset in bytes for info, the field member, this is relative to the beginning of the struct or union.

[g-field-info-get-type info]
[Procedure]
Returns a pointer.
Obtains and returns the GITypeInfo for info.
The GITypeInfo must be freed by calling [g-base-info-unref], page 81, when done.

Property Info

G-Golf Property Info low level API.
GITypeInfo — Struct representing a property.

Procedures

[gi-property-g-type], page 108
[g-property-info-get-flags], page 108
[g-property-info-get-ownership-transfer], page 108
[g-property-info-get-type], page 108

Struct Hierarchy

GIBaseInfoInfo
  +-- GITypeInfo

Description

GIPropertyInfo represents a property. A property belongs to either a GIOBJECTINFO or a GIINTERFACEMINFO.
Procedures
Note: in this section, the info argument is [must be] a pointer to a GIPROPERTYINFO.

**gi-property-g-type info**
- Returns an integer.
- Obtains and returns the GType value of the property.

**g-property-info-get-flags info**
- Returns a list of [%g-param-flags], page 68.
- Obtain the flags for this property info. See [GParamSpec], page 66, for the list of possible flag values.

**g-property-info-get-ownership-transfer info**
- Returns the ownership transfer for this property.
- Obtain the ownership transfer for this property. See [%gi-transfer], page 105, for more information about transfer values.

**g-property-infoxs-get-type info**
- Returns a pointer to a GITypeInfo.
- Obtain the type information for this property. The GITypeInfo must be free’d using `g-base-info-unref` when done.

Type Info
G-Golf Type Info low level API.
GITypeInfo — Struct representing a type.

Procedures
- [g-info-type-to-string], page 109
- [g-type-info-is-pointer], page 109
- [g-type-info-get-tag], page 109
- [g-type-info-get-param-type], page 109
- [g-type-info-get-interface], page 109
- [g-type-info-get-array-length], page 109
- [g-type-info-get-array-fixed-size], page 109
- [g-type-info-is-zero-terminated], page 110
- [g-type-info-get-array-type], page 110

Struct Hierarchy
- GIBaseInfoInfo
  → GITypeInfo

Description
GITypeInfo represents a type. You can retrieve a type info from an argument (see [Arg Info], page 102), a functions return value (see [Function Info], page 84), a field (see GIMandFieldInfo), a property (see [Property Info], page 107), a constant (see GIConstantInfo) or for a union discriminator (see GIUnionInfo).
A type can either be a of a basic type which is a standard C primitive type or an interface type. For interface types you need to call `g-type-info-get-interface` to get a reference to the base info for that interface.

**Procedures**

Note: in this section, the `info` argument is [must be] a pointer to a `GITypeInfo`.

- **g-info-type-to-string** `info-type`  
  [Procedure]  
  Returns a string or `#f`.  
  Obtains the string representation for `info-type` or `#f` if it does not exists.  
  `info-type` can either be a `symbol` or an `id`, a member of the `enum-set` of `[%gi-info-type]`, page 82, (otherwise, `#f` is returned).

- **g-type-info-is-pointer** `info`  
  [Procedure]  
  Returns `#t` or `#f`.  
  Obtains if the `info` type is passed as a reference.  
  Note that the types of `out` and `inout` parameters (see `[%gi-direction]`, page 104) will only be pointers if the underlying type being transferred is a pointer (i.e. only if the type of the C function’s formal parameter is a pointer to a pointer).

- **g-type-info-get-tag** `info`  
  [Procedure]  
  Returns a symbol.  
  Obtains the type tag for `info` (see `[%gi-type-tag]`, page 78, for the list of type tags).

- **g-type-info-get-param-type** `info` `n`  
  [Procedure]  
  Returns a pointer or `#f`.  
  Obtains the parameter type `n` (the index of the parameter). When there is no such `n` parameter, the procedure returns `#f`.

- **g-type-info-get-interface** `info`  
  [Procedure]  
  Returns a pointer or `#f`.  
  For interface types (see `[%gi-type-tag]`, page 78) such as GObjects and boxed values, this procedure returns a (pointer to a) `GIBaseInfo`, holding full information about the referenced type. You can then inspect the type of the returned `GIBaseInfo` to further query whether it is a concrete GObject, a GInterface, a structure, etc. using `g-base-info-get-type`, page 81.

- **g-type-info-get-array-length** `info`  
  [Procedure]  
  Returns an interger.  
  Obtain the array length of the type. The type tag must be an `array` (see `[%gi-type-tag]`, page 78), or `-1` will returned.

- **g-type-info-get-array-fixed-size** `info`  
  [Procedure]  
  Returns an interger.  
  Obtain the fixed array size of the type. The type tag must be an `array` (see `[%gi-type-tag]`, page 78), or `-1` will returned.
g-type-info-is-zero-terminated info
[Procedure]
Returns #t or #f.
Obtains if the last element of the array is NULL. The type tag must be a array (see [%gi-type-tag], page 78), or #f will be returned.

g-type-info-get-array-type info
[Procedure]
Returns a symbol or #f.
Obtain the array type for this type (see [%gi-array-type], page 79). If the type tag of this type is not array, #f will be returned.

FFI Interface
G-Golf FFI Interface low level API.
girffi — TODO.

Procedures

[gi-type-tag-get-ffi-type], page 110
[g-type-info-get-ffi-type], page 110
[gi-type-info-extract-ffi-return-value], page 110
[g-type-tag-extract-ffi-return-value], page 111
[g-callable-info-prepare-closure], page 111

Description
TODO.

Procedures

gi-type-tag-get-ffi-type type-tag is-pointer?
[Procedure]
Returns a (pointer to) ffi-type corresponding to the platform default C ABI for type-tag and is-pointer?.
The info argument is (must be) a valid [%gi-type-tag], page 78, otherwise an exception is raised.
The is-pointer? argument, #t or #f, to indicate whether or not this is a pointer type.

g-type-info-get-ffi-type info
[Procedure]
Returns an (pointer to) ffi-type corresponding to the platform default C ABI for info.
The info argument is [must be] a pointer to a GITypeInfo.

gi-type-info-extract-ffi-return-value type-info ffi-value
[Procedure]
gi-argument
Returns nothing.
Extract the correct bits from ffi-value into gi-argument.
The type-info is the GITypeInfo of ffi-value. The ffi-value is a pointer to a GIFFIFIReturnValue union containing the value from the ffi_call(). The gi-argument is a pointer to an allocated GIArgument.
gi-type-tag-extract-ffi-return-value return-tag
   interface-type ffi-value gi-argument

Returns nothing.

