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 125).

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\(^1\) 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:

```bash
    cd <download-path>
```

\(^1\) GNU Guile (http://www.gnu.org/software/guile) an interpreter and compiler for the Scheme (http://schemers.org) programming language.
I. Introduction

```
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/)

Install from the source

G-Golf (http://www.gnu.org/software/g-golf/) uses Git (https://git-scm.com/) for revision control, hosted on Savannah (https://savannah.gnu.org/projects/g-golf), you may browse the sources repository here (http://git.savannah.gnu.org/cgit/g-golf.git).

There are currently 2 [important] branches: master and devel. 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/) 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_COMPILED_PATH environment variables with these locations, respectively (or `%load-path and
%load-compiled-path at run time if you prefer (See Environment Variables
and Load Path (https://www.gnu.org/software/guile/manual/guile.html#Load-Paths)

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:

```
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. 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):

```
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 daviid.

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 109, and [g-name-name], page 109, 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 library 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 109, for example:

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

...
II. Using G-Golf

- Properties

Gnome library class properties are imported as GOOPS class slots, and their respective name is given by calling [g-name->name], page 109. 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 library methods are imported as GOOPS class methods and added to their respective generic function, the name of which is given by calling [g-name->name], page 109.

In addition, unless otherwise specified (See [Customizing G-Golf], page 10, section), G-Golf also defines so called short name methods, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long names.

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. 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>.

- Functions

Gnome library functions are imported as procedures, renamed by calling [g-name->name], page 109. For example:

```lisp
(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
G-Golf procedure names that bind a Glib, GObject, Gdk or GObject Introspection function always use the ‘original’ name, except that _ are replaced by -. For example:

\[
g\_main\_loop\_new
\Rightarrow [g\_main\_loop\_new], \text{page 35}
\]

\[
g\_repository\_get\_loaded\_namespaces
\Rightarrow [g\_repository\_get\_loaded\_namespaces], \text{page 64}
\]

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:
  \[\text{[call-with-input-typelib], page 96}\]

- syntax names that start as with- followed by a Glib, GObject, Gdk or GI type, such as:
  \[\text{[with-gerror], page 98}\]

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 the gi- prefix, and equally for variables, using %gi-.

- Types and Values

G-Golf variables that bind Glib, GObject, Gdk 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 \[\text{[g-studly-caps-expand], page 109}\].

For example, from the GIBaseInfo section:

\[
\text{GIInfoType}
\Rightarrow [\%gi\_info\_type], \text{page 69}
\]

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

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)\(^6\).

---

\(^5\) 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.

\(^6\) 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 wan’t to do in G-Golf. If you are interested by this (undocumented) feature for your own project though,
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-overide-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-overide-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):

- 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 you are looking at or working on.
- Accessors are exported, and with this convention, we almost certainly avoid all `name

---

I suggest you look for some examples in the Guile-Gnome ([https://www.gnu.org/software/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

classes' with user namespaces, that otherwise would be extremely frequent\(^8\).

- 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

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:

\[
#:duplicates (merge-generics
  replace
  warn-override-core
  warn
  last)
\]

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

(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

\(^8\) 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.
init.scm in the so-called Guile global site directory\textsuperscript{9}, here (evaluate the following expression in a terminal): `guile -c "(display (%global-site-dir))(newline)".\footnote{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.}

**Customizing G-Golf**

There are three ‘domains’ for which G-Golf offers a series of customization variables. The first is related to ‘name transformation’, or how things are being named as they are being imported. The second is related to the so called ‘short name methods’, whether G-Golf should create them. The third is related to the so called ‘syntax name protect’ mechanism, or how G-Golf should address syntax name ‘clash’ exceptions, if/when short name methods are created.

Variables listed in this subsection of the manual are somewhat briefly introduced, make sure to follow each cross-reference to also read their reference documentation entry.

- Name Transformation

As stated previously (See [Naming Conventions], page 5), when G-Golf imports a Gnome library, its classes, properties, methods, functions, types and constant are renamed, mainly to avoid ‘Camel Case’ (https://en.wikipedia.org/wiki/Camel_case), to surround class names by ‘<’ ‘>’ and to avoid ‘_’ (underscore) and use ‘-’ (hyphen) instead.

G-Golf provides two variables, that may be used to fully or partially customize the name transformation output:

\begin{verbatim}
[%g-name-transform-exceptions], page 111
[%g-studly-caps-expand-token-exceptions], page 111
\end{verbatim}

Here is a summary of how name transformation happens and how the above two variables are used:

- Class names are obtained by calling [g-name->class-name], page 109, which calls [g-name->name], page 109,

- [g-name->name], page 109, first checks if its argument has an entry in [%g-name-transform-exceptions], page 111, and returns its value if it found one, otherwise, it calls [g-studly-caps-expand], page 109,

- [g-studly-caps-expand], page 109, which does the core of the job, uses [%g-studly-caps-expand-token-exceptions], page 111, to specially treat its listed token exceptions.

- Short Name Methods

By default, when G-Golf imports a GI typelib, it creates so called ‘short name methods’, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long names. Users may change this default, by setting the following variable:

\begin{verbatim}
[%gi-method-short-names-skip], page 111
\end{verbatim}

- Syntax Name Protect
When a short name method is created, which is obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long name, it may lead to a so called name ‘clash’, with an already defined procedure or syntax. Name ‘clashes’ against procedures are not a concern (this is explained in the [syntax-name->method-name], page 110, documentation entry).

However, the ‘magic’ applied for name ‘clashes’ against procedures can not work for syntaxes, and those syntax names must be ‘protected’, which is achieved by (automatically) calling [syntax-name->method-name], page 110, (users should normally not call this procedure themselves - except for testing purposes).

Three variables are provided to customize the ‘Syntax Name Protect’ default mechanism:

- [%syntax-name-protect-prefix], page 111
- [%syntax-name-protect-postfix], page 111
- [%syntax-name-protect-renamer], page 111

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:

```lisp
;; 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"))
```

\(^{10}\) In its compiled form, a GObject-Introspectable GNOME library is called a Typelib (https://gi.readthedocs.io/en/latest) - a binary, readonly, memory-mappable database containing reflective information about a GObject library.
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:application app))
  (button (make <gtk-button>
    #:label "Hello, World!")))

;; - Which closes the window when clicked
  (connect button
    'clicked
    (lambda (b)
      (close window)))
  (set-child window button)
  (show window))

;; Create a new application
  (let ((app (make <gtk-application>
    #:application-id "org.example.GtkApplication")))
    (connect app 'activate activate)
    ;; Run the application
    (run app 0 '()))

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:

  (let ((app (make <gtk-application>
    #:application-id "com.example.GtkApplication")))
    (connect app 'activate activate)
    ;; Run the application
    (run app 0 '()))

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 `<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.

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

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:

- 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:

(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 20, 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:

(for-each (lambda (name)
            (gi-import-by-name "Gtk" name))
   '("Application"

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...
"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 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 67, 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         GtkWindow -> Window
            gtk_init -> init
            gtk_main -> main
            gtk_main_quit -> main_quit
            ...
WebKit2     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
II. Using G-Golf

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:

```
#!/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:

```
#!/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\textsuperscript{13}.

\textsuperscript{13} As seen in [Configuring Guile for G-Golf], page 9, (and in [GOOPS Notes and Conventions], page 7, - 'Merging Generics').
In Guile, (2) is achieved by calling the `eval-when` syntax\textsuperscript{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.

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

\[
\begin{align*}
&\text{(eval-when (expand load eval)} \\
&\quad \text{(use-modules (oop goops))} \\
&\quad \text{(default-duplicate-binding-handler} \\
&\quad \quad \text{'(merge-generics replace warn-override-core warn last))} \\
&\quad \text{(use-modules (g-golf))} \\
&\quad \text{(for-each (lambda (name) } \\
&\quad \quad \text{(gi-import-by-name "Gtk" name))} \\
&\quad \quad \text{'("Application" } \\
&\quad \quad \quad \text{"ApplicationWindow" } \\
&\quad \quad \quad \text{"Button"))} \\
&\end{align*}
\]

- 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:

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

\[
\begin{align*}
&\text{(eval-when (expand load eval)} \\
&\quad \text{(use-modules (oop goops))} \\
&\quad \text{(default-duplicate-binding-handler} \\
&\quad \quad \text{'(merge-generics replace warn-override-core warn last))} \\
&\quad \text{(use-modules (g-golf))} \\
&\quad \text{(for-each (lambda (name) } \\
&\quad \quad \text{(gi-import-by-name "Gtk" name))} \\
&\end{align*}
\]

\textsuperscript{14} See Section “Eval-when” in \textit{The GNU Guile Reference Manual} for a complete description.
'("Application"
 "ApplicationWindow"
 "Box"
 "Label"
 "Button")

