



v22 Ada Framework User Manual



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v22 Ada Framework User Manual

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Ed.	Release	Comments	
1	20230731	Initial release	sr
18	20230821	General update, v22 & UXString Api integration	sr
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77	20231128	Rewrite Setup chapter for Alire tooling	sr
78			

Preliminary

- Authors

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- Acknowledgments

v22 is based on a number of Ada open-source libraries. See Appendices for copyrights and credits.

- Manual

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The “Excuse me I’m French” speech - The main author of this manual is a Frenchman with basic English skills. Frenchmen are essentially famous as frog eaters². They have recently discovered that others ~~forms of communication~~ languages are widely used on earth. So, as a frog eater, I’ve tried to write some stuff in this foreign dialect loosely known here under the name of English. However, it’s a well known fact that frogs don’t really speak English. So your help is welcome to correct this bloody manual, for the sake of the wildebeests, and penguins too.

- Syntax notation

Inside a command line:

- A parameter between brackets [] is optional;
- Two parameters separated by | are mutually exclusives.

An important notice:

◊ This is an important notice !

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¹ International amateur radio call sign - https://en.wikipedia.org/wiki/Amateur_radio.

² We could be famous as designers of the Concorde, Ariane rockets, Airbus planes or even Ada computer language but, definitely, Frenchmen have to wear beret with bread baguette under their arm to go eating frogs in a smokey tavern. That's *le cliché* :)

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Introduction

Keep It Simple, Stupid.
Clarence Leonard "Kelly" Johnson



1 About v22 framework

1.1 Ready to use in production

v22 is a general purpose, KISS³ oriented, modular Ada framework for GNU/Linux Debian/Ubuntu⁴ service, console and web programs.

v22 is composed of many packages in charge of UTF-8 strings, program and OS functions, HTTP[S]/WS[S] web framework, integrated CURL, console handling and text files, advanced network, MySQL and SQLite high level binding, logging and configuration files handling.

Originally based on the v20 library, the v22 framework represents a major step forward in the following areas:

- UTF-8 compatibility;
- Simplified string processing [only one UTF-8 String type is used];
- Internationalization;
- New and extended database API;
- Extended database access to MySQL, in addition to SQLite;
- Improved concurrent access and performance for SQLite;
- Unlimited simultaneous SQLite and MySQL connections for a single program;
- New LGPLv3 licensing instead of GPLv3;
- New FSF GCC development environment not tied anymore to GPLv2 license;
- And much more.

1.2 Cooperative and open

v22's native dependencies are Gnoga, Simple_Components, UXStrings and Zanyblue.

v22 is both a high-level framework and an extension to the lower level components cited above.

³ Keep It Simple, Stupid - https://en.wikipedia.org/wiki/KISS_principle - In memory of <http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/johnson-clarence.pdf> the genius father of titanium Blackbirds.

⁴ Debian/Ubuntu features are limited to package management. Package management could be extended to other distributions. More generally, it would be possible and even desirable to adapt v22 to BSD or Mac OS systems. Any help on these subjects is welcome, as the main author of v22 only uses GNU/Linux Debian and Ubuntu.

v22 has been designed to:

- Use unmodified components;
- Not "reinvent the wheel". Component API are to be used first;
- Offer higher-level functions, or functions that do not exist in the components.

v22 must be used with the APIs of:

- UXStrings to process UTF-8 strings;
- Gnoga to connect to MySQL and/or SQLite databases;
- Gnoga to provide a Web interface;
- Simple_Components for network layer and more;
- Zanyblue if internationalization is desired.

In short:

- UXStrings is used throughout v22. The v22.Uxs package extends UXStrings functionality. The v22.Sql package extends the functionality of Gnoga.Server.Database. The v22.Gui graphics framework is based on Gnoga.Gui.
- v22's architecture allows it to be open to additional packages, depending on the software development required.

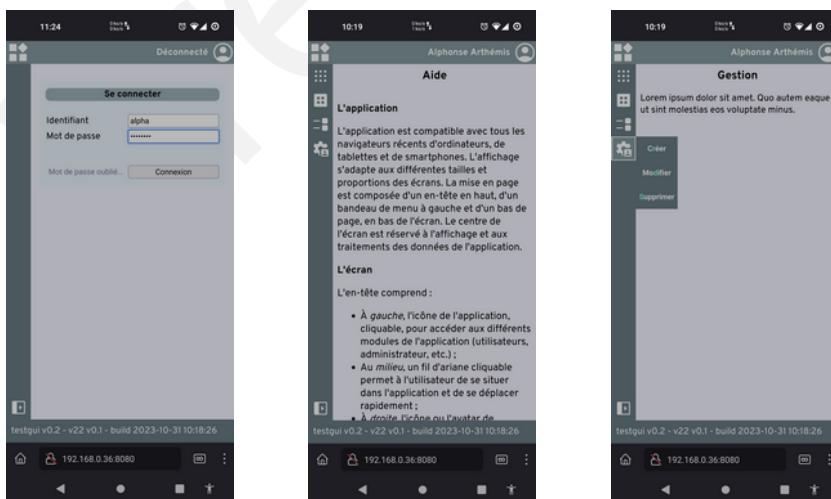
2 Everybody wants screenshots

v22 is as much console-based as it is web-based. Of course, it's the web that concerns us. v22 is fully responsive for smartphones and tablets.

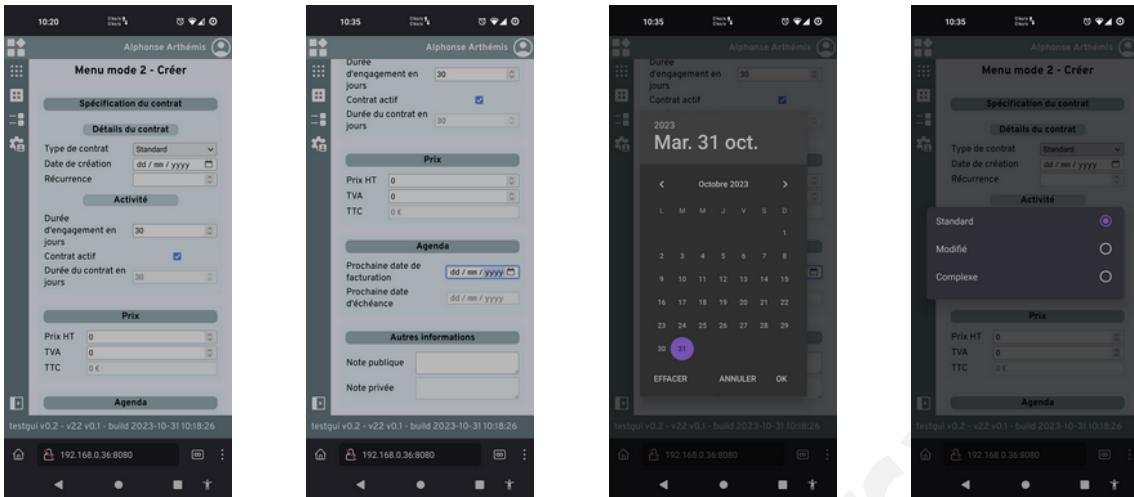
We haven't included screenshots of PC station, as they are similar, except for the screen proportions. v22 was tested on Linux Ubuntu 22.04 LTS with Firefox and Chrome browsers.

Below are a few screenshots of the demo program, on an android smartphone. v22 was tested without a hitch on a Nexus 5 [with a recent Firefox browser], a Nexus 5x, a Pixel 5 [Firefox], various Samsung [Chrome] and iPhone [Safari].