Extract the correct bits from ffi-value into gi-argument.

The return-tag is the [%gi-type-tag], page 78, of ffi-value. The interface-type is the [%gi-info-type], page 82, of the underlying interface. The ffi-value is a pointer to a GIFFIReturnValue union containing the value from the ffi_call(). The gi-argument is a pointer to an allocated GIArgument.

The interface-type argument only applies if return-tag is 'interface, otherwise it is ignored.

g-callable-info-prepare-closure info ffi-cif ffi-closure-callback
   user-data

Returns the native address of the closure or #f on error.

The procedure has been deprecated since version 1.72 and should not be used in newly-written code. Use [g-callable-info-create-closure], page 84, instead.

The return value should be freed by calling g-callable-info-free-closure.

Utilities

G-Golf GObject Introspection Utilities low level API.
Procedures and Syntax

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>gi-pointer-new</td>
<td>Returns a newly allocated (Glib) pointer.</td>
</tr>
<tr>
<td>gi-pointer-inc pointer [#offset %gi-pointer-size]</td>
<td>Returns a foreign pointer object pointing to the address of pointer increased by offset.</td>
</tr>
<tr>
<td>gi-attribute-iter-new</td>
<td>Creates and returns a foreign pointer to a C struct for a GIAttributeIter (a C struct containg four pointers, initialized to %null-pointer).</td>
</tr>
</tbody>
</table>

Types and Values

[%gi-pointer-size], page 115

Description

G-Golf GObject Introspection utilities low level API.
**Syntax**

```plaintext
with-gerror var body
```

Returns the result of the execution of `body`, or raises an exception.

`var` must be an identifier. Evaluate `body` in a lexical environment where `var` is bound to a pointer to a newly allocated (and `empty`) `GError`. `var` will always be freed. If no exception is raised, the result of the execution of `body` is returned.

**Procedure**

```plaintext
gi->scm value type [cmpl #f]
```

Returns the scheme representation of `value`.

The `type`, a symbol name (also called a `type tag` or just a `tag` in the GI terminology) supported values are:

- `'boolean` Calls [gi-boolean->scm], page 113.
- `'string`
- `'pointer` Calls [gi-string->scm], page 113, or [gi-pointer->scm], page 113.
- `'n-string`
- `'n-pointer`
- `'n-gtype` Calls [gi-n-string->scm], page 113, [gi-n-pointer->scm], page 113, or [gi-n-gtype->scm], page 113.
  
  The optional `cmpl` (complement) argument must be passed and set to the number of string(s), pointer(s) or gtype(s) contained in `value`.

- `'strings`
- `'pointers`  
  Calls [gi-strings->scm], page 114, or [gi-pointers->scm], page 114.

- `'csv-string`  
  Calls [gi-csv-string->scm], page 114.

- `'glist`
- `'gslist`  
  Calls [gi-glist->scm], page 114, or [gi-gslist->scm], page 114, respectively.

**Procedure**

```plaintext
gi-boolean->scm value
```

Returns `#t` or `#f`.

The GType of `value` must be a `gboolean`.

**Procedure**

```plaintext
gi-string->scm value
```

**Procedure**

```plaintext
gi-pointer->scm value
```

Returns a string, a pointer or `#f` if `value` is the `%null-pointer`.

The GType of `value` must be a `gchar*` or a `gpointer`.

**Procedure**

```plaintext
gi-n-string->scm value n-string
```

**Procedure**

```plaintext
gi-n-pointer->scm value n-pointer
```

**Procedure**

```plaintext
gi-n-gtype->scm value n-gtype
```

Returns a (possibly empty list) of string(s), pointer(s) or GType(s).

The GType of `value` must be a `gchar**`, a `gpointer[]` or a `GType[]`. The `n-string`, `n-pointer` and `n-gtype` argument must be the length of the `value` array.
### III. G-Golf Core Reference

#### Procedure

**gi-strings->scm value**

Returns a (possibly empty) list of strings or pointer.

The GType of value must be a `gchar**` or `gpointer[]`. The array must be NULL terminated.

**gi-pointers->scm value**

Returns a (possibly empty) list of strings or pointer.

**gi-csv-string->scm value**

Returns a list of string(s) or `#f` if value is the `%null-pointer`.

The GType of value is `gchar*`. Unless `#f`, the list of string(s) is obtained by splitting the (comma separated value) string pointed to by value using `#\`, as the char-pred.

**gi-glist->scm g-list**

**gi-gslist->scm g-slist**

Returns a (possibly empty) list.

Obtains and returns a (possibly empty) list of the pointers stored in the data field of each element of g-list or g-slist.

**scm->gi value type [cmpl #f]**

Returns the GI representation of value.

The type, a symbol name (also called a type tag or just a tag in the GI terminology) supported values are:

- `'boolean` Calls [scm->gi-boolean], page 114.
- `'string`
- `'pointer` Calls [scm->gi-string], page 114, or [scm->gi-pointer], page 114.
- `'n-string`
- `'n-pointer`
- `'n-gtype` Calls [scm->gi-n-string], page 115, [scm->gi-n-pointer], page 115, or [scm->gi-n-gtype], page 115.

The optional cmpl (complement) argument may be passed and set to the number of string(s), pointer(s) or gtype(s) contained in value.

- `'strings`
- `'pointers`

Calls [scm->gi-strings], page 115, or [scm->gi-pointers], page 115.

- `'gslist` Calls [scm->gi-gslist], page 115.

**scm->gi-boolean value**

Returns 0 if value is `#f`, otherwise, it returns 1.

**scm->gi-string value**

**scm->gi-pointer value**

Returns a pointer.

If value is `#f`, it returns `%null-pointer`. Otherwise, it returns a pointer to the string in value or value.


\[\text{scm->gi-n-string} \ value \ [n-string \ #f]\]

\[\text{scm->gi-strings} \ value\]

Returns two values.