(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:
II. Using G-Golf

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

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
```

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 - Part I. Concepts (https://developer.gnome.org/gobject/stable/pt01.html) of the GObject reference manual.

Import

G-Golf Import interfaces.
Importing GNOME libraries.

Procedures

[gi-import], page 19
[gi-import-by-name], page 20

Description

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

Procedures

\[
\text{gi-import} \ \text{namespace} \ [\#:\text{version} \ #f]
\]

[Procedure]

Returns nothing.

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

\[
,\text{use (g-golf}
\text{(gi-import "Clutter")}
\]

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 equipped 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 20, here below.
II. Using G-Golf

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

[Procedure]

Returns the object or constant returned by [gi-import-info], page 122, 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:

(gi-import-by-name "GLib" "IOChannel" #:with-method #f)

Events

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

- SPECIAL NOTE -

Most of the numerous, important and sometimes radical changes in between Gtk-3.0 (https://developer.gnome.org/gtk3/stable)/Gdk-3.0
have had no impact on G-Golf. And by most, we actually mean all but one: the GdkEvent
and its API.

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), 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.

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>  
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
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

### 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

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>)

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, let’s 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.

- **In Gdk-4.0**

In Gdk-4.0 ([https://developer.gnome.org/gdk4/stable/](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.

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 comes with G-Golf.

**Classes**

- ![gobject>], page 27
- ![ginterface>], page 28
- ![gobject-class>], page 28
- ![gtype-class>], page 28
- ![gtype-instance>], page 29

\(^{15}\) From a GI point of view - internally, it is a C struct.
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


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.

G-Golf uses GOOPS\textsuperscript{18} and defines the \([gobject>]\), page 27, 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:

\textsuperscript{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 whole, 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.

\textsuperscript{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.

\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.
<gobject>
<gtype-instance>
<object>
</top>
(No direct slot)

<ginterface> [Class]
The base class for GLib’s interface types. Not derivable in Scheme.
It is an instance of [gobject-class], page 28.
Superclasses are:

<gtype-instance>
Class Precedence List:

<ginterface>
<gtype-instance>
<object>
</top>
(No direct slot)

<gobject-class> [Class]
The metaclass of the [gobject], page 27, and [ginterface], page 28, classes.
It is an instance of <class>.
Superclasses are:

<gtype-class>
Class Precedence List:

<gobject-class>
<gtype-class>
<class>
<object>
</top>
(No direct slot)

<gtype-class> [Class]
The metaclass of all GType classes. Ensures that GType classes have an info slot, holding a pointer to either a GIObjecInfo or a GIInterfaceInfo.
It is an instance of <class>.
Superclasses are:

<class>
II. Using G-Golf

Class Precedence List:

<gtype-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 27, 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 <gtype-class>) [Accessor]
!derived (inst <gtype-class>) [Accessor]
!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>

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 28.

Superclasses are:

<object>
II. Using G-Golf

Class Precedence List:

\[
\begin{align*}
\langle \text{gtype-instance} \rangle \\
\langle \text{object} \rangle \\
\langle \text{top} \rangle
\end{align*}
\]

Direct slots are:

\[\text{g-inst} \quad \#\text{:accessor } !\text{g-inst}\]

The \text{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’).

\[\text{g-inst} \quad \langle \text{gtype-instance} \rangle \]

[Accessor]

Returns the content of the \text{g-inst} slot for \text{instance}.

\[\text{unref} \quad \langle \text{gtype-instance} \rangle \]

[Method]

Returns nothing.

This method calls [g-object-unref], page 49, on the \text{g-inst} of \text{instance}.

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

This method must be called upon instances that are not referenced anywhere anymore, so that their memory can be freed by the next gc occurrence.

Procedures

\[\text{gobject-class? } \text{val} \quad \]

[Procedure]

Returns \#t if \text{val} is a class and if [\langle \text{gobject} \rangle], page 27, is a member of its class precedence list. Otherwise, it returns \#f.

G-Golf Cache - Accessing

G-Golf Cache - Accessing.

Procedures

\[
\begin{align*}
\langle \text{gi-cache-show} \rangle, \text{page 31} \\
\langle \text{gi-cache-ref} \rangle, \text{page 31}
\end{align*}
\]

Variables

\[
\langle \%\text{gi-cache} \rangle, \text{page 32}
\]

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 [\langle \text{gi-enum} \rangle], page 102, [\langle \text{gi-flags} \rangle], page 104, and [\langle \text{gi-struct} \rangle], page 105, 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

\textbf{gi-cache-show} [\textit{m-key} \#f] \\
\hspace*{1em} [Procedure]

Returns nothing.

Displays the content of G-Golf main cache. If \textit{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 \textit{m-key} and displays its content if any, or \texttt{-- is empty} -- if none.

\textbf{gi-cache-ref} \textit{m-key} \textit{s-key} \\
\hspace*{1em} [Procedure]

Returns a [%gi-cache], page 32, entry or \#f.

Obtains and returns the [%gi-cache], page 32, entry for \textit{m-key} and \textit{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 \textbf{gi-cache-show}, page 31, (without or with an \textit{m-key} arg appropriately), but as a user, the two most important \textit{m-key} are ‘\texttt{enum} and ‘\texttt{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 \textbf{[g-name>name]}, page 109, upon the ‘\texttt{object} original name.

For example, let’s import, then retreive and visualize the content of the \texttt{GtkPositionType} (enum) type:

\begin{verbatim}
,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
\end{verbatim}
### III. G-Golf Core Reference

#### 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 33,
  
  (g-golf glib mem-alloc)

- **The Main Event Loop**
  
  
  [The Main Event Loop], page 34,
  
  (g-golf glib main-event-loop)

... 

**GObject**

- **Type Information**
  
  (https://developer.gnome.org/gobject/stable/gobject-Type-Information.html)
  
  [Type Information], page 44,
  
  (g-golf object type-info)

- **GObject**
  
  
  [GObject], page 48,
  
  (g-golf object object)

- **Enumeration and Flag Types**
  
  
  [Enumeration and Flag Types], page 50,
  
  (g-golf object enum-flags)

... 

#### Variables

%gi-cache

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

[Repository], page 63,
(g-golf gi repository)

common types
[Common Types], page 66,
(g-golf gi common-types)

[Base Info], page 67,
(g-golf gi base-info)

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 ...)

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 34
[g-malloc0], page 34
[g-free], page 34
[g-memdup], page 34

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*.

**g-memdup** *mem n-bytes*  
Returns a pointer to the allocated memory, or `#f`.  
Allocates *n-bytes* of memory and copies *n-bytes* into it from *mem*. If *mem* is the %null-pointer or *n-bytes* is 0 it returns `#f`.

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 35
[g-main-loop-run], page 35
[g-main-loop-ref], page 35
[g-main-loop-unref], page 35
[g-main-loop-quit], page 35
[g-main-context-new], page 35
[g-main-context-default], page 35
[g-timeout-source-new], page 36
[g-timeout-source-new-seconds], page 36
[g-idle-source-new], page 36
[g-source-ref-count], page 36
[g-source-ref], page 36
[g-source-unref], page 36
[g-source-free], page 36
[g-source-attach], page 37
[g-source-destroy], page 37
[g-source-is-destroyed?], page 37
[g-source-set-priority], page 37
[g-source-get-priority], page 37
[g-source-remove], page 37

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]
  Returns a pointer to a new GMainLoop.
  Creates a new GMainLoop structure.
  The `context` must be a pointer to a GMainContext of #f, in which case 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.
```

```
g-main-loop-ref loop
  Returns loop.
  Increases the `loop` reference count by one.
```

```
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.
```

```
g-main-loop-run loop
  Returns nothing.
  Runs a main loop until [g-main-loop-quit], page 35, 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.
```

```
g-main-loop-quit loop
  Returns nothing.
  Stops a GMainLoop from running. Any calls to [g-main-loop-run], page 35, for the `loop` will return.
  Note that sources that have already been dispatched when `g-main-loop-quit` is called will still be executed.
```

```
g-main-context-new
  Returns a pointer.
  Creates and returns a (pointer to a) new GMainContext structure.
```

```
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.

**g-timeout-source-new**<br>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 37, before it will be executed.

The timeout *interval* is in milliseconds.

**g-timeout-source-new-seCONDS**<br>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 37, 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 37, 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 37, 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 37.

**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

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

Returns an integer.

Obtains and returns the source priority.

**g-source-remove** id

Returns #t.

Removes the source with the given id from the default main context. You must use [g-source-destroy], page 37, 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 38
[g-io-channel-ref], page 38
[g-io-channel-unref], page 38
[g-io-create-watch], page 38

Types and Values

[%g-io-condition], page 39

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 \textit{fd}, \textit{channel} and \textit{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 39, flags.

\textbf{g-io-channel-unix-new} \textit{fd} \hfill \text{[Procedure]}

Returns a pointer.

Creates and returns a pointer to a new GIOChannel for \textit{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).

\textbf{g-io-channel-ref} \textit{channel} \hfill \text{[Procedure]}

Returns \textit{channel}.

Increments the \textit{channel} reference count.

\textbf{g-io-channel-unref} \textit{channel} \hfill \text{[Procedure]}

Returns nothing.

Decrements the \textit{channel} reference count.

\textbf{g-io-create-watch} \textit{channel condition} \hfill \text{[Procedure]}

Returns a pointer.

Creates and returns a pointer to a GSource that’s dispatched when condition is met for the given \textit{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  [Instance Variable of <gi-flag>]
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

Procedures

[g-get-prgname], page 39  
[g-set-prgname], page 39
[g-get-system-data-dirs], page 40
[g-get-system-config-dirs], page 40

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

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

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 41
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 \texttt{fd} and \texttt{condition} arguments are [must be] respectively an integer (a ‘valid’ file descriptor) and a list of one or more \texttt{%g-io-condition}, page 39, flags.

\texttt{g-unix-fd-source-new \textit{fd} \textit{condition}} \hfill \textbf{[Procedure]}
\begin{itemize}
\item Returns a pointer.
\item Creates and returns a pointer to a new \texttt{GSource} to watch for a particular IO \textit{condition} on \textit{fd}.
\item The source will never close the file descriptor, you must do it yourself.
\end{itemize}

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
\begin{itemize}
\item \texttt{[g-list-data], page 41}
\item \texttt{[g-list-next], page 42}
\item \texttt{[g-list-prev], page 42}
\item \texttt{[g-list-free], page 42}
\item \texttt{[g-list-length], page 42}
\item \texttt{[g-list-nth-data], page 42}
\end{itemize}

Description
The \texttt{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 \texttt{GSList}, which only allows movement through the list in the forward direction).


Procedures
\texttt{g-list-data} \texttt{g-list} \hfill \textbf{[Procedure]}
\begin{itemize}
\item Returns a pointer.
\item Obtains and returns a pointer to the data in \texttt{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], page 43  
- [g-slist-next], page 43  
- [g-slist-append], page 43  
- [g-slist-prepend], page 43  
- [g-slist-free], page 43  
- [g-slist-length], page 43  
- [g-slist-nth-data], page 43

**Description**

The GSList structure and its associated functions provide a standard singly-linked list data structure.

Each element in the list contains a piece of data, together with a pointer which links to the next element in the list. Using this pointer it is possible to move through the list in one direction only (unlike the [Doubly-Linked Lists], page 41, which allow movement in both directions).

Procedures

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

**g-slist-append** `g-slist` `data`  
Returns a pointer.  
Adds `data` - which is (must be) a pointer - to the end of `g-slist` 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 43, 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.

**g-slist-prepend** `g-slist` `data`  
Returns a pointer.  
Adds `data` - which is (must be) a pointer - to the start of `g-slist` and returns a pointer to the (possibly new) start of the list (so make sure you store the new value).

**g-slist-free** `g-slist`  
Returns nothing.  
Frees all of the memory used by `g-slist`.

**g-slist-length** `g-slist`  
Returns an integer.  
Obtains and returns the number of elements in `g-slist`. This function iterates over the whole list to count its elements.

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

Quarks

G-Golf Glib Quarks low level API.  
Quarks — a 2-way association between a string and a unique integer identifier.
III. G-Golf Core Reference

Procedures

[g-quark-from-string], page 44
[g-quark-to-string], page 44

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

Procedures

\texttt{g-quark-from-string \textit{str}}
\hspace*{1cm} [Procedure]

Returns an integer.

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.

\texttt{g-quark-to-string \textit{g-quark}}
\hspace*{1cm} [Procedure]

Returns a string.

Obtains and returns the string associated with the GQuark given by \textit{g-quark}.

GObject
G-Golf GObject modules are defined in the \texttt{gobject} subdirectory, such as (g-golf \texttt{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:

\begin{verbatim}
(use-modules (g-golf gobobject))
\end{verbatim}

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 45
- **[symbol->g-type]**, page 45
- **[g-type-name]**, page 45
- **[g-type-from-name]**, page 46
- **[g-type-parent]**, page 46
- **[g-type-is-a]**, page 46
- **[g-type-class-ref]**, page 46
- **[g-type-class-peek]**, page 46
- **[g-type-class-unref]**, page 46
- **[g-type-fundamental]**, page 46
- **[g-type-ensure]**, page 46

Types and Values

- **[%g-type-fundamental-flags]**, page 47
- **[%g-type-fundamental-types]**, page 47

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](https://developer.gnome.org/gobject/stable/gobject-Type-Information.html)) section from the GObject reference manual for a complete description.