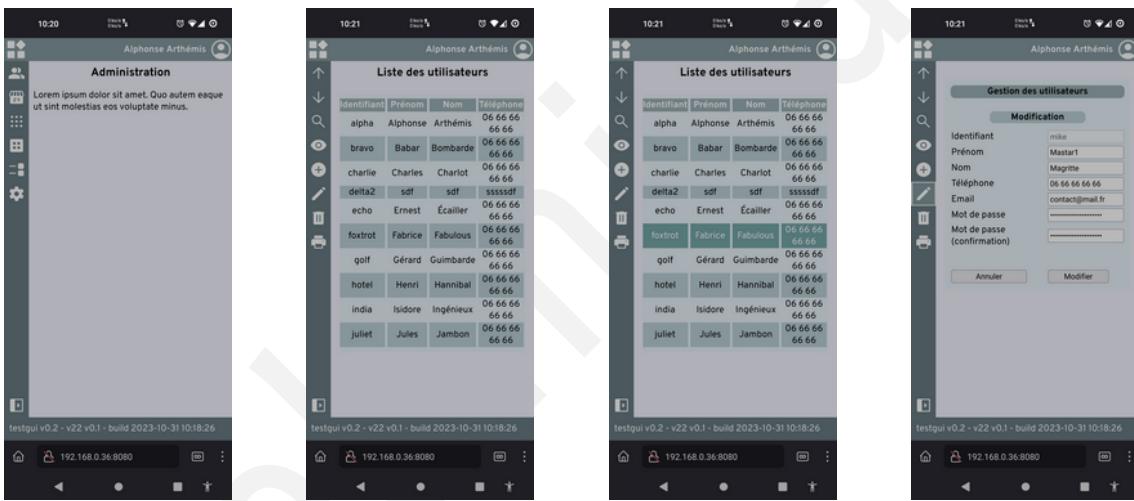
2.1 Login, help and sub-menu screens

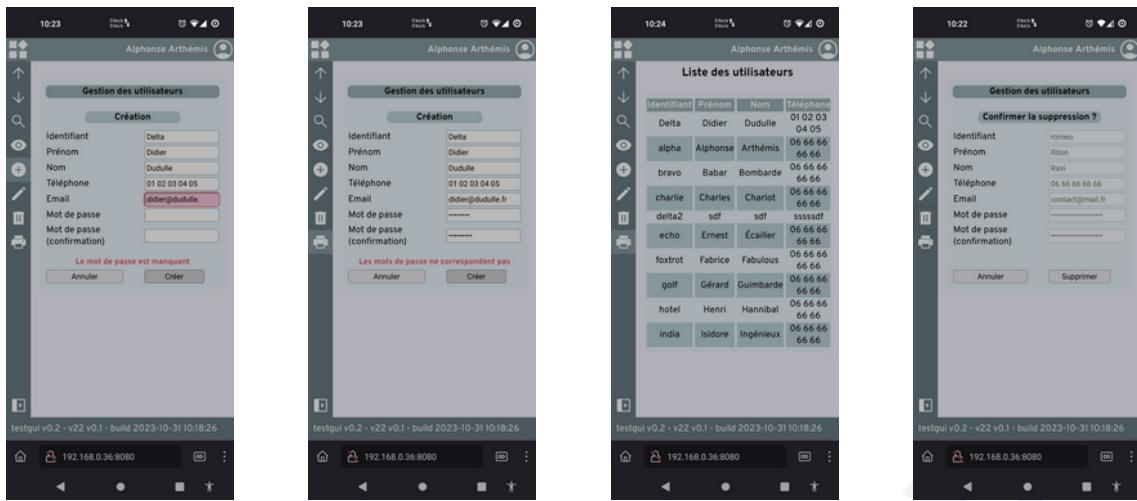


2.2 Full page screens



2.3 Admin users management





3 About the Ada Community

At first, thanks to the Ada Community, definitely one of the best.

3.1 Inspiration, packages used, ideas, help and more

AdaCore Ada compiler: <https://www.adacore.com/community>

David Botton: <https://www.linkedin.com/in/david-botton-3741b210> [Gnoga]

Dmitry A. Kazakov: <http://www.dmitry-kazakov.de/ada/components.htm> [Simple Components, used in Gnoga]

Gautier de Montmollin: <https://github.com/zertovitch> [Gnoga maintainer and much more]

Jean-Pierre Rosen: <https://adalog.fr> [Ada teacher, writer and much more]

Jeffrey R. Carter: <https://github.com/jrcarter/PragmARC> [PragmAda Reusable Components]

Michael Rohan: <https://sourceforge.net/projects/zanyblue> [Internationalization, used in Gnoga and v22]

Pascal Pignard: <https://github.com/Blady-Com> [UXStrings used in Gnoga and v22, Gnoga maintainer and much more]

3.2 Special thanks

Special thanks to Ada gurus Daniel Feneuille, Gautier de Montmollin, Pascal Pignard and Jean-Pierre Rosen. The chapter heading quotes are extracted from Murphy's Law and other reasons why things go wrong - A. Bloch. They come from <https://www.adalog.fr> site created by Jean-Pierre Rosen.

4 v22 history

We own the copyrights for v89, v90, v93, v95, v04, v20 and v22.

Some work in v22 framework is derived from theses libraries.

Ver.	Languages	Processor	OS	Context	Copyright	Users
v87	Clipper	i386	MsDos	ST Formation	Proprietary	CEA-DAM, CEA & EDF
v89	Clipper/C/Asm	i386	MsDos	Atlansys	Proprietary	ETDE, SAMU & EDF
v90	Clipper/C/Asm	i386	MsDos	Atlansys	Proprietary	Military, NGO & EDF
v93	C++	i386	Windows	Atlansys	Proprietary	Research
v95	Delphi	i386	Windows	Astriane	Proprietary	Military & NGO
v96	Asm	st62xx	Embedded	MRT	Proprietary	Military & Civilian
v97	Asm	pic17c44	Embedded	MRT	Proprietary	Military & Civilian
v04	Ada	i386	Windows	AIDE	GMGPL	Education
v20	Ada	x86-64	Linux	Sowebio	GPL v3	Terminal GP
v22	Ada	x86-64	Linux	Sowebio	LGPL v3	Terminal & Web GP

Setup

Doubling the number of programmers on a late project does not make anything else than double the delay.

Second Brook's Law



1 GNAT toolchain

To install an Ada toolchain suitable for v22, get **ADEL** [Ada Development Environment on Linux] manual at <https://github.com/sowebio/adel-doc> and apply the second chapter **GNAT Toolchain**.

2 Dependencies

2.1 Ada dependencies

v22 mainly depends on Gnatcoll, Gnoga, UXStrings, Zanyblue, LibcURL, PdfWriter.

Gnoga mainly depends on Simple_Components, UXStrings and Zanyblue.

So there's a strong community of dependencies between v22 and Gnoga.

2.1.1 Internal dependencies

Gnoga, Simple_Components, UXStrings, Zanyblue, PdfWriter are included in v22.

2.1.2 External dependencies

Add external dependencies:

```
user@system : alr get gnatcoll
```

2.2 System Dependencies

Most of the packages below are only required for Gnoga tests and demonstrations.

v22 uses its own source version of SQLite and *doesn't need the libsqlite2-* packages*.

MySQL support in v22 requires *libmariadb3*, *libmariadb-dev* and *libmariadb-dev-compat* for connection to a MariaDB database, which is preferred to MySQL, whose support on Debian and Ubuntu systems is considered rather low. But the final choice is yours.