If \(value\) is the empty list, it returns \%null-pointer and an empty list. Otherwise, it returns a pointer to an array of pointer(s) to the string(s) in \(value\) and a list of the ‘inner’ string pointer(s).

It is the caller’s responsibility to maintain a reference to those inner pointer(s), until the array ‘itself’ (the first returned value) is no longer needed/used.

The array returned by \[scm->gi-strings\], page 115, is NULL terminated, whereas the array returned by \[scm->gi-n-string\], page 115, is not.

\[\text{scm->gi-n-pointer} \ value \ [n-pointer \ #f]\]

\[\text{scm->gi-n-gtype} \ value \ [n-gtype \ #f]\]

Returns a pointer.

If \(value\) is an empty list, it returns \%null-pointer. Otherwise, it returns a pointer to an array the pointer(s) or GType(s) in \(value\).

The returned array is not NULL nor 0-terminated.

\[\text{scm->gi-pointers} \ value\]

Returns a pointer.

If \(value\) is an empty list, it returns \%null-pointer. Otherwise, it returns a pointer to an array the pointer(s) in \(value\).

The returned array is NULL terminated.

\[\text{scm->gi-gslist} \ value\]

Returns a pointer.

If \(value\) is an empty list, it returns \%null-pointer. Otherwise, it returns a pointer to a GSList, with its element’s data being (in order), the pointer(s) in \(value\).

Types and Values

\%gi-pointer-size

The size (the number of bytes) that a (Glib) pointer occupies in memory (which is architecture dependent).

Support

G-Golf uses a series of support modules, each documented in the following subsections. You may either import them all, like this \(\text{(use-modules (g-golf support))}\), or individually, such as \(\text{(use-modules (g-golf support modules))}\), \(\text{(use-modules (g-golf support goops))}\), ...

Module

G-Golf Module Utilities.
Syntax

[re-export-public-interface], page 116

re-export-public-interface mod1 mod2 ...

Re-export the public interface of a mod1 mod2 ...

Invoked like use-modules, where each mod1 mod2 ... is a module name (a list of symbol(s)).

Goops

Syntax, Procedures and Methods

[class-direct-virtual-slots], page 116
[class-virtual-slots], page 116
[class-direct-g-property-slots], page 116
[class-g-property-slots], page 116
[mslot-set!], page 116
[generic?], page 116

class-direct-virtual-slots (self <class>)

Returns a list.

Obtains and returns the list of the class direct slots for self that satisfy the (eq? (slot-definition-allocation slot) #:virtual) predicate.

class-virtual-slots (self <class>)

Returns a list.

Obtains and returns the list of the class slots for self that satisfy the (eq? (slot-definition-allocation slot) #:virtual) predicate.

class-direct-g-property-slots (self <class>)

Returns a list.

Obtains and returns the list of the class direct slots for self that satisfy the (eq? (slot-definition-allocation slot) #:g-property) predicate.

class-g-property-slots (self <class>)

Returns a list.

Obtains and returns the list of the class slots for self that satisfy the (eq? (slot-definition-allocation slot) #:g-property) predicate.

mslot-set! inst s1 v1 s2 v2 s3 v3 ...

Returns nothing.

Performs a multiple slot-set! for inst, setting its slot named s1 to the value v1, s2 to v2, s3 to v3 ...

generic? value

Returns #t if value is a <generic> instance. Otherwise, it returns #f.
Enum
G-Golf class, accessors, methods and procedures to deal with C enum types.

Classes

[<enum>], page 117
[<gi-enum>], page 117

Procedures, Accessors and Methods

[!enum-set], page 118
[enum->value], page 118
[enum->values], page 118
[enum->symbol], page 118
[enum->symbols], page 118
[enum->name], page 118
[enum->names], page 118
[!g-type_], page 118
[!g-name], page 118
[!name__], page 118

Description
G-Golf class, accessors, methods and procedures to deal with C enum types.

Classes

<enum>  [Class]
The <enum> class is for enumerated values. Its (unique) slot is:

\begin{verbatim}
enum-set #:accessor !enum-set #:init-keyword #:enum-set
\end{verbatim}

Notes:

• the enum-set can’t be empty and so you must use the #:enum-set (#:init-keyword) when creating new <enum> instances;
• the #:enum-set (#:init-keyword) accepts either a list of symbols or a well-formed enum-set;
• a well-formed enum-set is a list of (symbol . id) pairs, where id is a positive integer.
• each symbol and each id of an enum-set must be unique.

Instances of the <enum> class are immutable (to be precise, there are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable')

<gi-enum>  [Class]
The <gi-enum> class is a subclass of <enum>. Its class-direct-slots are:

\begin{verbatim}
g-type #:accessor !g-type #:init-keyword #:g-type #:init-value #f
\end{verbatim}
The `name` slot is automatically initialized.

Instances of the `<gi-enum>` class are immutable (to be precise, there are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

### Procedures, Accessors and Methods

#### [Accessor]

`!enum-set (inst <enum>)`

Returns the content of the enum-set slot for `inst`.

#### [Method]

`enum->value (inst <enum>) symbol`

Returns the `inst` value for `symbol` (or `#f` if it does not exists), or the list of all values for `inst`, respectively.

`enum->values (inst <enum>)`

Returns the `inst` value for `symbol` (or `#f` if it does not exists), or the list of all values for `inst`, respectively.

`enum->symbol (inst <enum>) value`

Returns the `inst` symbol for `value` (or `#f` if it does not exists), or the list of all symbols for `inst`, respectively.

`enum->symbols (inst <enum>)`

Returns the `inst` symbol for `value` (or `#f` if it does not exists), or the list of all symbols for `inst`, respectively.

`enum->name (inst <enum>) value`

`enum->names (inst <enum>)`

Returns the `inst` name (the string representation of the symbol) for `value` (or `#f` if it does not exists), or the list of all names for `inst`, respectively.

#### Flags

G-Golf class, accessors, methods and procedures to deal with C flags types.

### Classes

[<flags>], page 119

[<gi-flags>], page 119

### Procedures, Accessors and Methods

[integer->flags], page 119

[flags->integer], page 119

[!g-type___], page 119

[!g-name______], page 119

[!name______], page 119
Description
G-Golf class, accessors, methods and procedures to deal with C flags types.