Procedures

- **g-type->symbol g-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 g-type**

  Returns a string.
Get the unique name that is assigned to \textit{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.

\textbf{g-type-from-name \textit{name}} \hspace{1cm} \textbf{[Procedure]}

Returns a type ID or \#f.

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

\textbf{g-type-parent \textit{g-type}} \hspace{1cm} \textbf{[Procedure]}

Returns a \texttt{GType}.

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

\textbf{g-type-is-a \textit{g-type is-a-g-type}} \hspace{1cm} \textbf{[Procedure]}

Returns \#t if \textit{g-type} is a \textit{is-a-g-type}.

If \textit{is-a-g-type} is a derivable type, check whether \textit{g-type} is a descendant of \textit{is-a-g-type}. If \textit{is-a-g-type} is an interface, check whether \textit{g-type} conforms to it.

\textbf{g-type-class-ref \textit{g-type}} \hspace{1cm} \textbf{[Procedure]}

Returns a pointer.

Obtains and returns a pointer to the \texttt{GTypeClass} structure for \textit{g-type} (a GObject class \texttt{GType}). The reference count of the class is incremented, and the class is ‘\texttt{created}’ (instanciated) if/when it doesn’t exist already.

\textbf{g-type-class-peek \textit{g-type}} \hspace{1cm} \textbf{[Procedure]}

Returns a pointer.

Obtains and returns a pointer to the \texttt{GTypeClass} structure for \textit{g-type} (a GObject class \texttt{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).

\textbf{g-type-class-unref \textit{g-class}} \hspace{1cm} \textbf{[Procedure]}

Returns nothing.

Decrements the reference count for \textit{g-class} (a pointer to a \texttt{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.

\textbf{g-type-fundamental \textit{g-type}} \hspace{1cm} \textbf{[Procedure]}

Returns a type ID.

Extracts the fundamental type ID portion for \textit{g-type}.

\textbf{g-type-ensure \textit{g-type}} \hspace{1cm} \textbf{[Procedure]}

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
deeep-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: #f

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 as the C type "gchar".
uchar  The fundamental type corresponding to guchar.

19 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).
boolean  The fundamental type corresponding to gboolean.
int     The fundamental type corresponding to gint.
uint    The fundamental type corresponding to guint.
long    The fundamental type corresponding to glong.
ulong   The fundamental type corresponding to gulong.
int64   The fundamental type corresponding to gint64.
uint64  The fundamental type corresponding to guint64.
enum    The fundamental type from which all enumeration types are derived.
flags   The fundamental type from which all flags types are derived.
float   The fundamental type corresponding to gfloat.
double  The fundamental type corresponding to gdouble.
string  The fundamental type corresponding to null-terminated C strings.
pointer The fundamental type corresponding to gpointer.
boxed   The fundamental type from which all boxed types are derived.
param   The fundamental type from which all [GParamSpec], page 56, types are derived.
object  The fundamental type for [GObject], page 48.

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

Procedures

[g-object-class-find-property], page 49
[g-object-new], page 49
[g-object-new-with-properties], page 49
[g-object-ref], page 49
[g-object-unref], page 49
[g-object-ref-sink], page 50
[g-object-ref-count], page 50
[g-object-is-floating], page 50
[g-object-type], page 50
[g-object-type-name], page 50
[g-object-get-property], page 50
[g-object-set-property], page 50
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).

\texttt{g-object-class-find-property g-class name} \hspace{1cm} \text{[Procedure]}

Returns a pointer or \#f.

Obtains and returns (a pointer to) the \texttt{GParamSpec} for name, or \#f if g-class (a pointer to a \texttt{GObjectClass}) doesn’t have a property of that name.

\texttt{g-object-new gtype} \hspace{1cm} \text{[Procedure]}

Returns a pointer.

Creates and returns a (pointer to) a new instance of a GObject subtype \texttt{gtype}. All properties are set to there default values.

\texttt{g-object-new-with-properties gtype n-prop names g-values} \hspace{1cm} \text{[Procedure]}

Returns a pointer.

Creates and returns a (pointer to) a new instance of a GObject subtype \texttt{gtype}. The other arguments are \texttt{n-prop} the number of properties, \texttt{names} a pointer to an array of pointers to strings with the names of each property to be set and \texttt{values} an array of \texttt{GValue} containing the values of each property to be set.

Properties that are not explicitly specified are set to there default values.

\texttt{g-object-ref object} \hspace{1cm} \text{[Procedure]}

Returns a pointer.

Increases the reference count of \texttt{object}.

\texttt{g-object-unref object} \hspace{1cm} \text{[Procedure]}

Returns nothing.

Decreases the reference count of \texttt{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**

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 93, 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 93, 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.

**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 51
- `g-value-new`, page 51
- `g-value-init`, page 51
- `g-value-unset`, page 52

**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 an undefined GValue structure, simply call `g-value-new`, page 51, which creates a zero-filled GValue structure. To create and initialize a GValue, use the `g-value-init`, page 51, 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.

Please read the Generic Values section from the GObject reference manual for a complete description.

**Procedures**

- `g-value-size`  [Procedure]
  - Returns an integer.
  - Obtains and returns the size of a `GValue`.

- `g-value-new`  [Procedure]
  - Returns a pointer to a `GValue`.
  - Creates and returns (a pointer to) an empty (uninitialized) `GValue`.

- `g-value-init`  [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 `GTypeValueTable` associated with the type ID stored in the `GValue`. 

**g-value-unset**  

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>g-value</strong></td>
<td><strong>g-value</strong></td>
</tr>
</tbody>
</table>

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 53
- [g-value-type-tag], page 53
- [g-value-type-name], page 53
- [g-value-ref], page 53
- [g-value-set!], page 53
- [g-value-get-boolean], page 53
- [g-value-set-boolean], page 53
- [g-value-get-int], page 53
- [g-value-set-int], page 53
- [g-value-get-uint], page 54
- [g-value-set-uint], page 54
- [g-value-get-float], page 54
- [g-value-set-float], page 54
- [g-value-get-double], page 54
- [g-value-set-double], page 54
- [g-value-get-enum], page 54
- [g-value-set-enum], page 54
- [g-value-get-flags], page 54
- [g-value-set-flags], page 54
- [g-value-get-string], page 55
- [g-value-set-string], page 55
- [g-value-get-param], page 55
- [g-value-set-param], page 55
- [g-value-get-boxed], page 55
- [g-value-set-boxed], page 55
- [g-value-get-pointer], page 55
- [g-value-set-pointer], page 55
- [g-value-get-object], page 55
- [g-value-set-object], page 55

**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 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.

- **g-value-type** `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 47) or the GType name (see [g-type-name], page 45, 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 a 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.
**III. G-Golf Core Reference**

**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`.

**g-value-set-float**  
`g-value float`  
Returns nothing.  
Sets the content of `g-value` to `float`.

**g-value-get-double**  
`g-value`  
Returns a double.  
Obtains and returns the content of `g-value`.

**g-value-set-double**  
`g-value double`  
Returns nothing.  
Sets the content of `g-value` to `double`.

**g-value-get-enum**  
`g-value`  
Returns a symbol.  
Obtains and returns the (registered) enum type info symbol for `g-value`.

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

**g-value-get-flags**  
`g-value`  
Returns a list.  
Obtains and returns the (registered) list of flags for `g-value`.

**g-value-set-flags**  
(val <integer>)  
(flags <list>)  
Returns nothing.  
Sets the content of `g-value` to `val`, or to the value given by calling `[flags->integer]`, page 104, upon the list of `flags`, respectively. The `val` or the `flags` must be valid (as in being a valid member of the (registered) gi-flags type for `g-value`), otherwise an exception is raised.
**III. G-Golf Core Reference**

**g-value-get-string** g-value  
Returns a string or #f.
Obtains and returns the content of g-value, a string or #f if the g-value content is the %null-pointer.

**g-value-set-string** g-value str  
Returns nothing.
Sets the content of g-value to str.

**g-value-get-param** g-value  
Returns a (pointer to) GParamSpec or #f.
Obtains and returns the content of g-value, a (pointer to) GParamSpec or #f if the g-value content is the %null-pointer.

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

**g-value-get-boxed** g-value  
Returns either a list of values, or a pointer.
Obtains and returns the content of g-value. If the boxed type ![is-opaque?], page 106, or ![is-semi-opaque?], page 106, it ‘blindingly’ returns the boxed instance g-value pointer. Otherwise, the boxed instance is ‘decoded’, and a list of its field values is returned.

**g-value-set-boxed** g-value boxed  
Returns nothing.
Sets the content of g-value to boxed. If the boxed type ![is-opaque?], page 106, or ![is-semi-opaque?], page 106, then boxed is (supposed to be) a pointer, used to ‘blindingly’ set g-value. Otherwise, the boxed instance is (supposed to be) a list of values, that are ‘encoded’, and its (newly created) pointer is used to set g-value.

**g-value-get-pointer** g-value  
Returns a pointer.
Obtains and returns the content of g-value.

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

**g-value-get-object** g-value  
Returns a pointer.
Obtains and returns the content of g-value.

**g-value-set-object** g-value object  
Returns nothing.
Sets the content of \textit{g-value} to \textit{object} (a pointer to a \texttt{GObject} instance) and increases the \textit{object} reference count.

\textbf{GParamSpec}

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

GParamSpec — Metadata for parameter specifications.

\begin{itemize}
  \item \texttt{GParamSpec — Metadata for parameter specifications.}
  \item \texttt{GParamSpec} is an object structure that encapsulates the metadata required to specify parameters, such as e.g. \texttt{GObject} properties.
  \item \texttt{gi-g-param-spec-show} \texttt{p-spec}
    \texttt{[gi-g-param-spec-show], page 56}
    \texttt{[g-param-spec-type], page 57}
    \texttt{[g-param-spec-type-name], page 57}
    \texttt{[g-param-spec-get-default-value], page 57}
    \texttt{[g-param-spec-get-name], page 57}
    \texttt{[g-param-spec-get-nick], page 57}
    \texttt{[g-param-spec-get-blurb], page 57}
    \texttt{[g-param-spec-get-flags], page 57}
    \texttt{[%g-param-flags], page 57}
\end{itemize}

\textbf{Procedures}

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

\begin{verbatim}

\texttt{gi-g-param-spec-show} \texttt{p-spec}
\texttt{[Procedure]}
\end{verbatim}

Returns nothing.

Obtains and displays the following informations about the interface pointed to by \texttt{p-spec}:

\begin{verbatim}
,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)
\end{verbatim}

\end{verbatim}
Note that the last item, `type-name: g-strv` is not part of the `GParamSpec` structure. It is obtained (and used by G-Golf internally by calling `([g-name->name], page 109, g-type-name)`).

### Types and Values

#### `%g-param-flags`

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

- `type-name: GParamFlags`
- `name: g-param-flags`
- `enum-set:`
  - `readable` the parameter is readable
  - `writable` the parameter is writable
  - `readwrite` alas for readable writable
**construct**

the parameter will be set upon object construction

**construct-only**

the parameter can only be set upon object construction

**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 running 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 59
[g-closure-ref-count], page 59
[g-closure-ref], page 59
[g-closure-sink], page 59
[g-closure_unref], page 60
[g-closure-free], page 60
[g-closure invoke], page 60
[g-closure-add-invalidate-notifier], page 60
[g-closure-new-simple], page 60
[g-closure-set-marshal], page 60
[g-source-set-closure], page 60

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.

section from the GObject reference manual for a complete description.

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.  [Procedure]
  Obtains and returns the size (the number of bytes) that a GClosure occupies in
  memory.

g-closure-ref-count closure
  Returns an integer.  [Procedure]
  Obtains and returns the reference count of closure.

g-closure-ref closure
  Returns a pointer.  [Procedure]
  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. \( [g\text{-}closure\text{-}sink], \) page 59, 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, \( [g\text{-}closure\text{-}sink], \) page 59, does nothing.

Because \( [g\text{-}closure\text{-}sink], \) page 59, may decrement the reference count of closure (if it hasn’t been called on closure yet) just like \( [g\text{-}closure\text{-}unref], \) page 60, \( [g\text{-}closure\text{-}ref], \) page 59, should be called prior to this function.

\[
\text{g\text{-}closure\text{-}unref } closure
\]
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.

\[
\text{g\text{-}closure\text{-}free } closure
\]
Returns nothing.

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

\[
\text{g\text{-}closure\text{-}invoke } closure \text{ return-value } n\text{-}param \text{ param-vals}
\]

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).

\[
\text{g\text{-}closure\text{-}add\text{-}invalidate\text{-}notifier } closure \text{ data } function
\]
Returns nothing.

Registers an invalidation notifier which will be called when the closure is invalidated with \( g\text{-}closure\text{-}invalidate. \) 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).

\[
\text{g\text{-}closure\text{-}new\text{-}simple } size \text{ data}
\]
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.

\[
\text{g\text{-}closure\text{-}set\text{-}marshal } closure \text{ marshal}
\]
Returns nothing.

Sets the closure marshaller to marshal.

\[
\text{g\text{-}source\text{-}set\text{-}closure } source \text{ closure}
\]
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

**Procedures**

- [g-signal-query], page 61
- [g-signal-lookup], page 62
- [g-signal-list-ids], page 62
- [g-signal-parse-name], page 62

**Types and Values**

- [%g-signal-flags], page 62

**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**

Returns a list.

Obtains and returns a list composed of the signal id, name, interface-type\(^\text{20}\), flags, return-type, number of arguments and their types. For example\(^\text{21}\):

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

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

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

\(^\text{20}\) Within this context, the interface-type is the GType of the GObject subclass the signal is ‘attached to’ - knowing that signals are inhereted.

\(^\text{21}\) At least one GObject subclass instance must have been created prior to attempt to query any of its class signal(s).
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 GClosure, callbacks must assume that the instance upon which a signal is called is always the first argument of the callback.

**g-signal-lookup name g-type**

[Procedure]

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**

[Procedure]

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]**

[Procedure]

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

[Instance Variable of <gi-enum>]

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):