Although this documentation always refers to MySQL, v22 is compatible with both MySQL, through its native *libmysqlclient*, and MariaDB, thanks to the *libmariadb-dev-compat* package, which emulates the *libmysqlclient* layer.

v22 needs *libcurl4* and *libcurl4-openssl-dev* if v22.Crl package is used.

Finally, the *libgnutls30* package is required to implement a TLS connection such as the https and wss protocols. If your application is behind a TLS proxy, this library is no longer needed.

The v22 framework provides the functionality for a v22 application to control and install the packages required for its proper execution.

	<i>Paquet</i>	<i>Commentaire</i>
LibcURL	<i>libcurl4</i>	LibcURL – v22.Crl
	<i>libcurl4-openssl-dev</i>	LibcURL development files with OpenSSL
MySQL	<i>libmariadb3</i>	MariaDB database client library – v22.Sql
	<i>libmariadb-dev</i>	MariaDB database development files
MySQL	<i>libmariadb-dev-compat</i>	MariaDB Connector/C, compatibility symlink with MySQL
	<i>mariadb-client</i>	Optional, for the MySQL CLI client
SQLite	<i>libssqlite3-0</i>	SQLite 3 shared library
	<i>libssqlite3-dev</i>	SQLite 3 development files
TLS/https	<i>libgnutls30</i>	GNU TLS library - main runtime library – v22.Gui
Gtk	<i>pkg-config</i>	Manage compile and link flags for libraries
	<i>libwebkit2gtk-4.0-37</i>	Web content engine library for GTK
	<i>libwebkit2gtk-4.0-dev</i>	Web content engine library for GTK - development files
	<i>libgtk-3-0</i>	GTK graphical user interface library
	<i>libgtk-3-dev</i>	Development files for the GTK library
	<i>libjavascriptcoregtk-4.0-dev</i>	JavaScript engine from WebKitGTK - development files

⇒ Minimal client setup reminder: sudo apt install libcurl4 libmariadb3 libmariadb-dev libmariadb-dev-compat

3 v22 installation

3.1 Build framework and test programs

Assuming you wish to install v22 under <your path> with a GNAT toolchain already installed, do the following from a command line interpreter.

Open a terminal:

```
user@system: cd <your path>
user@system: git clone https://github.com/sowebio/v22
user@system: cd <your path>
user@system: alr init --bin --in-place v22
```

```
user@system: alr with gnatcoll
```

Check the newly created alire.toml at the root of the project and add “executables” parameter:

```
name = "v22"
description = ""
version = "0.1.0-dev"

authors = ["Your Name"]
maintainers = ["Your Name <example@example.com>"]
maintainers-logins = ["github-username"]
licenses = ""
website = ""
tags = []

executables = ["test/testapi", "test/testgui"]

[[depends-on]]
gnatcoll = "^24.0.0"
```

3.1.1 Build and test on the console

```
user@system: gprbuild -P v22
user@system: cd tests
user@system: ./testapi
user@system: ./testgui
```

3.1.2 Build and test with the IDE

```
user@system: alr edit
```

Then press F9 to build.

3.2 Directories

v22 comes with some inner directories:

Packages	Description
bin	test binary place, with dontdelete.me test file for trailing comments preservation
doc	place of sow - v22 Ada Library User Manual.pdf and others documentation files
doc-generated	API doc generated by GNATStudio with GNATDoc
obj/debug obj/fast obj/small obj/style	build directories
src	sources of v22
src/sys	specials system files as s-memory.adb, the GNATColl memory monitor hook

Packages	Description
src-testapi	v22 api test program
src-testgui	v22 gui test program

Preliminary



Architecture

Doubling the number of programmers on a late project does not make anything else than double the delay.

Second Brook's Law



1 Introduction

v22 is currently in *alpha stage*, so its architecture could be subject to *slights changes*. User feedback is encouraged in order to improve it.

2 Requirements

A Linux workstation or server and an Ada compiler from the GNAT/GCC family are required.

A GNU/Linux Debian or Debian based like Ubuntu or Mint is recommended.

GNAT FSF 1124 from AIDE is recommended [see <https://github.com/sowebio/aide>]

GCC 11.2.4 with GNAT included or GNAT CE 2021 are good alternatives.

3 Coding guidelines

3.1 General

English should be used, both for identifiers, comments and documentation.

Naming is capitalized using underscore for compound name. ex: Entry_Value.

Comments leaves two spaces between -- and text comment.

The v22 code tries to adhere to the recommendations of the *Ada 95 Quality and Style book*. Like many Ada programmers, we believe that clarity and standardization of code is a respectful practice for later readers.

One exception to this is the non-alignment of operators vertically, the main author of v22 finding that the extra spaces, sometimes very numerous, detract from the readability of a left-to-right reading.

An other exception is the source code length. 72 columns is not mandatory anymore with our large displays. The standard v22 margin has been extended to 131 columns.

3.2 Messages

- `Msg.Info` [“This is an information message.”]

Information messages starts with a capital and ends with a dot. Ending message with three dots are only allowed when a user input is waited.

```
20231030-102625 - INIT - INF - TestGui.SQL_Ping > Armed for 3600s cycles
```

- `Msg.Debug` [“This is a debug message”]

Debug messages are free form messages to ease debugging. They are activated by the `Msg.Set_Debug [On]` procedure.

```
20231030-105547 - INIT - DBG - Load Database_Pragma: journal_mode=WAL
```

- `Msg.Error` [“v22.Fls.Function_Name > Error creating mount point: “ & Target_To_Mount & ” linked to ” & Mount_Point & ” on ” & Remote_Host”]

Error messages starts with the library or program hierarchy, following by a “greater than” sign, following by the error message, terminated with a colon and a space, then, optionally, followed by more information.

```
20231030-102818 - INIT - ERR - v22.Tio.Open_Conf > Can't apply permissions to file
```

3.3 Naming

We've tried to stay close to Ada naming by using routine names such as `Put`, `Put_Line` or `New_Line` where appropriate.

We've also tried to remain consistent in the names of getters and setters. In any case, we're listening to what users have to say to improve the v22 name space.

3.4 Behavior

Unlike the Ada runtime does, the text mode `Open` function of v22 now logically opens in `File_In` mode (read mode).

4 Design

v22 is designed as a KISS⁵ working framework. It does not attempt to reproduce the outstanding granularity of the Ada runtime but tries to reuse the best existing libre software resources to offer a simple yet highly productive environment.

4.1 Types

Name	Packages	Description
Boolean	Standard	
Character	Standard	

⁵Keep It Simple and Safe in our context.

Name	Packages	Description
Float	Standard	Scientific computing
Integer	Standard	
Money	v22	Financial computing
String	UXStrings	Unbounded UTF-8 string subtyping from UXString by Pascal Pignard
Geo		Geographic Coordinates.
	handling ok	

4.2 Packages

Name	Packages	Description
v22	Base	
Api	Api handling	GP Api handling for clients like OVH, Ionos, etc.
Bio	Binary I/O	Binary IO: Binary files, locking, etc.
Cfg	Configuration files	Simple and user friendly config files handling
Crl	cURL interface	cURL related
Fls	File system	File system related
Gui	Graphic User Interface	High level framework for Gnoga by David Botton
Msg	Logging	Log - Terminal and file log - on top of Tio
Net	Network	Remote command via SSH, Tor, Email and SMS sending
Pdf	Pdf handling	Routines for PdfWriter by Gautier de Montmollin
Prg	Program	Program and user related
Sql	SQL database	MySQL and SQLite high level implementation
Sys	System	Operating System related
Tio	Text I/O	Text Input/Output and Text files related
Uxs	UXStrings add-ons	Routines for UXStrings by Pascal Pignard
	Already coded	

4.3 Functions

About strings, v22 functions always handles and return String [UXString].