Classes
<flags> [Class]
The <flags> class is a subclass of [enum], page 117. It has no direct slots.
<gi-flags> [Class]
The <gi-flags> class is a subclass of <flags>. Its class-direct-slots are:

   g-type #:accessor !g-type  #:init-keyword #:g-type  #:init-value #f
   g-name #:accessor !g-name  #:init-keyword #:g-name

The name slot is automatically initialized.

Instances of the <gi-flags> class are immutable (to be precise, there are not meant to
be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

Procedures, Accessors and Methods

integer->flags (inst <flags>) n [Method]
Returns a possibly empty) list of symbol(s).
Obtains and returns the list of (symbol) flags for the given <flags> instance and its
integer representation n.

flags->integer (inst <flags>) flags [Method]
Returns an integer.
Compute and returns the integer representation for the list of (symbol(s)) given by
flags and the given <flag> instance.

!g-type (inst <gi-flags>) [Accessor]
!g-name (inst <gi-flags>) [Accessor]
!name (inst <gi-flags>) [Accessor]
Returns the content of the g-type, g-name or name slot for inst, respectively.

Struct
G-Golf class, accessors, methods and procedures to deal with C struct types.

Classes
[<gi-struct>], page 120
III. G-Golf Core Reference

Procedures and Accessors

![g-name_], page 121
![name____], page 121
![alignment], page 121
![size], page 121
![is-gtype-struct?], page 121
![is-foreign?], page 121
![field-types], page 121
![scm-types], page 121
![init-vals], page 121
![is-opaque?], page 121
![is-semi-opaque?], page 121

Description

G-Golf class, accessors, methods and procedures to deal with C struct types.

Classes

<gi-struct>  
The <gi-struct> class is a subclass of <struct>. Its class-direct-slots are:

  g-name         #:accessor !g-name  
                 #:init-keyword #:g-name
  name           #:accessor !name
  alignment      #:accessor !alignment  
                 #:init-keyword #:alignment
  size           #:accessor !size  
                 #:init-keyword #:size
  is-gtype-struct?  
                 #:accessor !is-gtype-struct?  
                 #:init-keyword #:is-gtype-struct?
  field-types    #:accessor !field-types
                 #:init-keyword #:field-types
  scm-types      #:accessor !scm-types
  init-vals      #:accessor !init-vals
  is-opaque?     #:accessor !is-opaque?
  is-semi-opaque #:accessor !is-semi-opaque?
The name and scm-types slots are automatically initialized.

Instances of the <gi-struct> are immutable (to be precise, there are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

Procedures and Accessors

!g-name (inst <gi-struct>) [Accessor]
!name (inst <gi-struct>) [Accessor]
!alignment (inst <gi-struct>) [Accessor]
!size (inst <gi-struct>) [Accessor]
!is-gtype-struct? (inst <gi-struct>) [Accessor]
!field-types (inst <gi-struct>) [Accessor]
!scm-types (inst <gi-struct>) [Accessor]
!init-vals (inst <gi-struct>) [Accessor]

Returns the content of their respective slot for inst.

!is-opaque? (inst <gi-struct>) [Accessor]

Returns #t if inst is 'opaque', otherwise, it returns #f.

A <gi-struct> instance is said to be 'opaque' when the call to g-struct-info-get-size upon its GStructInfo pointer returns zero. In scheme, these <gi-struct> instances have no fields.

'Opaque' boxed types should never be 'decoded', nor 'encoded'. Instead, procedures, accessors and methods should 'blindingly' receive, pass and/or return their pointer(s).

!is-semi-opaque? (inst <gi-struct>) [Accessor]

Returns #t if inst is 'semi-opaque', otherwise, it returns #f.

A <gi-struct> instance is said to be 'semi-opaque' when one of its field types is void.

'Semi-opaque' boxed types should never be 'decoded', nor 'encoded'. Instead, procedures, accessors and methods should 'blindingly' receive, pass and/or return their pointer(s).

Union

G-Golf class, accessors, methods and procedures to deal with C union types.

Classes

[<gi-union>], page 122
Procedures, Accessors and Methods

[make-c-union], page 123
[c-union-ref], page 123
[c-union-set!], page 123
[!g-type__], page 123
[!g-name__], page 123
[!name___], page 123
[!size_], page 123
[!alignment_], page 123
[!fields], page 123
[!is-discriminated?], page 123
[!discriminator-offset], page 123
[!discriminator], page 123

Description

G-Golf class, accessors, methods and procedures to deal with C union types.

Classes

<gi-union>  

The <gi-union> class. Its class-direct-slots are:

- **g-type**: 
  - #:accessor !g-type
  - #:init-keyword #:g-type

- **g-name**: 
  - #:accessor !g-name
  - #:init-keyword #:g-name

- **name**: 
  - #:accessor !name

- **size**: 
  - #:accessor !size
  - #:init-keyword #:size

- **alignment**: 
  - #:accessor !alignment
  - #:init-keyword #:alignment

- **fields**: 
  - #:accessor !fields
  - #:init-keyword #:fields

- **is-discriminated?**: 
  - #:accessor !is-discriminated?
  - #:init-keyword #:is-discriminated?

- **discriminator-offset**: 
  - #:accessor !discriminator-offset
  - #:init-keyword #:discriminator-offset

- **discriminator**: 
  - #:accessor !discriminator
  - #:init-keyword #:discriminator
  - #:init-value #f
The name slot is automatically initialized.

Instances of the <gi-union> are immutable (to be precise, there are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

Procedures, Accessors and Methods

**make-c-union** types [type #\textit{f}] [val #\textit{f}]  
Returns a pointer.

Create a foreign pointer to a C union for the list of types (see Foreign Types (https://www.gnu.org/software/guile/manual/guile.html#Foreign-Types) in the Guile Reference Manual for a list of supported types).

**c-union-ref** foreign size type  
Returns the content of the C union pointed by foreign, for the given size and type.

**c-union-set!** foreign size type val  
Returns nothing.

Sets the content of the C union pointed by foreign to val, given its size and type.