```
(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.
III. G-Golf Core Reference

Procedures

[g-irepository-get-default], page 64
[g-irepository-get-dependencies], page 64
[g-irepository-get-loaded-namespaces], page 64
[g-irepository-get-n-infos], page 65
[g-irepository-get-info], page 65
[g-irepository-enumerate-versions], page 65
[g-irepository-get-typelib-path], page 65
[g-irepository-require], page 65
[g-irepository-get-c-prefix], page 65
[g-irepository-get-shared-library], page 65
[g-irepository-get-version], page 65
[g-irepository-find-by-gtype], page 66
[g-irepository-find-by-name], page 66

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 64).

[g-irepository-get-default]

[Procedure]
Returns a pointer to the singleton process-global default GIRepository.

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]]

[Procedure]
Returns a list of all (transitive) versioned dependencies for namespace. Returned string are of the form namespace-version.

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]]

[Procedure]
Return the list of currently loaded namespaces.
g-irepository-get-n-infos namespace [#:repository #f] [Procedure]
Returns the number of metadata entries in namespace. The namespace must have already been loaded before calling this procedure.

g-irepository-get-info namespace index [#:repository #f] [Procedure]
Returns a pointer to a particular metadata entry in the given namespace. 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] [Procedure]
Returns a (possibly empty) list. 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] [Procedure]
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] [Procedure]
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] [Procedure]
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] [Procedure]
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] [Procedure]
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]  [Procedure]
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]  [Procedure]
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.

Common Types
G-Golf Common Types low level API.
common types - TODO

Types and Values
[%gi-type-tag], page 66
[%gi-array-type], page 67

%gi-type-tag  [Instance Variable of <gi-enum>]
An instance of <gi-enum>, who’s members are the type tag of a GITypeInfo:
g-name: GITypeTag
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
%gi-array-type

[Instance Variable of <gi-enum>]
An instance of <gi-enum>, who’s members are the type of array in a GITypeInfo:

\[gi-array-type\]
\[name: gi-array-type\]
\[enum-set:\]
\[c\]
array
ptr-array
byte-array

Base Info
G-Golf Base Info low level API.
GIBaseInfo — Base struct for all GITypelib structs.

Procedures

[g-base-info-ref], page 68
[g-base-info-unref], page 68
[g-base-info-equal], page 68
[g-base-info-get-type], page 68
[g-base-info-get-typelib], page 68
[g-base-info-get-namespace], page 68
[g-base-info-get-name], page 68
[g-base-info-get-attribute], page 69
[g-base-info-iterate-attributes], page 69
[g-base-info-get-container], page 69
[g-base-info-is-deprecated], page 69

Types and Values

[%gi-info-type], page 69

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 68, has to be called when done accessing the data. GIBaseInfos are normally accessed by calling either [g-irepository-find-by-name], page 66, [g-irepository-find-by-gtype], page 66, or [g-irepository-get-info], page 65.

Example: Getting the Button of the Gtk typelib

```lisp
(use (g-golf gi))
(g-irepository-require "Gtk")
(g-irepository-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** [Procedure]

Returns the same info.

Increases the reference count of info.

**g-base-info-unref info** [Procedure]

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** [Procedure]

Returns #t if and only if info1 equals info2.

Compares 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** [Procedure]

Returns the info type of info.

**g-base-info-get-typelib info** [Procedure]

Returns a pointer to the GITypelib the info belongs to.

**g-base-info-get-namespace info** [Procedure]

Returns the namespace of info

**g-base-info-get-name info** [Procedure]

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**  
[Procedure]  
Returns the value of the attribute or #f if not such attribute exists.

**g-base-info-iterate-attributes info proc**  
[Procedure]  
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**  
[Procedure]  
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**  
[Procedure]  
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
Callable Info

G-Golf Callable Info low level API.
GICallableInfo — Struct representing a callable.

Procedures

[g-callable-info-get-n-args], page 70
[g-callable-info-get-arg], page 70
[g-callable-info-get-instance-ownership-transfer], page 70
[g-callable-info-get-caller-owns], page 70
[g-callable-info-get-return-type], page 71
[g-callable-info-may-return-null], page 71

Struct Hierarchy

GIBaseInfoInfo
  +— GICallableInfo
    +— GIFunctionInfo
    +— GISignalInfo
    +— GIVFuncInfo

Description

GICallableInfo represents an entity which is callable. Currently a function (GIFunctionInfo), virtual function, (GIVFuncInfo) or callback (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 68, when done accessing the data.

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 90, for the list of possible values.

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 90, for the list of possible values.

\[ \text{g-callable-info-get-return-type info} \]  \hspace{1em} \text{[Procedure]}  
Returns a pointer to the GITypeInfo.

It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.

\[ \text{g-callable-info-may-return-null info} \]  \hspace{1em} \text{[Procedure]}  
Returns \#t if the callable info could return NULL.

See if a callable could return NULL.

**Signal Info**

G-Golf Signal Info low level API.

**GISignalInfo** — Struct representing a signal.

**Procedures**

[\[g-signal-info-get-flags\], page 71]

**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 70, for information on how to retrieve arguments and other metadata from the signal.

**Struct Hierarchy**

```
GIBaseInfoInfo  
+— GICallableInfo  
  +— GIFunctionInfo  
  +— GISignalInfo  
  +— GIVFuncInfo
```

**Procedures**

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

\[ \text{g-signal-info-get-flags info} \]  \hspace{1em} \text{[Procedure]}  
Returns a list of [%g-signal-flags], page 62.

Obtain the flags for this signal info. See [%g-signal-flags], page 62, for more information about possible flag values.

**Function Info**

G-Golf Function Info low level API.

**GIFunctionInfo** — Struct representing a function.
Procedures

[gi-function-info-is-method?], page 72
[g-function-info-get-flags], page 72
[g-function-info-get-property], page 72
[g-function-info-get-symbol], page 72
[g-function-info-get-vfunc], page 73
[g-function-info-invoke], page 73

Types and Values

[%g-function-info-flags], page 73

Struct Hierarchy

GIBaseInfoInfo
  +-- GICallableInfo
    +-- GIFunctionInfo
    +-- GISignalInfo
    +-- GIVFuncInfo

Description

GIFunctionInfo represents a function, method or constructor. To find out what kind of entity a GIFunctionInfo represents, call [g-function-info-get-flags], page 72.

See also [Callable Info], page 70, 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 72.

g-function-info-get-flags info  [Procedure]
Returns a list of [%g-function-info-flags], page 73.
Obtain the GIFunctionInfoFlags for info.

g-function-info-get-property info  [Procedure]
Returns a pointer or #f.
Obtains the GIPROPERTYInfo associated with info. Only GIFunctionInfo with the flag is-getter or is-setter have a property set. For other cases, #f will be returned.
The GIPROPERTYInfo must be freed by calling [g-base-info-unref], page 68, when done.

g-function-info-get-symbol info  [Procedure]
Returns a string.
Obtain the ‘symbol’ of the function\(^{22}\).

\[
g\text{-function-info-get-vfunc info}
\]

([Procedure])

Returns a pointer or \#f.

Obtains the GIVFuncInfo associated with \(\text{info}\). Only GIFunctionInfo with the flag \text{wraps-vfunc} has its virtual function set. For other cases, \#f will be returned.

The GIVFuncInfo must be freed by calling \([g\text{-base-info-unref}], \) page 68, when done.

\[
g\text{-function-info-invoke info in-args n-in out-args n-out r-val g-error}
\]

([Procedure])

Returns \#t if the function has been invoked, \#f if an error occurred.

Invokes the function described in \(\text{info}\) with the given arguments. Note that \text{inout} parameters must appear in both argument lists. The arguments are:

- \(\text{info}\) a pointer to a GIFunctionInfo describing the function to invoke.
- \(\text{in-args}\) a pointer to an array of GIArguments, one for each \text{in} and \text{inout} parameter of \(\text{info}\). If there are no \text{in} parameter, \(\text{in-args}\) must be the \%null-pointer.
- \(\text{n-in}\) the length of the \(\text{in-args}\) array.
- \(\text{out-args}\) a pointer to an array of GIArguments, one for each \text{out} and \text{inout} parameter of \(\text{info}\). If there are no \text{out} parameter, \(\text{out-args}\) must be the \%null-pointer.
- \(\text{n-out}\) the length of the \(\text{out-args}\) array.
- \(\text{r-val}\) a pointer to a GIArguments, the return location for the return value of the function. If the function returns void, \(\text{r-val}\) must be the \%null-pointer.
- \(\text{g-error}\) 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 \([\text{with-gerror}], \) page 98).

Types and Values

\[
\text{\%g\text{-function-info-flags}}
\]

([Instance Variable of \(\text{<gi\text{-flag}>}\)])

An instance of \(\text{<gi\text{-flag}>}\), who’s members are the scheme representation of the GIFunctionInfoFlags:

- \(g\text{-name}\): GIFunctionInfoFlags
- \(name\): gi-function-info-flags
- \(enum\text{-set}\):

\[\text{is\text{-method}}\]

Is a method.

\(^{22}\) As you have noticed already, since \(g\text{-function-info-get-symbol}\) 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\text{-module\text{-symbol}()}’
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.

Registered Type Info
G-Golf Registered Type Info low level API.
GIRegisteredTypeInfo — Struct representing a struct with a GType.

Procedures

[gi-registered-type-info-name], page 74
[g-registered-type-info-get-type-name], page 75
[g-registered-type-info-get-type-init], page 75
[g-registered-type-info-get-g-type], page 75

Struct Hierarchy

GIBaseInfo
 +— GIRegisteredTypeInfo
      +— GIIEnumInfo
      +— GIIInterfaceInfo
      +— GIObjectInfo
      +— GITypeInfo

Description
GIRegisteredTypeInfo represents an entity with a GType associated. Could be either a
GIIEnumInfo, GIIInterfaceInfo, GIObjectInfo, GITypeInfo or a GITypeInfo.
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.

gi-registered-type-info-name info
[Procedure]
Returns a type name.

Some registered type are not 'registered', and calling [g-registered-type-info-get-type-name], page 75, returns #f

Note: Another symptom for those is that if you call ([g-type-name], page 45, g-type), it returns "void".
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 [G-Golf Cache - Accessing], page 30).

Obtains and returns a unique name for info. If [g-registered-type-info-get-type-name], page 75, 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:

```lisp
(g-irepository-find-by-name "GObject" "ParamFlags")
⇒ $2 = #<pointer 0x5654c59ee4f0>

(g-registered-type-info-get-type-name $2)
⇒ $3 = #f

(gi-registered-type-info-name $2)
⇒ $4 = "GObjectParamFlags"

(g-name->name $4)
⇒ $5 = g-object-param-flags
```

**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.

**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 language bindings or applications.

**g-registered-type-info-get-g-type info**  
Returns the GType for info.

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.

GTypeEnumInfo — Structs representing an enumeration and its values.
Procedures

- `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 78: just like a GIStructInfo holds a list of pointers to GIFieldInfo from which we get the (field) type, a GIEnumInfo 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.

Struct Hierarchy

GIBaseInfo
  +— GIRegisteredTypeInfo
    +— GIEnumInfo

Description

GIEnumInfo represents an argument. An argument is always part of a GICallableInfo.
**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.  
GITypeInfo — Structures representing a C structure.

**Procedures**

[gi-struct-import], page 77  
[gi-struct-field-types], page 78  
[g-struct-info-get-alignment], page 78  
[g-struct-info-get-size], page 78  
[g-struct-info-get-gtype-struct], page 78  
[g-struct-info-get-size], page 78  
[g-struct-info-get-n-fields], page 78  
[g-struct-info-get-field], page 78  
[g-struct-info-get-n-methods], page 78  
[g-struct-info-get-method], page 78

**Struct Hierarchy**

GIBaseInfo  
+— GIRegisteredTypeInfo  
  +— GITypeInfo

**Description**

GITypeInfo 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 GITypeInfo.

**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-types info**

[Procedure]

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 GIFieldInfo) for the field at the specified n index.

The GIFieldInfo must be freed by calling [g-base-info-unref], page 68, when done.

**g-struct-info-get-n-methods info**

[Procedure]

Returns an integer.

Obtains the number of methods for info.

**g-struct-info-get-method info n**

[Procedure]

Returns a pointer.

Obtains and returns the info type information (a pointer to a GIFunctionInfo) for the method at the specified n index.

The GIFunctionInfo must be freed by calling [g-base-info-unref], page 68, when done.
Union Info

G-Golf Union Info low level API.
GIUnionInfo — Struct representing a C union.

Procedures

[g-union-info-get-n-fields], page 79
[g-union-info-get-field], page 79
[g-union-info-get-n-methods], page 79
[g-union-info-get-method], page 79
[g-union-info-is-discriminated?], page 80
[g-union-info-get-discriminator-offset], page 80
[g-union-info-get-discriminator-type], page 80
[g-union-info-get-discriminator], page 80
[g-union-info-get-size], page 80
[g-union-info-get-alignment], page 80

Description

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.

Struct Hierarchy

GIBaseInfo
  +— GIRegisteredTypeInfo
    +— GIUnionInfo

Procedures

Note: in this section, unless otherwise specified, the info argument is [must be] a pointer to a GIUnionInfo.

g-union-info-get-n-fields info

[Procedure]

Returns an integer.

Obtains and returns the number of fields the info union has.

g-union-info-get-field info n

[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 68, when done.

g-union-info-get-n-methods info

[Procedure]

Returns an integer.

Obtains and returns the number of methods the info union has.

g-union-info-get-method info n

[Procedure]

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 68, when done.

\textbf{g-union-info-is-discriminated? info} \hspace{1cm} \textbf{[Procedure]}

Returns \#t if info contains a discriminator field, otherwise it returns \#f.

\textbf{g-union-info-get-discriminator-offset info} \hspace{1cm} \textbf{[Procedure]}

Returns an integer.

Obtains and returns the offset of the discriminator field for info.

\textbf{g-union-info-get-discriminator-type info} \hspace{1cm} \textbf{[Procedure]}

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 68, when done.

\textbf{g-union-info-get-discriminator info n} \hspace{1cm} \textbf{[Procedure]}

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 68, when done.

\textbf{g-union-info-get-size info} \hspace{1cm} \textbf{[Procedure]}

Returns an integer.

Obtains and returns the total size of the union specified by info.

\textbf{g-union-info-get-alignment info} \hspace{1cm} \textbf{[Procedure]}

Returns an integer.

Obtains and returns the required alignment for info.

\textbf{Object Info}

G-Golf Object Info low level API.

GIOBJECTINFO — Structs representing a GObject.
Procedures

[g-object-show], page 81
[g-object-property-names], page 82
[g-object-method-names], page 82
[g-object-method-find-by-name], page 83
[g-object-info-get-abstract], page 83
[g-object-info-get-parent], page 83
[g-object-info-get-type-name], page 83
[g-object-info-get-type-init], page 83
[g-object-info-get-n-constants], page 83
[g-object-info-get-constant], page 83
[g-object-info-get-n-fields], page 83
[g-object-info-get-field], page 83
[g-object-info-get-n-interfaces], page 83
[g-object-info-get-interface], page 83
[g-object-info-get-n-methods], page 84
[g-object-info-get-method], page 84
[g-object-info-find-method], page 84
[g-object-info-get-n-properties], page 84
[g-object-info-get-property], page 84
[g-object-info-get-n-signals], page 84
[g-object-info-get-signal], page 84
[g-object-info-find-signal], page 84
[g-object-info-get-n-vfuncs], page 84
[g-object-info-get-vfunc], page 84
[g-object-info-get-class-struct], page 84

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 0x56396a4fdc00>
```

```
(gi-object-show $3)
⊣ #<pointer 0x56396a4fdc00> 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 109, 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 109, to obtain their scheme representation).

Each pair is composed of the info [g-function-info-get-symbol], page 72, and [g-base-info-get-name], page 68, names.
III. G-Golf Core Reference

**gi-object-method-find-by-name** info name
- **Procedure**
- 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 72, is string=? to name. If there is such method, it returns #f.

**g-object-info-get-abstract** info
- **Procedure**
- 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
- **Procedure**
- 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
- **Procedure**
- 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
- **Procedure**
- 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
- **Procedure**
- Returns the number of constants for info.
- Obtain the number of constants that this object type has.

**g-object-info-get-constant** info n
- **Procedure**
- Returns a pointer to the nth GIConstantInfo of info.
- It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.

**g-object-info-get-n-fields** info
- **Procedure**
- Returns the number of fields for info.
- Obtain the number of fields that this object type has.

**g-object-info-get-field** info n
- **Procedure**
- Returns a pointer to the nth GIFieldInfo of info.
- It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.

**g-object-info-get-n-interfaces** info
- **Procedure**
- Returns the number of interfaces for info.
- Obtain the number of interfaces that this object type has.

**g-object-info-get-interface** info n
- **Procedure**
- Returns a pointer to the nth GIInterfaceInfo of info.
- It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.
III. G-Golf Core Reference

**g-object-info-get-n-methods info**

[Procedure]

Returns the number of methods for info.

Obtain the number of methods that this object type has.

**g-object-info-get-method info n**

[Procedure]

Returns a pointer to the nth GIFunctionInfo of info.

It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.

**g-object-info-find-method info name**

[Procedure]

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 68, when done accessing the data.

**g-object-info-get-n-properties info**

[Procedure]

Returns the number of properties for info.

Obtain the number of properties that this object type has.

**g-object-info-get-property info n**

[Procedure]

Returns a pointer to the nth GIPropertyInfo of info.

It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.

**g-object-info-get-n-signals info**

[Procedure]

Returns the number of signals for info.

Obtain the number of signals that this object type has.

**g-object-info-get-signal info n**

[Procedure]

Returns a pointer to the nth GISignalInfo of info.

It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.

**g-object-info-find-signal info name**

[Procedure]

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 68, when done accessing the data.

**g-object-info-get-n-vfuncs info**

[Procedure]

Returns the number of vfuncs for info.

Obtain the number of vfuncs that this object type has.

**g-object-info-get-vfunc info n**

[Procedure]

Returns a pointer to the nth GIVfuncInfo of info.

It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.

**g-object-info-get-class-struct info**

[Procedure]

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 68, when done accessing the data.
Interface Info

G-Golf Interface Info low level API.
GIInterfaceInfo — Structs representing a GInterface.

Procedures

[gi-interface-import], page 85
[gi-interface-show], page 85
[g-interface-info-get-n-prerequisites], page 86
[g-interface-info-get-prerequisite], page 86
[g-interface-info-get-n-properties], page 86
[g-interface-info-get-property], page 86
[g-interface-info-get-n-methods], page 86
[g-interface-info-get-method], page 87
[g-interface-info-find-method], page 87
[g-interface-info-get-n-signals], page 87
[g-interface-info-get-signal], page 87
[g-interface-info-find-signal], page 87
[g-interface-info-get-n-vfunc], page 87
[g-interface-info-get-vfunc], page 87
[g-interface-info-find-vfunc], page 87
[g-interface-info-get-n-constants], page 87
[g-interface-info-get-constant], page 87
[g-interface-info-find-constant], page 87
[g-interface-info-get-iface-struct], page 87

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:

```lisp
use (g-golf)
(g-irepository-require "Gtk")
⇒ $2 = #<pointer 0x55649014c780>
```

```lisp
(g-irepository-find-by-name "Gtk" "Orientable")
⇒ $3 = #<pointer 0x5564901531e0>
```

```lisp
(gi-interface-show $3)
⇒ #<pointer 0x5564901531e0> is a (pointer to a) GIInterfaceInfo:

  namespace: "Gtk"
  name: "Orientable"
  g-type: 93890405098944
  g-type-name: "GtkOrientable"
  n-prerequisites: 0
  n-properties: 1
  n-methods: 2
  n-signals: 0
  n-vfuncts: 0
  n-constants: 0
  iface-struct: #<pointer 0x556490153140>
  iface-struct-name: "OrientableIface"
```

<table>
<thead>
<tr>
<th>Procedure</th>
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</thead>
<tbody>
<tr>
<td>g-interface-info-get-n-prerequisites</td>
<td>info</td>
</tr>
<tr>
<td>Returns the number of prerequisites for info.</td>
<td></td>
</tr>
<tr>
<td>Obtain the number of prerequisites for this interface type. A prerequisites is another interface that needs to be implemented for interface, similar to a base class for GObjects.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure</th>
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<tbody>
<tr>
<td>g-interface-info-get-prerequisite</td>
<td>info n</td>
</tr>
<tr>
<td>Returns a pointer to the nth prerequisite for info.</td>
<td></td>
</tr>
<tr>
<td>The prerequisite as a GIBaseInfo. It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>Procedure</th>
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<tbody>
<tr>
<td>g-interface-info-get-n-properties</td>
<td>info</td>
</tr>
<tr>
<td>Returns the number of properties for info.</td>
<td></td>
</tr>
<tr>
<td>Obtain the number of properties that this interface type has.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>g-interface-info-get-property</td>
<td>info n</td>
</tr>
<tr>
<td>Returns a pointer to the nth GIPROPERTYINFO of info.</td>
<td></td>
</tr>
<tr>
<td>It must be freed by calling [g-base-info-unref], page 68, when done accessing the data.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>g-interface-info-get-n-methods</td>
<td>info</td>
</tr>
<tr>
<td>Returns the number of methods for info.</td>
<td></td>
</tr>
<tr>
<td>Obtain the number of methods that this interface type has.</td>
<td></td>
</tr>
</tbody>
</table>
**III. G-Golf Core Reference**

**g-interface-info-get-method info n**

Returns a pointer to the \texttt{n}th GIFunctionInfo of \texttt{info}.

It must be freed by calling \texttt{[g-base-info-unref]}, page 68, 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 \texttt{[g-base-info-unref]}, page 68, when done accessing the data.

**g-interface-info-get-n-signals info**

Returns the number of signals for \texttt{info}.

Obtain the number of signals that this interface type has.

**g-interface-info-get-signal info n**

Returns a pointer to the \texttt{n}th GISignalInfo of \texttt{info}.

It must be freed by calling \texttt{[g-base-info-unref]}, page 68, when done accessing the data.

**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 \texttt{[g-base-info-unref]}, page 68, when done accessing the data.

**g-interface-info-get-n-vfuncs info**

Returns the number of vfuncs for \texttt{info}.

Obtain the number of vfuncs that this interface type has.

**g-interface-info-get-vfunc info n**

Returns a pointer to the \texttt{n}th GIVfuncInfo of \texttt{info}.

It must be freed by calling \texttt{[g-base-info-unref]}, page 68, 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 \texttt{[g-base-info-unref]}, page 68, when done accessing the data.

**g-interface-info-get-n-constants info**

Returns the number of constants for \texttt{info}.

Obtain the number of constants that this interface type has.

**g-interface-info-get-constant info n**

Returns a pointer to the \texttt{n}th GIConstantInfo of \texttt{info}.

It must be freed by calling \texttt{[g-base-info-unref]}, page 68, when done accessing the data.

**g-interface-info-get-iface-struct info**

Returns a pointer to a GIStructInfo for \texttt{info}, or \#f.

Obtains and returns the layout C structure associated with \texttt{info}. It must be freed by calling \texttt{[g-base-info-unref]}, page 68, 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 88
- [g-arg-info-get-destroy], page 88
- [g-arg-info-get-direction], page 88
- [g-arg-info-get-ownership-transfer], page 89
- [g-arg-info-get-scope], page 89
- [g-arg-info-get-type], page 89
- [g-arg-info-may-be-null], page 89
- [g-arg-info-is-caller-allocates], page 89
- [g-arg-info-is-optional], page 89
- [g-arg-info-is-return-value], page 89
- [g-arg-info-is-skip], page 89

Types and Values

- [%gi-direction], page 89
- [%gi-scope-type], page 90
- [%gi-transfer], page 90

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.

- 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.

- 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.

- g-arg-info-get-direction info
  [Procedure]
  Returns a symbol.
  Obtains and returns the [%gi-direction], page 89, of the argument.
g-arg-info-get-ownership-transfer info  
Returns a symbol.
Obtains and returns the [%gi-transfer], page 90, for this argument.

Procedure


g-arg-info-get-scope info  
Returns a symbol.
Obtains and returns the [%gi-scope-type], page 90, 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.

Procedure


g-arg-info-get-type info  
Returns a pointer.
Obtains the GITypeInfo holding the type information for info. Free it using [g-base-info-unref], page 68, when done.

Procedure


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.

Procedure


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.

Procedure


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.

Procedure


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.

Procedure


g-arg-info-is-skip info  
Returns #t or #f.
Obtains if an argument is only useful in C.

Types and Values

%gi-direction  
[Instance Variable of <gi-enum>]
An instance of <gi-enum>, who’s members are the scheme representation of the direction of a GIAArgInfo:
III. G-Golf Core Reference

\[ g-name: \text{GIDirection} \]
\[ name: \text{gi-direction} \]
\[ enum-set: \]
\[ \text{in} \quad \text{in argument.} \]
\[ \text{out} \quad \text{out argument.} \]
\[ \text{inout} \quad \text{in and out argument.} \]

\%gi-scope-type \[ \text{Instance Variable of <gi-enum>} \]
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.

\[ g-name: \text{GIScopeType} \]
\[ name: \text{gi-scope-type} \]
\[ enum-set: \]
\[ \text{invalid} \quad \text{The argument is not of callback type.} \]
\[ \text{call} \quad \text{The callback and associated user.data is only used during the call to this function.} \]
\[ \text{async} \quad \text{The callback and associated user.data is only used until the callback is invoked, and the callback. is invoked always exactly once.} \]
\[ \text{notified} \quad \text{The callback and and associated user.data is used until the caller is notified via the destroy_notify.} \]

\%gi-transfer \[ \text{Instance Variable of <gi-enum>} \]
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 <gi-enum>, who’s members are the scheme representation of the GITransfer:

\[ g-name: \text{GITransfer} \]
\[ name: \text{gi-transfer} \]
\[ enum-set: \]
\[ \text{nothing} \quad \text{transfer nothing from the callee (function or the type instance the property belongs to) to the caller. The callee retains the ownership of the transfer and the caller doesn’t need to do anything to free up the resources of this transfer} \]
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 

\[ \text{g\_list\_free, g\_hash\_table\_destroy,} \]

... of this transfer

transfer everything, e.g., 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.

**Constant Info**

G-Golf Constant Info low level API.

GICOnstantInfo — Struct representing a constant.

**Procedures**

- \[ g\text{-constant\_info\_free\_value}, \text{page 91} \]
- \[ g\text{-constant\_info\_get\_type}, \text{page 91} \]
- \[ g\text{-constant\_info\_get\_value}, \text{page 91} \]

**Struct Hierarchy**

GIBaseInfo

\[ \rightarrow \text{GICOnstantInfo} \]

**Description**

GICOnstantInfo represents a constant. A constant has a type associated which can be obtained by calling \[ g\text{-constant\_info\_get\_type}, \text{page 91} \], and a value, which can be obtained by calling \[ g\text{-constant\_info\_get\_value}, \text{page 91} \].

**Procedures**

Note: in this section, the \textit{info} and \textit{value} arguments are [must be] pointers to a GICOnstantInfo and a GIArgument, respectively.

\texttt{g\text{-constant\_info\_free\_value} info value} \quad [\text{Procedure}]

Returns nothing.

Frees the value returned from \[ g\text{-constant\_info\_get\_value}, \text{page 91} \].

\texttt{g\text{-constant\_info\_get\_type} info} \quad [\text{Procedure}]

Returns a pointer.

Obtains and returns a pointer to the GITypeInfo for \textit{info}. Free it using \[ g\text{-base\_info\_unref}, \text{page 68} \], when done.

\texttt{g\text{-constant\_info\_get\_value} info value} \quad [\text{Procedure}]

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 [g-constant-info-free-value], page 91.

Field Info

G-Golf Field Info low level API.

GIFieldInfo — Struct representing a struct or union field.

Procedures

[g-field-info-get-type], page 92

Struct Hierarchy

GIBaseInfo
  +— GIFieldInfo

Description

A GIFieldInfo struct represents a field of a struct (see [Struct Info], page 77), union (see GIUnionInfo) or an object (see [Object Info], page 80). The GIFieldInfo is fetched by calling [g-struct-info-get-field], page 78, g-union-info-get-field or [g-object-info-get-field], page 83. A field has a size, type and a struct offset associated and a set of flags, which is 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-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 68, when done.

Property Info

G-Golf Property Info low level API.

GIPROPERTYInfo — Struct representing a property.

Procedures

[gi-property-g-type], page 93
[g-property-info-get-flags], page 93
[g-property-info-get-ownership-transfer], page 93
[g-property-info-get-type], page 93

Struct Hierarchy

GIBaseInfo
  +— GIPROPERTYInfo
Description

GIPROPERTYInfo represents a property. A property belongs to either a GIObjectInfo or a GIInterfaceInfo.

Procedures

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

gi-property-g-type info
[Procedure]

Returns an integer.

Obtains and returns the GType value of the property.

g-property-info-get-flags info
[Procedure]

Returns a list of [%g-param-flags], page 57.

Obtain the flags for this property info. See [GParamSpec], page 56, for the list of possible flag values.

g-property-info-get-ownership-transfer info
[Procedure]

Returns the ownership transfer for this property.

Obtain the ownership transfer for this property. See [%gi-transfer], page 90, for more information about transfer values.

g-property-infoxs-get-type info
[Procedure]

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-type-tag-to-string], page 94
[g-info-type-to-string], page 94
[g-type-info-is-pointer], page 94
[g-type-info-get-tag], page 94
[g-type-info-get-param-type], page 94
[g-type-info-get-interface], page 94
[g-type-info-get-array-length], page 95
[g-type-info-get-array-fixed-size], page 95
[g-type-info-is-zero-terminated], page 95
[g-type-info-get-array-type], page 95

Struct Hierarchy

GIBaseInfoInfo
+— GITypeInfo
Description

GITypeInfo represents a type. You can retrieve a type info from an argument (see [Arg Info], page 88), a function's return value (see [Function Info], page 71), a field (see GIFieldInfo), a property (see [Property Info], page 92), a constant (see GIConstantInfo) or for a union discriminator (see GIBaseInfo).

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-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.

type-tag can either be a symbol or an id, a member of the enum-set of [%gi-type-tag], page 66, (otherwise, #f is returned).

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 exist.

info-type can either be a symbol or an id, a member of the enum-set of [%gi-info-type], page 69, (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 89) 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 66, 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 66) 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 68.

**g-type-info-get-array-length info**  
Returns an integer.

Obtain the array length of the type. The type tag must be a **array** (see [%gi-type-tag], page 66), or -1 will returned.

**g-type-info-get-array-fixed-size info**  
Returns an integer.

Obtain the fixed array size of the type. The type tag must be a **array** (see [%gi-type-tag], page 66), or -1 will returned.

**g-type-info-is-zero-terminated info**  
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 66), or **#f** will returned.

**g-type-info-get-array-type info**  
Returns a symbol or **#f**.

Obtain the array type for this type (see [%gi-array-type], page 67). If the type tag of this type is not array, **#f** will be returned.

**Typelib**

G-Golf Typelib low level API.

GITypelib — Layout and accessors for typelib.

**Procedures**

[g-golf-typelib-new], page 95  
[call-with-input-typelib], page 96  
[g-typelib-new-from-memory], page 96  
[g-typelib-free], page 96  
[g-typelib-get-namespace], page 96

**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 96.
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.

Utilities
G-Golf GObject Introspection Utilities low level API.
Procedures and Syntax

- **gi-pointer-new**, page 97
- **gi-pointer-inc**, page 97
- **gi-attribute-iter-new**, page 97
- **with-gerror**, page 98
- **gi->scm**, page 98
- **gi-boolean->scm**, page 98
- **gi-string->scm**, page 98
- **gi-n-string->scm**, page 98
- **gi-strings->scm**, page 99
- **gi-csv-string->scm**, page 99
- **gi-pointer->scm**, page 98
- **gi-n-pointer->scm**, page 98
- **gi-pointers->scm**, page 99
- **gi-n-gtype->scm**, page 98
- **gi-glist->scm**, page 99
- **gi-gslist->scm**, page 99
- **scm->gi**, page 99
- **scm->gi-boolean**, page 99
- **scm->gi-string**, page 99
- **scm->gi-n-string**, page 100
- **scm->gi-strings**, page 100
- **scm->gi-pointer**, page 99
- **scm->gi-n-pointer**, page 100
- **scm->gi-pointers**, page 100
- **scm->gi-n-gtype**, page 100
- **scm->gi-gslist**, page 100

Types and Values

- **%gi-pointer-size**, page 100

Description

G-Golf GObject Introspection utilities low level API.

Procedures and Syntax

**gi-pointer-new**

Returns a newly allocated (Glib) pointer.

**gi-pointer-inc**  

Returns a foreign pointer object pointing to the address of `pointer` increased by `offset`.

**gi-attribute-iter-new**

Returns a pointer. Creates and returns a foreign pointer to a C struct for a GIAttributeIter (a C struct containing four pointers, initialized to %null-pointer).
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.

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 98.
'string
'pointer Calls [gi-string->scm], page 98, or [gi-pointer->scm], page 98.
'n-string
'n-pointer
'n-gtype Calls [gi-n-string->scm], page 98, [gi-n-pointer->scm], page 98, or [gi-n-gtype->scm], page 98.
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 99, or [gi-pointers->scm], page 99.
'csv-string
Calls [gi-csv-string->scm], page 99.
'glist
'gslist Calls [gi-glist->scm], page 99, or [gi-gslist->scm], page 99, respectively.

gi-boolean->scm value

Returns #t or #f.

The GType of value must be a gboolean.

gi-string->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.

gi-n-string->scm value n-string

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.

[Procedure] gi-pointers->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.

[Procedure] 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.

[Procedure] gi-glist->scm g-list
[Procedure] 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.

[Procedure] 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 99.

'string

'pointer Calls [scm->gi-string], page 99, or [scm->gi-pointer], page 99.

'n-string

'n-pointer

'n-gtype Calls [scm->gi-n-string], page 100, [scm->gi-n-pointer], page 100, or [scm->gi-n-gtype], page 100.
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 100, or [scm->gi-pointers], page 100.

'gslist Calls [scm->gi-gslist], page 100.

[Procedure] scm->gi-boolean value
Returns 0 if value is #f, otherwise, it returns 1.

[Procedure] scm->gi-string value
[Procedure] 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.
### 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 `(use-modules (g-golf support))`, or individually, such as `(use-modules (g-golf support modules))`, `(use-modules (g-golf support goops))`, ...
Syntax

[re-export-public-interface], page 101

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 101
[class-virtual-slots], page 101
[class-direct-g-property-slots], page 101
[class-g-property-slots], page 101
[mslot-set!], page 101
[generic?], page 101

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.
Enumerable

G-Golf class, accessors, methods and procedures to deal with C enum types.

Classes

- `<enum>`, page 102
- `<gi-enum>`, page 102

Procedures, Accessors and Methods

- `!enum-set`, page 103
- `[enum->value]`, page 103
- `[enum->values]`, page 103
- `[enum->symbol]`, page 103
- `[enum->symbols]`, page 103
- `[enum->name]`, page 103
- `[enum->names]`, page 103
- `!g-type_`, page 103
- `!g-name`, page 103
- `!name__`, page 103

Description

G-Golf class, accessors, methods and procedures to deal with C enum types.

Classes

`<enum>`

The `<enum>` class is for enumerated values. Its (unique) slot is:

```
enum-set #:accessor !enum-set
#:init-keyword #:enum-set
```

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>`

The `<gi-enum>` class is a subclass of `<enum>`. Its class-direct-slots are:

```
g-type #:accessor !g-type
#:init-keyword #:g-type
#:init-value #f
```
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

- !enum-set (inst <enum>) [Accessor]
  Returns the content of the enum-set slot for inst.

- enum->value (inst <enum>) symbol [Method]
- enum->values (inst <enum>) [Method]
  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 [Method]
- enum->symbols (inst <enum>) [Method]
  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 [Method]
- enum->names (inst <enum>) [Method]
  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.

value can either be a symbol or an id.

- !g-type (inst <gi-enum>) [Accessor]
- !g-name (inst <gi-enum>) [Accessor]
- !name (inst <gi-enum>) [Accessor]
  Returns the content of the g-type, g-name or name slot for inst, respectively.

Flags
G-Golf class, accessors, methods and procedures to deal with C flags types.

Classes

- [<flags>], page 104
- [<gi-flags>], page 104

Procedures, Accessors and Methods

- [integer->flags], page 104
- [flags->integer], page 104
- ![g-type___], page 104
- ![g-name______], page 104
- ![name______], page 104
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 102. 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
  name  #:accessor !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 105
Procedures and Accessors

![g-name_], page 106
![name___], page 106
![alignment], page 106
![size], page 106
![is-gtype-struct?], page 106
![is-foreign?], page 106
![field-types], page 106
![scm-types], page 106
![init-vals], page 106
![is-opaque?], page 106
![is-semi-opaque?], page 106

Description

G-Golf class, accessors, methods and procedures to deal with C struct types.

Classes

<gi-struct> [Class]

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>)
!name (inst <gi-struct>)
!alignment (inst <gi-struct>)
!size (inst <gi-struct>)
!is-gtype-struct? (inst <gi-struct>)
!field-types (inst <gi-struct>)
!scm-types (inst <gi-struct>)
!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 GIStructInfo 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 107
III. G-Golf Core Reference

Procedures, Accessors and Methods

[make-c-union], page 108
[c-union-ref], page 108
[c-union-set!], page 108
[!g-type__], page 108
[!g-name__], page 108
[!name__], page 108
[!size__], page 108
[!alignment__], page 108
[!fields__], page 108
[!is-discriminated?], page 108
[!discriminator-offset__], page 108
[!discriminator__], page 108

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:

\[
\text{g-type} \quad #:accessor !g-type \\
\text{#:init-keyword #:g-type} \\
\text{g-name} \quad #:accessor !g-name \\
\text{#:init-keyword #:g-name} \\
\text{name} \quad #:accessor !name \\
\text{size} \quad #:accessor !size \\
\text{#:init-keyword #:size} \\
\text{alignment} \quad #:accessor !alignment \\
\text{#:init-keyword #:alignment} \\
\text{fields} \quad #:accessor !fields \\
\text{#:init-keyword #:fields} \\
\text{is-discriminated?} \quad #:accessor !is-discriminated? \\
\text{#:init-keyword #:is-discriminated?} \\
\text{discriminator-offset} \quad #:accessor !discriminator-offset \\
\text{#:init-keyword #:discriminator-offset} \\
\text{discriminator} \quad #:accessor !discriminator \\
\text{#:init-keyword #:discriminator} \\
\text{#:init-value #f}
\]
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 #f] [val #f]  [Procedure]
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  [Procedure]
Returns the content of the C union pointed by foreign, for the given size and type.

c-union-set! foreign size type val  [Procedure]
Returns nothing.
Sets the content of the C union pointed by foreign to val, given its size and type.
```

```
!g-type (inst <gi-union>)  [Accessor]
!g-name (inst <gi-union>)  [Accessor]
!name (inst <gi-union>)  [Accessor]
!size (inst <gi-union>)  [Accessor]
!alignment (inst <gi-union>)  [Accessor]
!fields (inst <gi-union>)  [Accessor]
!is-discriminated? (inst <gi-union>)  [Accessor]
!discriminator-offset (inst <gi-union>)  [Accessor]
!discriminator (inst <gi-union>)  [Accessor]
```

Returns the content of their respective slot for inst.

Utilities

Procedures

```
[g-studly-caps-expand], page 109
[g-name->name], page 109
[g-name->short-name], page 109
[g-name->class-name], page 109
[gi-type-tag->ffi], page 110
[gi-type-tag->init-val], page 110
[syntax-name->method-name], page 110
```

Variables

```
[%g-name-transform-exceptions], page 111
[%g-studly-caps-expand-token-exceptions], page 111
[%gi-method-short-names-skip], page 111
[%syntax-name-protect-prefix], page 111
[%syntax-name-protect-postfix], page 111
[%syntax-name-protect-renamer], page 111
```
III. G-Golf Core Reference

Description
G-Golf utilities low level API.

Procedures

\texttt{g-studly-caps-expand \ str} \quad \textbf{[Procedure]}

Returns a string.

Given a ‘Camel Case (https://en.wikipedia.org/wiki/Camel_case)’ string, this procedure\textsuperscript{24} returns a new string, with all \_' transformed into ‘-’, uppercase letters are transformed into their corresponding lowercase letter, and a \#\_ is inserted in between occurrences of two consecutive uppercase letters, unless the sequence analysed is part of a prefix defined in the [%g-studly-caps-expand-token-exceptions], page 111, alist.

Here are two examples:

\begin{verbatim}
(g-studly-caps-expand "GStudlyCapsExpand") ⇒ "g-studly-caps-expand"
(g-studly-caps-expand "WebKitWebContext") ⇒ "webkit-web-context"
\end{verbatim}

\texttt{g-name->name \ g-name [as-string? \ #\!]} \quad \textbf{[Procedure]}

\texttt{g-name->short-name \ g-name \ g-parent-name [as-string? \ #\!]} \quad \textbf{[Procedure]}

\texttt{g-name->class-name \ g-name [as-string? \ #\!]} \quad \textbf{[Procedure]}

Return a symbol name, or a string name if \texttt{as-string} is \#t.

[g-name->name], page 109, first obtains the scheme representation string for \texttt{g-name}, by looking for a possible entry in [%g-name-transform-exceptions], page 111, or if it failed, by calling [g-studly-caps-expand], page 109. Then, if as-string is \#t, it returns that string, otherwise, it calls and returns the result of \texttt{string->symbol}.

[g-name->short-name], page 109, returns a (method) short name for \texttt{g-name}. It first obtains the scheme representation string for both argument, \texttt{name} and \texttt{parent-name}, which is the container (class) name, then:

- if \texttt{parent-name} is (fully) contained in \texttt{name}, it drops the \texttt{parent-name} prefix - or its plural form - and its trailing \#\_ (hphen) delimiter from \texttt{name};
- otherwise, it drops the longest common string prefix it finds.

Then, if \texttt{as-string} 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
\end{verbatim}

\textsuperscript{24}This procedure, as well as [g-name->name], page 109, and [g-name->class-name], page 109, come from Guile-Gnome (https://www.gnu.org/software/guile-gnome), where there are named \texttt{GStudlyCapsExpand, gtype-name->scm-name and gtype-name->class-name}, in the (Guile-Gnome) module (gnome gobject utils). In G-Golf, these will also be used to transform other (Gobject Inptrospection given) names, such as function names, hence their \texttt{g-name->} prefix instead
(g-name->shortname "gdk_events_get_angle" "GdkEvent")
⇒ get-angle

(g-name->short-name "gtk_drag_begin" "GtkWidget")
⇒ drag-begin

>[g-name-class-name], page 109, calls [g-name-name], page 109, surrounds the result using #'< and #'> characters then either return that string, if as-string? is #t, otherwise it calls and returns the result of string->symbol:

(g-name->class-name "GtkWindow")
⇒ <gtk-window>

**gi-type-tag->ffi** type-tag

[Procedure]

Returns an integer or '*, (the symbol *).

Obtains the corresponding Guile’s ffi tag value for type-tag, which must be a member of [%gi-type-tag], page 66. 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.

**syntax-name->method-name** name

[Procedure]

Returns a (symbol) name.

This procedure is used to ‘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.

Unless otherwise specified (see [%gi-method-short-names-skip], page 111), when a GI typelib is imported, G-Golf also creates so called short name methods, obtained by dropping the container name (and its trailing hyphen) from the GI typelib method full/long names.

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 110, does, using a renamer, or by adding a prefix, a postfix or both to its (symbol) name argument.