4.4 Databases

v22 handles MySQL [and MariaDB, Percona, etc. derivatives] and SQLite.

v22 does not act as an ORM, but offers selected features for rapid development of database applications

4.4.1 Data types

Nothing is really well defined in SQL, and the standard [not freely available] is betrayed in every implementation. SQLite's typing is particularly strange in this respect.

v22 gets around this problem, at type level, by limiting itself to basic six types, with normalized extra v22 data types such as Money, Datetime, Date.

We must not use MySQL-specific data types to remain compatible with SQLite.

Common types between MariaDB and SQLite used in v22:

<i>MySQL</i>	<i>SQLite</i>	<i>Compatibility notes</i>
Bigint	Bigint	-2 ⁶³ to 2 ⁶³ - 1
Blob	Blob	65535 max
Integer	Integer	-2147483648 to 2147483647 [signed]
Float	Float	Float SQLite affinity REAL
Text	Text	65535 max UTF-8, UTF-16BE, UTF-16LE
Varchar[n]	Varchar[n]	65535 max

Extended v22 types are:

<i>v22 Type</i>	<i>Database</i>	<i>Storing format</i>
Date	Varchar[8]	YYYYMMDD
DateTime	Varchar[15]	YYYYMMDD-HHMMSS
Money	Bigint	-999_999_999_999.99 to 999_999_999_999.99

Notes:

MONEY is **type Money is delta 0.01 digits 14**, stored in database as Bigint at the lowest unit, usually cents for euros or dollars. Ada Bigint is Long_Long_Integer.

BLOB of huge sizes should be allways stored as regular files.

4.5 Exceptions

V22 comes with an extended postmortem exception handler. This displays the trace not only on the screen, but also in a file bearing the application's name and .err extension.

A wide range of information is displayed and recorded:

```

-----
Exception time          : 20230921-123354
Program uptime          : 0h0 0m0 0s
Program build DT stamp : build 2023-09-21 12:33:15
Program name & version  : testgui v0.1
Library name & version : v22 v0.1
Start directory         : /home/sr/Sowebio/informatique/dev/gpl/github/v22/tests
Home directory          : /home/sr
Ada mem. alloc. [bytes]: Ada Cur: [ 4132 ] Max: [ 4708 ]
All mem. alloc. [bytes]: All Cur: [ 15204352 ] Max: [ 15204352 ]

raised V22.RAISE_EXCEPTION.V22_EXCEPTION_TEST : v22.adb: 81
[./testgui]
0x496f9e v22__raise_exception at v22.adb: 81
0x41c1b1 _ada_testgui at testgui.adb: 830
0x488d8f main at b__testgui.adb: 1173
[/lib/x86_64-linux-gnu/libc.so.6]
0x7fb0fee29d8e
0x7fb0fee29e3e
[./testgui]
0x415973_start at ???
0xffffffffffffffe
-----
```

```
20230921-123354 - INIT    - MSG - testgui > Exception detected, finalize application  
20230921-123354 - SQL T1  - MSG - Closing SQLITE database: v22_testapi_1  
20230921-123354 - SQL T1  - MSG - Closing SQLITE database: v22_testapi_2
```

When an exception occurs, the databases connections are cleanly closed, the console text cursor is restored and specific exit status are set.

- Implementation notes

In the GNAT Pro and CE releases, AdaCore has integrated the GNU/GCC utility addr2line into the GNAT runtime. Addr2line is called to display the subroutine names and line numbers of the call stack.

This feature is missing in the GNAT FSF version. This is a recurring complaint on the net, some people offer workarounds, but none of them work here [Linux, GNAT FSF 11]. Since the CE versions are terminated, there were two ways to restore this useful feature; the clean one, rebuild a full FSF compiler with this feature, and the fast dirty one. We obviously choose the latter.

When handling an exception, v22 search if the addr2line utility exists on the system and then, for each line indicating a "???", we run, on the executable itself, a command addr2line -e <executable name> <address> and analyze the return. If the latter is valid [example: /home/sr/.../debug/gnx-utl_sv.adb:1174, as opposed to "addr2line: DWARF error: can't find .debug_ranges section." and/or "?:?", ?:0"], the function replaces "???" by "gnx-utl_sv.adb:1174".

If the program was compiled with GNAT Pro or CE, this is transparent and if add2line was not found, the "???" are left as they are.

5 Components

5.1 Gnoga

Most of the information in this chapter is taken from the Gnoga documentation, written by Gnoga author David Botton.

5.1.1 What is Gnoga

Defining Gnoga is an important first step to using it. Gnoga is a framework and associated tools for developing GUI applications using the Ada language, leveraging web technologies to provide a rendering engine.

Gnoga should not be confused with a web development framework. While Gnoga is very capable of creating web applications and perform in that role and is even more capable than most web development frameworks, using Gnoga for web applications is only one possibility.

Native applications for desktop and mobile are just as easy to create, all using the same code base.

5.1.2 How does Gnoga work?

A Gnoga application can be divided into three parts:

- The application code written in Ada using the Gnoga framework and tools;
- The communication layer;
- The GUI rendering surface, an HTML-5 compliant browser or an embedded widget for native platform development.

The communication layer is not passive as in typical web programming using HTTP, nor is it using Ajax calls to simulate a live-active connection. It is an active, open connection using HTML5 web sockets or direct access at the API level to an embedded widget.

❖ Since the communication layer is always active there is a stateful constant connection to the rendering surface as there is in traditional desktop GUI development even if the rendering surface is a remote browser.

The idea of using publishing technologies to display a GUI is not new. Next used Postscript; Mac OS X uses PDF; and Gnoga uses HTML 5.

5.1.3 Singleton and multi-connect applications

There are two basic application types in Gnoga, Singleton applications and Multi Connect applications. Singleton applications are ideal for single user desktop use. They allow only a single connection and exit when that connection is lost. Since the application will not be accessed in parallel by other connections implementation is easier in that there is no need to protect data except from parallel incoming events from a single user [In Gnoga events are not serialized and are fired as they are generated concurrently].

5.1.4 Concurrency and exceptions

While this example works, there is an issue. In Gnoga and in particular in Multi-Connect applications, concurrency and exceptions must always be considered, given that:

- While highly unlikely, it is possible for our Users vector to be accessed concurrently, something that standard Ada containers are not designed to handle. If this were a production application, Users should be protected;
- While again highly unlikely given our application, it is possible for a view to be destroyed during the On\Change event. This could result in trying to call User\View.-Draw on an already deallocated object. Therefore, it would be a good idea to capture exceptions in the On\Change event at the very least, or as part of protecting the Users vector a means be included to insure the validity of the User_View before calling Draw.

Gnoga will handle most exceptional situations not handled in your code, but creating a solid Multi-Connect application should include considerations for the above in all designs. Improving on our example is left as an exercise to the reader.

5.1.5 Advanced: The "Connection" Parameter and GUI elements on Stack

The extra parameter "Connection" in our controller procedure "Default" can be used when you wish to block the connection procedure until the connection is closed. The two common uses of Connection.Hold to block until connection loss are:

- To add clean up code on connection loss to the connection procedure; this could also have been added to the On_Destroy event for Main_Window.
- To prevent finalization of statically defined GUI elements within the connection procedure until the connection has been lost.