**!g-type** (inst <gi-union>)  
**!g-name** (inst <gi-union>)  
**!name** (inst <gi-union>)  
**!size** (inst <gi-union>)  
**!alignment** (inst <gi-union>)  
**!fields** (inst <gi-union>)  
**!is-discriminated?** (inst <gi-union>)  
**!discriminator-offset** (inst <gi-union>)  
**!discriminator** (inst <gi-union>)  
Returns the content of their respective slot for inst.

Utilities

Procedures

[g-studly-caps-expand], page 124  
[g-name->name], page 124  
[g-name->class-name], page 124  
[g-name->short-name], page 124  
[class-name->name], page 125  
[class-name->g-name], page 125  
[name->g-name], page 125  
[syntax-name->method-name], page 125  
[gi-type-tag->ffi], page 126  
[gi-type-tag->init-val], page 126

Description

G-Golf utilities low level API.
Procedures

`g-studly-caps-expand str` [Procedure]

Returns a string\(^{30}\).

Expand the StudlyCaps `str` to a more schemey-form, according to the conventions of GLib libraries. For example:

- `(g-studly-caps-expand "GStudlyCapsExpand")` ⇒ "g-studly-caps-expand"
- `(g-studly-caps-expand "GSource")` ⇒ "g-source"
- `(g-studly-caps-expand "GtkIMContext")` ⇒ "im-context"

G-Golf slightly modified the original code to also allow the possibility to specially treat the `str` (expanded) tokens, such as:

- `(g-studly-caps-expand "WebKitWebContext")` ⇒ "webkit-web-context" ;; not "web-kit-web-context"

The list of StudlyCaps token exception pairs are maintained in the `[g-studly-caps-expand-token-exception]`, page 34, alist.

`g-name->name g-name [as-string? #f]` [Procedure]

Return a symbol name, or a string name if `as-string` is #t.

`g-name->class-name g-name [as-string? #f]` [Procedure]

Return a symbol name, or a string name if `as-string` is #t.

If the optional `as-string` argument is #t, it returns that string, otherwise, it calls and returns the result of `string->symbol`.

`g-name->short-name g-name g-class-name [as-string? #f]` [Procedure]

Return a symbol name, or a string name if `as-string` is #t.

---

\(^{30}\) This procedure, as well as `[g-name->name]`, page 124, and `[g-name->class-name]`, page 124, come from Guile-GNOME (https://www.gnu.org/software/guile-gnome), where there are named `GStudlyCapsExpand`, `gtype-name->scm-name` and `gtype-name->class-name`.

In G-Golf, these procedures are also be used to transform other (GObject Introspection) names, such as function names, hence they use the `g-name->` prefix instead.
Obtains and returns a (method) short name for \texttt{g-name}. It first obtains the sro (scheme representation of) both \texttt{g-name} and \texttt{g-class-name} (which is expected to be the upstream method container (class) name), as a string, then:

- if the sro \texttt{g-class-name} is (fully) contained in the sro \texttt{g-name}, it drops the sro \texttt{g-class-name} prefix - or its plural form - and its trailing \#- (hiphen) delimiter from the sro \texttt{g-name};
- otherwise, it drops the longest common sro string prefix it finds.

If the optional \texttt{as-string} argument is \#t, it returns that string, otherwise, it calls and returns the result of \texttt{string->symbol}.

To illustrate, here is an example for each of the three above exposed cases:

\begin{verbatim}
(g-name->shortname "gdk_event_get_event_type" "GdkEvent")
⇒ get-event-type

(g-name->shortname "gdk_events_get_angle" "GdkEvent")
⇒ get-angle

(g-name->short-name "gtk_drag_begin" "GtkWidget")
⇒ drag-begin
\end{verbatim}

\textbf{class-name->name class-name} \hfill [Procedure]

Returns a (symbol) name.

Obtains and returns the (symbol) name for \texttt{class-name}, by dropping the surrounding \'<' and '>' characters. For example:

\begin{verbatim}
(class-name->name '<foo-bar>)
⇒ 'foo-bar
\end{verbatim}

\textbf{class-name->g-name class-name} \hfill [Procedure]

Returns a string.

Obtains and returns the StudlyCaps string representation for \texttt{class-name}. For example:

\begin{verbatim}
(class-name->g-name '<foo-bar>)
⇒ "FooBar"
\end{verbatim}

\textbf{name->g-name name [as-string? #f]} \hfill [Procedure]

Return a symbol, or a string if \texttt{as-string} is \#t.

Unless \texttt{name} is a string, it first calls \texttt{symbol->string name}, then changes all occurrences of - (hyphen) to _ (underscore) (other characters are not valid in a g-name).

If the optional \texttt{as-string} argument is \#t, it returns that string, otherwise, it calls and returns the result of \texttt{string->symbol}.

\textbf{syntax-name->method-name name} \hfill [Procedure]

Returns a (symbol) name.

This procedure is used to \texttt{protect} syntax names, from being redefined as generic functions and methods.
Users should normally not call this procedure - except for testing purposes, if/when they customize its default settings - it is appropriately and automatically called by G-Golf when importing a GI typelib.

Here is what it does:

- it first checks if a renamer is available, by calling `syntax-name-protect-renamer`, page 38, and if so, calls it passing `name` and returns the result;

- if no renamer is available, it checks if either or both `syntax-name-protect-prefix`, page 38, and `syntax-name-protect-postfix`, page 38, is(are) available, calls `symbol-append` adequately passing either or both and `name` and returns the result.

- It will raise an exception if none of the syntax name protect prefix, postfix and renamer is available.

See [Customization Square], page 32, - GI Syntax Name Protect. G-Golf GI Syntax Name Protect default values are:

```
[syntax-name-protect-prefix], #f
page 38,
[syntax-name-protect-postfix], '_. (the symbol _)
page 38,
[syntax-name-protect-renamer], #f
page 38,
```

As an example, using these default settings, the method short name for `gcr-secret-exchange-begin` would be `begin_`.

---

**gi-type-tag->ffi** `type-tag`

[Procedure]

Returns an integer or `'*' (the symbol `*`).

Obtains the correponding Guile’s ffi tag value for `type-tag`, which must be a member of `[%gi-type-tag]`, page 78. If `type-tag` is unknown, an exception is raised. Note that Guile’s ffi tag values are integers or `'*' (the symbol `*`, used by convention to denote pointer types.

**gi-type-tag->init-val** `type-tag`

[Procedure]

Returns the default init value for `type-tag`.