By default, the renamer (%syntax-name-protect-renamer), page 111) and prefix (%syntax-name-protect-prefix), page 111) variables are set to #f. The the postfix
(\%syntax-name-protect-postfix, page 111) variable is set to _ (the underscore symbol).

As an example, using these default settings, the short name method for gcr-secret-exchange-begin would be begin_.

Variables

\%g-name-transform-exceptions [Variable]
Contains an alist where each key is a GType name exception for the \[g-name\-name\], page 109, procedure, and the corresponding value is the name \[g-name\-name\], page 109, should use instead.

Its default value contains an entry for GObject, which should not (never) be removed:

(\define \%g-name-transform-exceptions '(("GObject" . "gobject")))

\%g-studly-caps-expand-token-exceptions [Variable]
Contains an alist where each key is a token exception for the \[g-studly-caps-expand\], page 109, procedure, and the corresponding value the string that \[g-studly-caps-expand\], page 109, will use for that token transformation instead.

Its default value contains an entry for the WebKit token:

(\define \%g-studly-caps-expand-token-exceptions '(("WebKit" . "webkit")))

Users may add or remove alist pairs to satisfy their needs.

\%gi-method-short-names-skip [Variable]
This variable is used by G-Golf to decide, while importing a GI typelib, if a short name method should be created or not (\textasciitilde skipping\textasciiexcl', hence the variable name).

It can take the following values:

\'(\textit{all}) This is the default value. In this case, a short name method is created for every full/long name method, or in other words, no short name method creation process is skipped.

\'(\textit{all}) In this case, no short name method is created, or in other words, all short name method creation process is skipped.

\textit{a list of short name(s)} In this case, for each short name in the list, the short name method creation process is skipped.

\%syntax-name-protect-prefix [Variable]
\%syntax-name-protect-postfix [Variable]
\%syntax-name-protect-renamer [Variable]
These variables are used by \[syntax-name\-method-name\], page 110, and may be customized. Their default values are:
%syntax-name-protect-prefix #f
%syntax-name-protect-postfix ‘ (the underscore symbol)
%syntax-name-protect-renamer #f

%syntax-name-protect-prefix and %syntax-name-protect-postfix may be defined as #f or a symbol name. Unless a renamer is set, at least one of these two variables must be defined as a symbol name.

The %syntax-name-protect-renamer may be defined as #f or a procedure, that takes one argument - a symbol name - and returns a symbol name.

[syntax-name->method-name], page 110, first checks for a %syntax-name-protect-renamer, and calls it if it has been defined, ignoring the other variables.

Otherwise, [syntax-name->method-name], page 110, returns a symbol name prefixed using %syntax-name-protect-prefix when not #f and/or postfixed using %syntax-name-protect-postfix when not #f. As mentioned above, unless a renamer is set, at least one of these two variables must be defined as a symbol name.

**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 113

**Accessors and Methods**

[!g-closure], page 113
[!function], page 113
[!return-type], page 113
[!param-types], page 113
[invoke], page 114

**Description**
The GLib/GOBject type system supports the creation and invocation of ‘Closures’, which represents a callback supplied by the programmer (see [Closures], page 58, if you are curious
about the low-level description and API, though you don’t need 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 114, for example:

\[ (\text{use (g-golf)}) \]

\[
\text{(make <closure>}
  \begin{align*}
  &\text{:function (lambda (a b) (+ a b))} \\
  &\text{:return-type 'int} \\
  &\text{:param-types '(int int)}
\end{align*}
\]

⇒ $2 = \#<\text{closure} 55f24a0228d0>

\[
\text{(invoke } 2 \text{ 3 2)}
\]

⇒ $3 = 5

**Classes**

`<closure>`

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 47.

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`. 
**Method**

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 procedures\(^25\).

---

**Function**

G-Golf GI function and argument high level API.
The G-Golf GI function and argument high level API.

---

**Classes**

[<function>], page 117
[<argument>], page 118

---

\(^{25}\) From scheme, you would ‘immediately’ call the procedure instead of course.
Accessors and Methods

[[info_], page 119
[[namespace_], page 119
[[g-name____], page 119
[[name], page 119
[[override?], page 119
[[i-func], page 119
[[o-func], page 119
[[o-spec-pos], page 119
[[flags], page 119
[[is-method?], page 119
[[n-arg], page 119
[[caller-owns], page 119
[[return-type_], page 119
[[type-desc], page 119
[[may-return-null], page 119
[[arguments], page 119
[[n-gi-arg-in], page 119
[[args-in], page 119
[[gi-args-in], page 119
[[gi-args-in-bv], page 119
[[n-gi-arg-out], page 119
[[args-out], page 119
[[gi-args-out], page 119
[[gi-args-out-bv], page 119
[[gi-arg-result], page 119
[[g-name____], page 120
[[name_], page 120
[[closure], page 120
[[destroy], page 120
[[direction], page 120
[[transfert], page 120
[[scope], page 120
[[type-tag], page 120
[[type-desc_], page 120
[[forced-type], page 120
[[string-pointer], page 120
[[is-pointer?], page 120
[[may-be-null?], page 120
[[is-caller-allocate?], page 120
[[is-optional?], page 120
[[is-return-value?], page 120
[[is-skip?], page 120
[[arg-pos], page 120
[[gi-argument-in], page 120
[[gi-argument-in-bv-pos], page 120
[[gi-argument-out], page 120
[[gi-argument-out-bv-pos], page 120
[[gi-argument-field], page 120

III. G-Golf Core Reference 116
Variables

[\%gi-strip-boolean-result\], page 121

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
args-out    #:accessor !args-out
gi-args-out #:accessor !gi-args-out
gi-args-out-bv #:accessor !gi-args-out-bv

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>       [Class]
    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-nul?
    #: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  
!n-arg function  
!caller-owns function  
!return-type function  
!type-desc function  
!may-return-null function  
!arguments function  
!n-gi-arg-in function  
!args-in function  
!gi-args-in function  
!gi-args-in-bv function  
!n-gi-arg-out function  
!args-out function  
!gi-args-out function  
!gi-args-out-bv function  
!gi-arg-result function  

Returns the content of their respective slot for function.

!g-name argument  
!name argument  
!closure argument  
!destroy argument  
!direction argument  
!transfert argument  
!scope argument  
!type-tag argument  
!type-desc argument  
!forced-type argument  
!string-pointer argument  
!is-pointer? argument  
!may-be-null? argument  
!is-caller-allocate? argument  
!is-optional? argument  
!is-return-value? argument  
!is-skip? argument  
!arg-pos argument  
!gi-argument-in argument  
!gi-argument-in-bv-pos argument  
!gi-argument-out argument  
!gi-argument-out-bv-pos argument  
!gi-argument-field argument  

Returns the content of their respective slot for argument.
Variables

%gi-strip-boolean-result [Variable]
A list of procedure and method names that that have at least one 'inout or 'out argument(s) and return either #t or #f, solely to indicate that the procedure or method call was successful or not.

These procedures and methods, if (and only if) their name is a member of %gi-strip-boolean-result, will see their returned valued eluded if it is #t, otherwise, an exception will be raised.26

Initially, %gi-strip-boolean-result is empty, and it is a user responsibility to fill it appropriately, for each namespace they are importing.

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

,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:

(clutter-color-from-string "Bluee")
⇒ $4 = #f
⇒ $5 = (0 0 0 0)

Now, let’s add this procedure name to %gi-strip-boolean-result:

(push! 'clutter-color-from-string
%gi-strip-boolean-result)
⇒ $6 = (clutter-color-from-string)

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

And call it with an undefined color name:

(clutter-color-from-string "Bluee")
前置 scm-error "clutter-color-from-string" failed." 前置
前置 Entering a new prompt. Type ',bt' for a backtrace or ',q' to continue.

Import

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

26 In any other situation, but void, the returned value comes first, then in order, if any, the 'inout and/or 'out argument(s).
Procedures

- [gi-import-info], page 122
- [gi-import-enum], page 122
- [gi-import-flags], page 122
- [gi-import-struct], page 122
- [gi-import-function], page 123
- [gi-import-constant], page 124

Variables

- [%gi-base-info-types], page 124
- [%gi-imported-base-info-types], page 124

Procedures

**gi-import-info info**

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 20, 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]**

**gi-import-flags info [#:with-method #t]**

**gi-import-struct info [#:with-method #t]**

Returns a `<gi-enum>`, page 102, a `<gi-flags>`, page 104, or a `<gi-struct>`, page 105, instance, respectively.
The \textit{info} argument is (must be) a pointer to \texttt{GIEnumInfo}, a \texttt{GIEnumInfo} for which (\cite{g-base-info-get-type}, page 68, info) returned \texttt{flags} and a \texttt{GIEnumInfo} respectively. It is an error to call any of these procedures upon an invalid \textit{info} argument.

The optional keyword \texttt{#:with-method} argument - which is \#t by default - is passed using \#f, then \textit{info} will be imported without its respective methods. A description and an example were also given here above, as part of the \cite{gi-import-by-name}, page 20, documentation entry.

Every imported \cite{gi-enum}, page 102, \cite{gi-flags}, page 104, and \cite{gi-struct}, page 105, instance is cached under the \texttt{enum}, \texttt{flags} and \texttt{boxed} main key (respectively), using the content of their (symbol) \texttt{name} slot as the secondary key. For example, reusing the "Clutter" "ActorFlags" namespace/name introduced above, you would retrieve its \cite{gi-flags}, page 104, instance as is:

\begin{verbatim}
... (gi-cache-ref 'flags 'clutter-actor-flags) ⇒ $6 = #<<gi-flags> 5642cb13c5d0>
\end{verbatim}

\texttt{gi-import-function info} [Procedure]

Returns a \cite{function}, page 117, instance.

Imports \texttt{info} - a pointer to a \texttt{GIFunctionInfo} (see \cite{Function Info}, page 71), 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 \texttt{function} main key, and using the value of their \cite{function}, page 117, instance \texttt{name} slot as the secondary key. Here is an example:

\begin{verbatim}
,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
\end{verbatim}
... (gi-cache-ref 'function 'clutter-init)
⇒ $5 = #<function> 55c191e81510>

Returned value(s):

In most situations, but when 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 'inout and/or 'out argument(s).

However, some function and method, that have at least one 'inout or 'out argument(s), do return a 'boolean, but 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/or 'out argument(s) have been 'correctly' set and may be safely 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 defines a [%gi-strip-boolean-result], page 121, variable, initially empty, that users may fill appropriately, using the function or method (symbol) name, as described in its documentation: make sure to carefully read and understand it.

\textbf{gi-import-constant info} \hspace{1cm} [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.

\section*{Variables}

\textbf{%gi-base-info-types} \hspace{1cm} [Variable]
\textbf{%gi-imported-base-info-types} \hspace{1cm} [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 G-Golf is complete, both lists should be identical.

Initially, these variables are empty. As [gi-import], page 19, [gi-import-info], page 122, and/or [gi-import-by-name], page 20, 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 [gi-import], page 19, calls and how complete is G-Golf.

Utilities
G-Golf additional utilities.

Procedures

[gi-find-by-property-name], page 125

Description
G-Golf additional utilities.

Procedures

**gi-find-by-property-name** namespace name

[Procedure]

Returns a (possibly empty) list.

Obtains and returns a (possibly empty) list of (pointers to) GIObjectInfo in *namespace* that have a property named *name*. Property names are obtained calling g-base-info-get-name, with no translation/transformation - underscore, if any, are kept 'as is', and the comparison with *name* is case sensitive.

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\input texinfo
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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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