An example of this second method would allow us to rewrite the skeleton procedure as:

```
``` ada
procedure Default
 [Main_Window : in out Gnoga.Gui.Window.Window_Type' Class;
 Connection : access
 Gnoga.Application.Multi_Connect.Connection_Holder_Type]
is
 View : GnogaBoard.View.Default_View_Type;
begin
 View.Create [Main_Window];
 View.Click_Button.On_Click_Handler [On_Click' Access];

 Connection.Hold;
end Default;
```

```

5.1.6 Advanced: Per Connection App Data

In the multi-connect example above we use the connection's main view to store data specific for each user connection. It is often convenient to have a data structure containing the data specific to a connection. Gnoga offers a way to associate data to a connection and allow access to those data through any GUI element on that connection.

The following is an example:

```
``` ada
type App_Data is new Connection_Data_Type with
 record
 Main_Window : Window.Pointer_To_Window_Class;
 Hello_World : aliased Common.DIV_Type;
 end record;
type App_Access is access all App_Data;

procedure On_Click [Object : in out Gnoga.Gui.Base.Base_Type' Class;
 Event : in Gnoga.Gui.Base.Mouse_Event_Record]
is
 App : App_Access := App_Access [Object.Connection_Data];
begin
 App.Hello_World.Text ("I've been clicked");
end On_Click;

procedure On_Connect
 [Main_Window : in out Gnoga.Gui.Window.Window_Type' Class;
 Connection : access
 Gnoga.Application.Multi_Connect.Connection_Holder_Type]
is
 App : App_Access := new App_Data;
begin
 Main_Window.Connection_Data [App];
 App.Main_Window := Main_Window'Unchecked_Access;
```

```

```

App.Hello_World.Create [Main_Window, "Click Me"];
-- By default Connection_Data is assumed to be a dynamic object
-- and freed when the connection is closed. To use static app
-- data pass Dynamic => False
...
``end On_Connect;

```

5.1.7 Multi Connect Applications for a Single User

A Multi-Connect application allows multiple connections to the same application at the same time. This does not always imply multiple users, it could even be the same user with multiple browser windows connected to the same application. When using a multi-connect application as a single-user desktop application you simply need to restrict access to the application to the local machine and provide some way for the application to know it is time to shutdown. Some tips:

- In the On_Connect procedure check if there has already been a connection and if a reconnect is tried return a view that indicates application is already running.
- If limiting to only one main window, use that window's On_Destroy event to tell the application to shut down using Gnoga.Application.Multi\Connect.End\Application if you do not provide some other way to exit the application, or track connections and end the application when all connections are closed.
- Limit connections to the local machine only: in initialize use Initialize [Host => "127.0.0.1"];

5.1.8 Gnoga Types

By convention in Gnoga all types are usually defined in the following way and using the following naming convention:

```

type Some_Type is ....;
type Some_Access is access all Some_Type;

```

if Some_Type is a tagged type:

```

type Pointer_to_Some_Class is access all Some_Type' Class

```

5.1.9 Directory structure when developing apps

If you use the gnoga_make tool it will set up a development directory structure in addition to creating a skeleton application. [See the Singleton and Multi-Connect examples]. For reference the following directory structure is the basic structure:

```

App Dir
|
|___ bin - your gnoga app binary
|
|___ html - boot.html [or other boot loader used]
|
|___ js - must contain jquery.min.js and boot.js

```

```

|--- css - optional, all files served as CSS files
|--- img - optional, files served as graphics files
|--- src - Source code for your gnoga app
|--- obj - Build objects
|--- templates - optional, if using Gnoga.Server.Template_Parser
|--- upload - optional, optional directory for incoming files

```

If any of the subdirectories are missing, the files expected to be in them are assumed to be in html. If the html subdirectory is also missing these files are assumed to be in App Dir. The executable can be in the bin directory or in App Dir.

5.1.10 Application, Types, Gui, Server, Client

See Gnoga API Application, Types, Gui, Server, Client for more details.

5.1.11 Plugins and Modules

Users can write and publish to the Gnoga Marketplace two Gnoga-specific UI extension types, Plugins and Modules.

Plugins, including jQuery, jQueryUI, Boot_Strap, and Ace\Editor, are bindings to JavaScript libraries for use on the client side.

Modules are unique Gnoga-based UI elements written with Gnoga.

5.1.12 Tags Bound in Gnoga

While Gnoga is not exactly HTML in Ada, knowing the relationships may be of assistance in developing your application:

- HTML5 Tags Bound as Gui Elements in Gnoga

| HTML tags | GUI Elements |
|--|---|
| <a>,<hr>,
,<button>,<div>,,<meter>,<progress>,<p> | Element.Common - see also Gui.View for <div> and |
| <canvas> | Element.Canvas |
| <svg> | Element.SVG |
| <form>,<input>,<textarea>,<select>,<datalist>,<legend>,<label>,<option>,<optgroup> | Element.Form |
| <fieldset> | Element.Form.Fieldset |
| <audio>,<video>,<source>*,<track>* | Element.Multimedia |
| <iframe> | Element.IFrame |
| <html>,<body>,<head> | Access through Window_Type.Document |
| ,,,<dl>,<dd>,<dt> | Element.List |
| <address>,<article>,<aside>,<header>,<main>,<nav>,<p>,<pre>,<section> | Element.Section |
| <code>,,,<dfn>,<samp>,<kbd>,<var>,<marked>,,<ins>,<s>,<q>,<big>,<small>,<time>,<tt>,<wbr> | Element.Phrase |

| HTML tags | GUI Elements |
|---|---|
| <link>, <style>, <title> | Element.Style_Block, The Style property on Element_Type
Document.Load_CSS, Document.Title Since content is generated by code |
| <table>, <caption>, <td>, <tr>, <th>, <col>, <colgroup>, <tfoot>, <thead> | Element.Table |

* Not needed

- **HTML5 Tags Unbound as Gui Elements in Gnoga**

Note: All tags can be bound and used with Element_Type.Create_With_HTML. For various reasons as described here, they are not bound specifically.

| HTML tags | GUI Elements |
|---|---|
| <map>, <area> | No specific bindings currently for image maps; best generated with an automated tool as regular HTML. |
| <bdi>, <bdo>, <ruby>, <rp>, <rt>, <details>, <output>, <figure>, <flgcaption> | Text formatting tags are not bound. Have no application specific use. Span_Type should be used to contain text that needs interaction or interactive styling. |
| <object>, <embed>, <script>, <noscript>, <param>, <applet> | No bindings are made for external plugins or scripting tags |
| <base>, <meta> | base and meta only make sense for static pages |
| <dialog>, <keygen>, <menu>, <menuitem> | No browsers support these tags in a way worth binding yet |
| <frameset>, <frame>, <noframes> | No window level frame support; see Element.IFrame |

5.1.13 Gnoga Concepts: in and out of the DOM

An HTML document is a hierarchical collection of objects. In a browser window, the displayed document is the browser's DOM, but it is possible within JavaScript to have objects that are not in the main DOM and have their own hierarchical collections, DOMs.

Gnoga maintains on the browser side JavaScript references to GUI elements it creates; these elements may or may not also be in the browser's DOM. When creating a new object in Gnoga, if the parent is in the browser's DOM, the child will be there as well. If not, it will just be part of the parent's individual DOM and not be visible, and even changing the visibility of that object will not make it appear on the browser window since they are not in the Browser's DOM.

To take an object and all its children out of the DOM use Gnoga.Gui.Element.Remove; to place it back in the DOM use one of the Place_* methods in Gnoga.Gui.Element.

5.1.14 Gnoga Concepts: Display, Visible, Hidden

HTML5 uses a few different independently working properties for visibility.

Visible will turn on or off the visibility of an element and its children, but the objects will still take the same space on the page.