Obtains and returns the default init value for `type-tag`, which will either be 0 (zero), or `%null-pointer`. 

III. G-Golf Core Reference

G-Golf High Level API

G-Golf High Level API modules are defined in the hl-api subdirectory, such as (g-golf hl-api gobject).

Where you may load these modules individually, the easiest way to use the G-Golf High Level API is to import the hl-api module: it imports and re-exports the public interface of (oop goops), some G-Golf support modules and all G-Golf High Level API modules:

(use-modules (g-golf hl-api))

As stated in the introduction, G-Golf high level API (main) objective is to make (imported) GOBject classes and methods available using GOOPS, the Guile Object Oriented System (see Section “GOOPS” in The GNU Guile Reference Manual), in a way that is largely inspired by Guile-Gnome (https://www.gnu.org/software/guile-gnome).

Closure

G-Golf closure high level API.
The G-Golf integration with GObject Closures.

Classes

[<closure>], page 128

Accessors and Methods

[!g-closure], page 128
[!function], page 128
[!return-type], page 128
[!param-types], page 128
[invoke], page 128

Description

The GLib/GObject type system supports the creation and invocation of ‘Closures’, which represents a callback supplied by the programmer (see [Closures], page 69, if you are curious about the low-level description and API, though you don’t need to to understand and use the high level API described here).

Its infrastructure allows one to pass a Scheme function to C, and have C call into Scheme, and vice versa. In Scheme, a <closure> instance holds a pointer to a GClosure instance, a Scheme procedure, the type of its return value, and a list of the type of its arguments.

Closures can be invoked with [invoke], page 128, for example:

(use (g-golf)

(make <closure>
  #:function (lambda (a b) (+ a b))
  #:return-type 'int
  #:param-types '(int int))
⇒ $2 = #<<closure> 55f24a0228d0>

(invoke $2 3 2)
$3 = 5$

Classes

<closure> [Class]

Its slots are:

- **g-closure** [#:accessor !g-closure]
- **function** [#:accessor !function, #:init-keyword #:function]
- **return-type** [#:accessor !return-type, #:init-keyword #:return-type]
- **param-types** [#:accessor !param-types, #:init-keyword #:param-types]

The #:return-type and #:param-types accept respectively one symbol and a list of symbols that are members of the [%g-type-fundamental-types], page 57.

Instances of the <closure> class are immutable (to be precise, there are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

Accessors and Methods

Note: in this section, the closure argument is [must be] a <closure> instance.

- !g-closure closure [Accessor]
- !function closure [Accessor]
- !return-type closure [Accessor]
- !param-types closure [Accessor]

Returns the content of their respective slot for closure.

- invoke closure . args [Method]

Returns the result of the invocation of closure, using (the possibly empty list of) args. This is a 'low level' method, not used internally, provided mainly for debugging (or demonstration) purposes, so you may test and verify your callbacks and signals procedures31.

Function

G-Golf GI function and argument high level API.

The G-Golf GI function and argument high level API.

Classes

[<function>], page 131
[<argument>], page 132

31 From scheme, you would ‘immediately’ call the procedure instead of course.
Accessors and Methods

\[\text{\texttt{[!info\_], page 133}}\]
\[\text{\texttt{[!namespace\_], page 133}}\]
\[\text{\texttt{[!g-name\_\_\_\_], page 133}}\]
\[\text{\texttt{[!name\_], page 133}}\]
\[\text{\texttt{[!override\?], page 133}}\]
\[\text{\texttt{[!i-func\], page 133}}\]
\[\text{\texttt{[!o-func\], page 133}}\]
\[\text{\texttt{[!o-spec-pos\], page 133}}\]
\[\text{\texttt{[!flags\], page 133}}\]
\[\text{\texttt{[!is-method\?], page 133}}\]
\[\text{\texttt{[!n-arg\], page 133}}\]
\[\text{\texttt{[!caller-owns\], page 133}}\]
\[\text{\texttt{[!return-type\_\_\_], page 133}}\]
\[\text{\texttt{[!type-desc\_\_\_], page 133}}\]
\[\text{\texttt{[!may-return-null\], page 133}}\]
\[\text{\texttt{[!arguments\_\_\_\_\_], page 133}}\]
\[\text{\texttt{[!n-gi-arg-in\], page 133}}\]
\[\text{\texttt{[!args-in\], page 133}}\]
\[\text{\texttt{[!gi-args-in\], page 133}}\]
\[\text{\texttt{[!gi-args-in-bv\], page 133}}\]
\[\text{\texttt{[!n-gi-arg-out\], page 133}}\]
\[\text{\texttt{[!args-out\], page 133}}\]
\[\text{\texttt{[!gi-args-out\], page 133}}\]
\[\text{\texttt{[!gi-args-out-bv\], page 133}}\]
\[\text{\texttt{[!gi-arg-result\], page 133}}\]
\[\text{\texttt{[!g-name\_\_\_\_\_], page 134}}\]
\[\text{\texttt{[!name\_\_\_\_\_, page 134}}\]
\[\text{\texttt{[!closure\], page 134}}\]
\[\text{\texttt{[!destroy\], page 134}}\]
\[\text{\texttt{[!direction\], page 134}}\]
\[\text{\texttt{[!transfert\], page 134}}\]
\[\text{\texttt{[!scope\], page 134}}\]
\[\text{\texttt{[!type-tag\], page 134}}\]
\[\text{\texttt{[!type-desc\_\_\_], page 134}}\]
\[\text{\texttt{[!forced-type\], page 134}}\]
\[\text{\texttt{[!string-pointer\], page 134}}\]
\[\text{\texttt{[!is-pointer\?], page 134}}\]
\[\text{\texttt{[!may-be-null\?], page 134}}\]
\[\text{\texttt{[!is-caller-allocate\?], page 134}}\]
\[\text{\texttt{[!is-optional\?], page 134}}\]
\[\text{\texttt{[!is-return-value\?], page 134}}\]
\[\text{\texttt{[!is-skip\?], page 134}}\]
\[\text{\texttt{[!arg-pos\], page 134}}\]
\[\text{\texttt{[!gi-argument-in\], page 134}}\]
\[\text{\texttt{[!gi-argument-in-bv-pos\], page 134}}\]
\[\text{\texttt{[!gi-argument-out\], page 134}}\]
\[\text{\texttt{[!gi-argument-out-bv-pos\], page 134}}\]
\[\text{\texttt{[!gi-argument-field\], page 134}}\]
Classes