Hidden will turn off visibility and the object and its children will no longer take up space on the page, either.

Display changes how the elements are laid out by the browser. Using Display [None] acts in the same fashion as Hidden.

5.1.15 Gnoga Concepts: Inner_HTML, Text and Value

Retrieving the contents of an Element in Gnoga differs depending on the type of Element. For form Elements the Value method is used. For others Text can be used to retrieve the text alone or Inner_HTML to retrieve the contents including any HTML tags present.

The reason there are different methods is based on the way the underlying HTML 5 works. Text and Inner\HTML are retrieving all child nodes with in the element while Value is an attribute of Form elements. So Text or Inner_HTML will return the contents of every child.

<https://this-page-intentionally-left-blank.org>

v22 Ada Framework User Manual



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Examples

Investment in C programs reliability will increase up to exceed the probable cost of errors or until someone insists on recoding everything in Ada.
Gilb's laws synthesis



1 TestApi

TestApi is a simple console program which shows the main features of v22 packages.
TestApi is automatically build when building v22.

2 TestGui

TestGui is a simple web program which mainly shows some features of v22.Gui and v22.Sql. TestApi is automatically build when building v22.

When launching for the first time,

```
20231031-172139 - INIT      - MSG - v22 Framework - GUI test program
20231031-172139 - INIT      - MSG - Copyright [C] Sowebio SARL 2020-2023 under LGPLv3
20231031-172139 - INIT      - MSG - testgui v0.2 - v22 v0.1 - build 2023-10-31 17: 21: 16
```

TestGui creates an already set testgui.cfg to create a standalone SQLite database.

```
20231031-172139 - INIT      - MSG - TestGui.Init.App > Configuration file testgui.cfg has been created.
20231031-172139 - INIT      - MSG - TestGui.Init.App > Configuration file testgui.cfg loaded
```

Then GestGui also creates and populates a demo database named testgui.db.

```
20231031-172139 - INIT      - MSG - Database testgui needs creation or update
20231031-172139 - INIT      - MSG - Create Table: Sys_Config - Create Column: Parameter VARCHAR[40] UNIQUE PRIMARY KEY
20231031-172139 - INIT      - MSG - Table: Sys_Config - Create Column: Value TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Config - Creating Index: Idx_Config_Parameter Parameter
20231031-172139 - INIT      - MSG - Create Table: Sys_Schema - Create Column: Table_Name VARCHAR[40]
20231031-172139 - INIT      - MSG - Table: Sys_Schema - Create Column: Column_Name VARCHAR[40]
20231031-172139 - INIT      - MSG - Table: Sys_Schema - Create Column: Column_Type TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Schema - Create Column: Column_Constraint TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Schema - Create Column: Version TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Schema - Create Column: Comment TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Schema - Creating Index: Idx_Schema_Table_Name Table_Name,Column_Name
20231031-172139 - INIT      - MSG - Create Table: Sys_Users - Create Column: Login VARCHAR[40] UNIQUE PRIMARY KEY
20231031-172139 - INIT      - MSG - Table: Sys_Users - Create Column: First_Name TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Users - Create Column: Last_Name TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Users - Create Column: Phone TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Users - Create Column: Email TEXT
20231031-172139 - INIT      - MSG - Table: Sys_Users - Create Column: Password TEXT
```

```

20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Grants TEXT
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Properties TEXT
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Language TEXT
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Time_Zone TEXT
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Theme TEXT
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Notes TEXT
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Created_On VARCHAR[15]
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Updated_On VARCHAR[15]
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Connection_Timeout INTEGER
20231031-172139 - INIT   - MSG - Table: Sys_Users - Create Column: Connection_Total INTEGER
20231031-172140 - INIT   - MSG - Table: Sys_Users - Create Column: Connection_Counter INTEGER
20231031-172140 - INIT   - MSG - Table: Sys_Users - Create Column: Connection_Info INTEGER
20231031-172140 - INIT   - MSG - Table: Sys_Users - Creating Index: Idx_User_Login Login UNIQUE

```

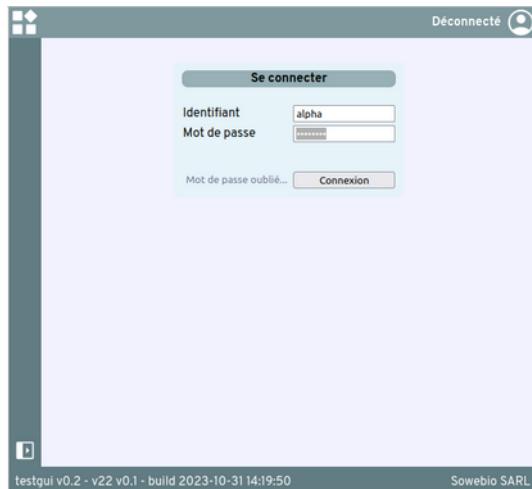
Finally, TestGui is ready to use and wait for its first connexion.

```

20231031-172140 - INIT   - MSG - TestGui.On_Connect > Starting Gnoga server
20231031-172140 - INIT   - MSG - TestGui.SQL_Ping > Armed for 3600s cycles

```

In your preferred browser, type localhost:8080 to connect to TestGui and type Identifier: alpha and Password: password to log in.

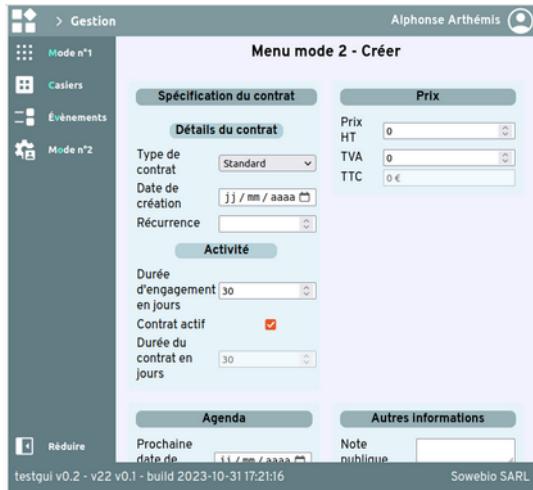


When logged, the main screen appears. Click on the icon at bottom left to expand the menu bar. Click on the User parameters icon [labelled Mode 2]. A sub menu appears.



Then click on create to display a new two columns screen.

Test the drop-down menu and the calendar.



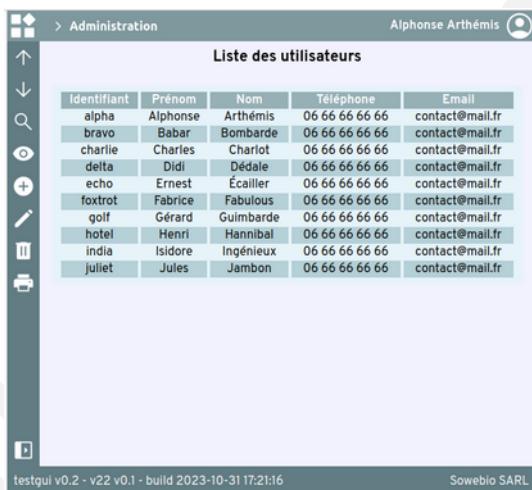
Adjust the screen width to test the responsiveness. TestGui will adapt and shrink to one column.



Then click on the icon at the top left, then click on admin.



Click on the first icon in the menu bar [labelled Users].



Up arrow move the list backward. Down arrow move the list forward.

Click on an item list [the color change] and display the detailed view clicking on the magnifier or on the pen to update the item.

Click on the plus sign to create a new user or, after selected an item, click on the bin to delete it.

3 Event listener interfaces with Gnoga

Reproduction of ~/Gnoga/doc/articles/event_listeners.txt by Jeremiah Breeden.

An option that I have used is to create event listener interface. I extend the button class to include an event generator that maintains a list of listeners and I add an Add_Listener procedure so outside views can add themselves as listeners. I create a handler that Gnoga expects but have that handler operate the generator to fire the events out of the button class.

Then I extend whichever view I am using to implement the listening interface, override the create procedure, and have it call the Add_Listener procedure mentioned above. Then I just have to override the listener procedure that handles the event and I have both the parent view that is interested in the event and the button that sourced the original event.

It's a bit complex, but it allows me to have any structure I want be able to respond to any event just by adding itself as a listener to the event.

The big thing is Handle_On_Click gives you the containing view type which allows you to modify other controls using the on click from the button. You can also pass the on click event to other parent views who may want to modify their own layouts based on that button event. You would just need to add a public Add_On_Click Listener [or whatever name] procedure to Listener_View.View_Type [or whatever view you create] and have it call the button's Add_On_Click Listener procedure.

Button_For_Listeners is the extended class for Gnoga's Button_Type Listener_View is just a test view type that would contain a Button among other controls.

button_for_listeners.ads

```
with Gnoga.Gui.Element.Common;
with Ada.Containers.Vectors;

package Button_For_Listeners is

    type Listener_Type is limited interface;

    type Button_Type is new Gnoga.Gui.Element.Common.Button_Type with private;

    procedure Add_On_Click_Listener
        (Self      : in out Button_Type;
         Listener : not null access Listener_Type'Class);

    procedure Handle_On_Click(Listener : in out Listener_Type;
                             Source   : in out Button_Type'Class) is abstract;

private
    type Listener_Class_Access is access all Listener_Type'Class;
    package Vectors is new Ada.Containers.Vectors(Natural,Listener_Class_Access);

    type Button_Type is new Gnoga.Gui.Element.Common.Button_Type with record
        On_Click_Listeners : Vectors.Vector;
    end record;

end Button_For_Listeners;
```

button_for_listeners.adb

```
with Gnoga.Gui.Base;

package body Button_For_Listeners is

    procedure Gnoga_On_Click(Object : in out Gnoga.Gui.Base.Base_Type'Class) is
        Cursor : Vectors.Cursor := Button_Type(Object).On_Click_Listeners.First;
    begin
```

```

        while Vectors.Has_Element(Cursor) loop
            Vectors.Element(Cursor).Handle_On_Click(Button_Type'Object);
            Cursor := Vectors.Next(Cursor);
        end loop;
    end Gnoga_On_Click;

    procedure Add_On_Click_Listener
        (Self      : in out Button_Type;
         Listener : not null access Listener_Type'Class) is
    begin
        Self.On_Click_Listeners.Append(Listener);
        Self.On_Click_Handler(Gnoga_On_Click' Access);
    end Add_On_Click_Listener;

end Button_For_Listeners;

```

listener_view.ads

```

with Gnoga.Gui.View;
with Gnoga.Gui.Base;
with Button_For_Listeners;

package Listener_View is
    package Buttons renames Button_For_Listeners;

    type View_Type is new Gnoga.Gui.View.View_Type
        and Buttons.Listener_Type with private;

    overriding
    procedure Create
        (Self      : in out View_Type;
         Parent   : in out Gnoga.Gui.Base.Base_Type'Class;
         ID       : in      String  := "");

    private
        type Self_Ref_Type(Ref : access Buttons.Listener_Type'Class)
            is limited null record;

        type View_Type is new Gnoga.Gui.View.View_Type
            and Buttons.Listener_Type with record
            Button : Buttons.Button_Type;
            Self_Reference : Self_Ref_Type(View_Type' Access);
        end record;

    overriding
    procedure Handle_On_Click(Listener : in out View_Type;
                               Source   : in out Buttons.Button_Type'Class);
end Listener_View;

```

listener_view.adb

```

package body Listener_View is
    procedure Create(Self      : in out View_Type;
                     Parent   : in out Gnoga.Gui.Base.Base_Type'Class;
                     ID       : in      String  := "") is
    begin
        Gnoga.Gui.View.View_Type(Self).Create(Parent);
        Self.Button.Create(Self, "Test Button");
        Self.Button.Add_On_Click_Listener(Self.Self_Reference.Ref);
    end Create;

    Test_Count : Natural := 0;

```



```

overriding
procedure Handle_On_Click(Listener : in out View_Type;
                           Source   : in out Buttons.Button_Type'Class) is
begin
   Listener.Button.Text("Testing: " & Integer' Image[Test_Count]);
   Test_Count := Test_Count + 1;
end Handle_On_Click;

end Listener_View;

```

4 Productivity tools

Gnoga allows you to leverage existing HTML tools to quickly design and create Forms for use in Gnoga applications.

Here is a simple step by step guide to quickly creating a bootstrap based Form using a simple online tool with Gnoga.

4.1 Form builder

Amended reproduction of [~/Gnoga/doc/articles/QuickandSimpleFormBuildingwith-Gnoga.pdf](#), author unknown.

4.1.1 Create form

<http://bootsnipp.com/forms?version=3>

Click on Form Name for the title that will be displayed above the form, for this Example: “Hello World Gnoga and Bootstrap”

Drag a “Text Input” on to the form with your mouse

Click on the Text Input and fill in:

- ID/Name : fname
- Label Text : First Name
- Placeholder : blank
- Help Text : Enter your first name
- Click required
- Leave input size at Medium
- Click Save

Drag a “Text Input” on to the form with your mouse under the First Name field

Click on the Text Input and fill in:

- ID/Name : lname
- Label Text : Last Name
- Placeholder : blank
- Help Text : Enter your last name
- Click required
- Leave input size at Medium
- Click Save

Click on the “buttons” tab above the form elements

Drag a Single Button over under the two fields

Click on the Single Button and fill in:

- ID/Name : sbutton
- Label Text : blank
- Button Label : Ok
- Leave button type : Primary
- Click Save

4.1.2 Create Gnoga Project

Let's create our skeleton project using gnoga_make:

- Run [add path if needed]: gnoga_make new form_demo1 multi_connect
- Edit the path [if needed] to gnoga at form_demo1/src/form_demo1.gpr

Replace boot.html copy ~/gnoga/html/boot_starp3.html to replace boot.html from the html directory of your project.

From the css directory of your project, copy the bootstrap.min.css file from the bootstrap dist directory [see below].

From the js directory of your project, copy the bootstrap.min.js file from the bootstrap dist directory [see below].

Make the directory templates:

- mkdir templates

Copy the content of Rendered or View HTML tab to the body of form_demo1.html.