<function>

Its slots are:

- info #:accessor !info
- namespace #:accessor !namespace
- g-name #:accessor !g-name
- name #:accessor !name
- override? #:accessor !override?
- i-func #:accessor !i-func
- o-func #:accessor !o-func
- o-spec-pos #:accessor !o-spec-pos
- flags #:accessor !flags
- is-method? #:accessor !is-method
- n-arg #:accessor !n-arg
- caller-owns #:accessor !caller-owns
- return-type #:accessor !return-type
- type-desc #:accessor !type-desc
- may-return-null? #:accessor !may-return-null?
- arguments #:accessor !arguments
- n-gi-arg-in #:accessor !n-gi-arg-in
- args-in #:accessor !args-in
- gi-args-in #:accessor !gi-args-in
- gi-args-in-bv #:accessor !gi-args-in-bv
- n-gi-arg-out #:accessor !n-gi-arg-out
Instances of the `<function>` class are immutable (to be precise, there are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

<argument>  
 Its slots are:

- `g-name`:_accessor !g-name  
  #:init-keyword #:g-name
- `name`:_accessor !name  
  #:init-keyword #:name
- `closure`:_accessor !closure
- `destroy`:_accessor !destroy
- `direction`:_accessor !direction  
  #:init-keyword #:direction
- `transfert`:_accessor !transfert
- `scope`:_accessor !scope
- `type-tag`:_accessor !type-tag  
  #:init-keyword #:type-tag
- `type-desc`:_accessor !type-desc  
  #:init-keyword #:type-desc
- `forced-type`:_accessor !forced-type  
  #:init-keyword #:forced-type
- `string-pointer`:_accessor !string-pointer
- `is-pointer?`:_accessor !is-pointer?  
  #:init-keyword #:is-pointer?
- `may-be-null?`:_accessor !may-be-null?  
  #:init-keyword #:may-be-null?
is-caller-allocate?  #:accessor !is-caller-allocate?

is-optional?  #:accessor !is-optional?

is-return-value?  #:accessor !is-return-value?

is-skip?  #:accessor !is-skip?

arg-pos  #:accessor !arg-pos
  #:init-keyword #:arg-pos

gi-argument-in
  #:accessor !gi-argument-in
  #:init-value #f


gi-argument-in-bv-pos
  #:accessor !gi-argument-in-bv-pos
  #:init-value #f


gi-argument-out
  #:accessor !gi-argument-out
  #:init-value #f


gi-argument-out-bv-pos
  #:accessor !gi-argument-out-bv-pos
  #:init-value #f

name  #:accessor !gi-argument-field
  #:init-keyword #:gi-argument-field

Instances of the <argument> class are immutable (to be precise, there are not meant to be mutated, see [GOOPS Notes and Conventions], page 7, 'Slots are not Immutable').

**Accessors and Methods**

Note: in this section, the function and argument arguments are [must be] a <function> and an <argument> instance, respectively.

| info function | [Accessor] |
| namespace function | [Accessor] |
| g-name function | [Accessor] |
| name function | [Accessor] |
| override? function | [Accessor] |
| i-func function | [Accessor] |
| o-func function | [Accessor] |
| o-spec-pos function | [Accessor] |
| flags function | [Accessor] |
| is-method? function | [Accessor] |
| n-arg function | [Accessor] |
| caller-owns function | [_accessor] |
| return-type function | [Accessor] |
![type-desc function](Accessor)

![may-return-null function](Accessor)

![arguments function](Accessor)

![n-gi-arg-in function](Accessor)

![args-in function](Accessor)

![gi-args-in function](Accessor)

![gi-args-in-bv function](Accessor)

![n-gi-arg-out function](Accessor)

![args-out function](Accessor)

![gi-args-out function](Accessor)

![gi-args-out-bv function](Accessor)

![gi-arg-result function](Accessor)

Returns the content of their respective slot for `function`.

![g-name argument](Accessor)

![name argument](Accessor)

![closure argument](Accessor)

![destroy argument](Accessor)

![direction argument](Accessor)

![transfert argument](Accessor)

![scope argument](Accessor)

![type-tag argument](Accessor)

![type-desc argument](Accessor)

![forced-type argument](Accessor)

![string-pointer argument](Accessor)

![is-pointer? argument](Accessor)

![may-be-null? argument](Accessor)

![is-caller-allocate? argument](Accessor)

![is-optional? argument](Accessor)

![is-return-value? argument](Accessor)

![is-skip? argument](Accessor)

![arg-pos argument](Accessor)

![gi-argument-in argument](Accessor)

![gi-argument-in-bv-pos argument](Accessor)

![gi-argument-out argument](Accessor)

![gi-argument-out-bv-pos argument](Accessor)

![gi-argument-field argument](Accessor)

Returns the content of their respective slot for `argument`.

**Import**

G-Golf GI import interfaces.
The G-Golf GI namespace (Typelib) import interfaces.
Procedures

[gi-import-info], page 135
[gi-import-enum], page 135
[gi-import-flags], page 135
[gi-import-struct], page 135
[gi-import-function], page 136
[gi-import-constant], page 137

Variables

[%gi-base-info-types], page 137
[%gi-imported-base-info-types], page 137

Procedures

gi-import-info info

[Procedure]
Returns the object or constant returned by the one of the gi-import-enum, gi-import-flags, ..., called upon info.

Obtains the GIBaseInfo type for info and uses it to dispatch a call to gi-import-enum, gi-import-enum, ..., and returns the object or constant returned by the procedure that has been called.

You probably will prefer to call [gi-import-by-name], page 19, most of the time, but here is a example:

,use (g-golf)
(g-irepository-require "Clutter")
⇒ $2 = #<pointer 0x5642cb065e30>

(g-irepository-find-by-name "Clutter" "ActorFlags")
⇒ $3 = #<pointer 0x5642cb067de0>

(gi-import-info $3)
⇒ $4 = #<gi-flags> 5642cb13c5d0>

(describe $4)
- #<gi-flags> 5642cb13c5d0> is an instance of class <gi-flags>
- Slots are:
  - enum-set = ((mapped . 2) (realized . 4) (reactive . 8) (visible . 16) (no-layout . 32))
  - g-type = 94844874149456
  - g-name = "ClutterActorFlags"
  - name = clutter-actor-flags

gi-import-enum info [#:with-method #t] [Procedure]

Returns a [gi-enum], page 117, a [gi-flags], page 119, or a [gi-struct], page 120, instance, respectively.
The `info` argument is (must be) a pointer to `GIEnumInfo`, a `GIEnumInfo` for which ([g-base-info-get-type], page 81, info) returned `flags` and a `GIStructInfo` respectively. It is an error to call any of these procedures upon an invalid `info` argument.

The optional keyword `#:with-method` argument - which is `#t` by default - is passed using `#f`, then `info` will be imported without its respective methods. A description and an example were also given here above, as part of the [gi-import-by-name], page 19, documentation entry.

Every imported `<gi-enum>`, page 117, `<gi-flags>`, page 119, and `<gi-struct>`, page 120, instance is cached under the `enum`, `flags` and `boxed` main key (respectively), using the content of their (symbol) `name` slot as the secondary key. For example, reusing the "Clutter" "ActorFlags" namespace/name introduced above, you would retrieve its `<gi-flags>`, page 119, instance as is:

```lisp
... (gi-cache-ref 'flags 'clutter-actor-flags)
⇒ $6 = #<<gi-flags> 5642cb13c5d0>
```

`gi-import-function info` [Procedure]

Returns a `<function>`, page 131, instance.

Imports `info` - a pointer to a `GIFunctionInfo` (see [Function Info], page 84), which represents a function, a method or a constructor - in Guile and exports its interface. This procedure also imports, recursively (and exports the interface of) its argument's type(s) and method(s).

Every imported function, method and constructor is cached under `function` main key, and using the value of their `<function>`, page 131, instance `name` slot as the secondary key. Here is an example:

```lisp
,use (g-golf)
(g-irepository-require "Clutter")
⇒ $2 = #<pointer 0x55c191f3fe30>

(g-irepository-find-by-name "Clutter" "init")
⇒ $3 = #<pointer 0x55c191f41de0>

(gi-import-function $3)
⇒ $4 = #<<function> 55c191e81510>

(describe $4)
- #<<function> 55c191e81510> is an instance of class <function>
- Slots are:
  - info = #<pointer 0x55c191f41de0>
  - name = clutter-init
  - flags = ()
  - n-arg = 2
  - caller-owns = nothing
  - return-type = interface
...  

\begin{verbatim}
(gi-cache-ref 'function 'clutter-init)
⇒ $5 = #<<function> 55c191e81510>
\end{verbatim}

**Returned value(s):**

In most situations - unless the return-type is 'void (in which case nothing is returned) - the function or method returned value comes first, then in order, if any, the value(s) of its 'inout and 'out argument(s).

However, some function and method, that have at least one 'inout or 'out argument(s), do return #t or #f solely to indicate that the function or method call was successful or not. It is only if the call is successful that the 'inout and 'out argument(s) have been 'correctly' set and may safely be used.

In scheme, when binding such a function or method, we would rather (a) when the call is successful, elude the boolean and return, in order, the 'inout and/or 'out argument(s) value(s); and (b), when the call is unsuccessful, raise an exception.

Since it is not possible to automatically detect these functions and methods, G-Golf provides a series of interfaces to maintain, at user discretion and responsibility, a list of GI typelib functions and methods for which G-Golf is expected to elude their result value from the returned value(s). G-Golf interfaces to maintain this list are documented in the [Customization Square], page 32, section.

**gi-import-constant info** [Procedure]

Returns two values, the constant value and its name.

Obtains and returns the info constant value and its name. For example:

\begin{verbatim}
,use (g-golf)
(g-irepository-require "GLib")
⇒ #<pointer 0x55ad58e6ae00>

(g-irepository-find-by-name "GLib" "PRIORITY_DEFAULT_IDLE")
⇒ $3 = #<pointer 0x55ad58e6cde0>

(gi-import-constant $3)
⇒ $4 = 200
⇒ $5 = "PRIORITY_DEFAULT_IDLE"
\end{verbatim}

Constants are curently not being automatically imported, though this will probably change in the near future, stay tuned.

**Variables**

%gi-base-info-types [Variable]
%gi-imported-base-info-types [Variable]

A (cumulative) list of the distinct (top level) base info types contained in the imported namespace(s).

These two variables have no other purpose then offering a feedback about: (a) the (top level) base info types contained in the namespace(s) passed to [gi-import], page 19;
(b) the (top level) base info types that have effectively been imported - when \texttt{G-Golf}

is complete, both lists should be identical.

Initially, these variables are empty. As \texttt{[gi-import]}, page 19, \texttt{[gi-import-info]}, page 135,

and/or \texttt{[gi-import-by-name]}, page 19, are being called, they are filled with new types,

which are added to both lists.

Note that the order in which base info types appear in these two lists is irrelevant, and

may slightly vary, depending on the order of the namespace used for the successive

\texttt{[gi-import]}, page 19, calls and how complete is \texttt{G-Golf}.

\section*{Utilities}

G-Golf additional utilities.

\section*{Procedures}

\texttt{[gi-find-by-property-name]}, page 138

\section*{Description}

G-Golf additional utilities.

\section*{Procedures}

\texttt{gi-find-by-property-name namespace name} \quad \texttt{[Procedure]}

Returns a (possibly empty) list.

Obtains and returns a (possibly empty) list of (pointers to) \texttt{GIObjectInfo} in \texttt{namespace} that have a property named \texttt{name}. Property names are obtained calling \texttt{g-base-info-get-name}, with no translation/transformation - underscore, if any, are kept 'as is', and the comparison with \texttt{name} is case sensitive.

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with the Invariant Sections being list their titles, with
the Front-Cover Texts being list, and with the Back-Cover Texts
being list.
```

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.

\input texinfo
Concept Index

This index contains concepts, keywords and non-Schemey names for several features, to make it easier to locate the desired sections.

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## Procedure Index

This is an alphabetical list of all the procedures, methods and macros in G-Golf.

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