Edit our view spec form_demo1view.ads:

- Add with Gnoga.Gui.Element.Form;
- Replace the record contents of Default_View_Type with:
- First_Name : Gnoga.Gui.Element.Form.Text_Type;
- Last_Name : Gnoga.Gui.Element.Form.Text_Type;

Edit the view form_demo1view.adb:

- In the procedure Create after the call to the parent Create add:
- Replace the Create procedure body with:

```
Gnoga.Gui.View.View_Type [View].Create [Parent, ID];
View.Load_File ["form_demo1.html"];
View.First_Name.Attach_Using_Parent [View, "fname"];
View.Last_Name.Attach_Using_Parent [View, "lname"];
```

Edit the form_demo1controller.adb:

- Replace the On_Click with:

```
procedure On_Submit [Object : in out Gnoga.Gui.Base.Base_Type'Class];
procedure On_Submit [Object : in out Gnoga.Gui.Base.Base_Type'Class] is
View : form_demo1.View.Default_View_Type renames
form_demo1.View.Default_View_Type [Object];
begin
Gnoga.Log ("First Name : " & View.First_Name.Value);
Gnoga.Log ("Last Name : " & View.Last_Name.Value);end On_Submit;
```

- Replace the body of Default with:

```
View.Dynamic;
View.Create [Main_Window];
View.On_Submit_Handler [On_Submit'Access];
```

Now build the project by running make at the root dir of your project and open your browser to localhost:8080 and your done :]

The complete View and Controller files follow along with the form_demo1.html clip from the website:

```
with Gnoga.Gui.Base;
with Gnoga.Gui.View;
with Gnoga.Gui.Element.Form;

package form_demo1.View is

    type Default_View_Type is new Gnoga.Gui.View.View_Type with
        record
            First_Name : Gnoga.Gui.Element.Form.Text_Type;
            Last_Name : Gnoga.Gui.Element.Form.Text_Type;
        end record;

    type Default_View_Access is access all Default_View_Type;
    type Pointer_to_Default_View_Class is access all Default_View_Type'Class;

    overriding procedure Create [View : in out Default_View_Type; Parent : in out Gnoga.Gui.Base.Base_Type'Class; ID : in String := ""];

end form_demo1.View;
```

```
package body form_demo1.View is

    Create

        overriding procedure Create [View : in out Default_View_Type; Parent : in out Gnoga.Gui.Base.Base_Type'Class; ID : in String := ""] is
            begin
                Gnoga.Gui.View.View_Type [View].Create [Parent, ID];
                View.Load_File ["form_demo1.html"];
                View.First_Name.Attach_Using_Parent [View, "fname"];
                View.Last_Name.Attach_Using_Parent [View, "lname"];
            end Create;

end form_demo1.View;
```

```
with Gnoga.Gui.Base;
with form_demo1.View;

package body form_demo1.Controller is

    procedure On_Submit [Object : in out Gnoga.Gui.Base.Base_Type'Class];
    procedure On_Submit [Object : in out Gnoga.Gui.Base.Base_Type'Class] is
        View : form_demo1.View.Default_View_Type renames
            form_demo1.View.Default_View_Type [Object];
        begin
            Gnoga.Log ["First Name : " & View.First_Name.Value];
    end On_Submit;
```

```

        Gnoga.Log ["Last Name : " & View.Last_Name.Value];
end On_Submit;

procedure Default [Main_Window : in out Gnoga.Gui.Window.Window_Type'Class; Connection : access Gnoga.Application.Multi_Connect.Connection_Holder_Type] is
    View : form_demo1.View.Default_View_Access := new form_demo1.View.Default_View_Type;
begin
    View.Dynamic;
    View.Create [Main_Window];
    View.On_Submit_Handler [On_Submit' Access];
end Default; begin

Gnoga.Application.Multi_Connect.On_Connect_Handler [Default' Access, "default"];

end form_demo1.Controller;

```

4.1.3 templates/form_demo.html

```

<form class="formhorizontal">
<fieldset>

<! Form Name >
<legend>Hello World Gnoga and Bootstrap</legend>

<! Text input>
<div class="formgroup">
    <label class="colmd4 controllabel" for="fname">First Name</label>
    <div class="colmd4">
        <input id="fname" name="fname" type="text" placeholder="" class="formcontrol input-md" required="">
        <span class="helpblock">Enter your first name</span>
    </div>
</div>

<! Text input>
<div class="formgroup">
    <label class="colmd4 controllabel" for="lname">Last Name</label>
    <div class="colmd4">
        <input id="lname" name="lname" type="text" placeholder="" class="formcontrol input-md" required="">
        <span class="helpblock">Enter your last name</span>
    </div>
</div>

<! Button >
<div class="formgroup">
    <label class="colmd4 controllabel" for="sbutton"></label>
    <div class="colmd4">
        <button id="sbutton" name="sbutton" class="btn btnprimary">Ok</button>
    </div>
</div>

</fieldset>
</form>

```

4.1.4 Bootstrap-Form-Builder

<https://github.com/minikomi/Bootstrap-Form-Builder> using Bootstrap 2.3.1
<http://bootsnipp.com/forms?version=3> using Bootstrap 2.3.1

4.1.5 Bootstrap library

<https://getbootstrap.com>

```
git clone https://github.com/twbs/bootstrap
```

```
git checkout tags/v2.3.2 -b v2.3.2-branch  
Basculement sur la nouvelle branche 'v2.3.2-branch'
```

```
git checkout tags/v3.4.1 -b v3.4.1-branch  
Basculement sur la nouvelle branche 'v3.4.1-branch'
```

4.2 Page builder

<<<TODO>>>

Evaluate the online page builder <https://bootsnipp.com/builder>.

Needs Bootstrap 4 for widgets.

<https://this-page-intentionally-left-blank.org>

Preliminary

v22 Ada Framework User Manual



www.soweb.io
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API

There are 10 types of people in the world: those who understand binary and those who don't.

Anonymous



1 v22

1.1 Introduction

1.1.1 Concepts

The developer is a writer. The writer's courtesy is clarity;

❖ Clarity and ease of use are prioritized over speed and efficiency.

The performance of a compiled language such as Ada as well as the hardware capabilities of current systems justify – most of the times - these choices.

On a simple loop, let's recall that if HAC [a very valuable and helpful Ada subset interpreter] is [among others] 7 times faster and vastly more capable than Bash, HAC itself is 300 times slower than Ada. So... Loop to the grayed second line :]

1.1.2 Conventions

To ease developers:

❖ String type is a subtype of UXString. This new String UTF-8 subtype is the standard v22 type. You should always use String⁶.

❖ All strings constants and function only returns String type.

❖ All strings parameters accept String type.

1.1.3 Usage

Use ./v22/v22.gpr as a stub for your own projects.

Use ./v22/example/ as an application template useful to create your own projects.

⁶ Only use Standard.String when appropriate.

1.2 v22
Base package.

1.2.1 Get_Build

- **Description**

Returns the formatted build date stamp as: "build YYYY-mm-dd hh:mm:ss".

- **Usage**

```
function Get_Build return String
```

- **Example**

```
Log.Msg ["Date stamp build: " & v22.Get_Build];  
build 2021-08-04 14:36:27
```

1.2.2 Get_Log_Dir

- **Description**

Returns the log directory.

- **Usage**

```
function Get_Log_Dir return String
```

- **Example**

```
Log.Msg ["v22.Get_Log_Dir];  
/var/log/
```

1.2.3 Get_Tmp_Dir

- **Description**

Returns the temporary files directory.

- **Usage**

```
function Get_Tmp_Dir return String
```

- **Example**

```
Log.Msg ["v22.Get_Tmp_Dir];  
/tmp/
```

1.2.4 Get_Version

- **Description**

Returns the Library name and formatted version: "<space>v.minor.major".

- **Usage**

```
function Get_Version return String
```

- **Example**

```
Log.Msg ["Library version: " & v22.Get_Version];
v22 v0.6
```

1.2.5 Raise_Exception

- **Description**

Raise an exception for reporting test and <program_Name.err> file creation.

In addition to the usual trace, a v22 exception give some extra information like: exception time, program uptime, program & library names & versions, start & home directories and Ada and all languages memory allocation, current & maximum (peak) values.

- **Usage**

```
procedure Raise_Exception
```

- **Example**

```
Raise_Exception;
20230921-123354 - INIT      - MSG - Exception test triggered by a raise exception
-----
Exception time          : 20230921-123354
Program uptime          : 0h0 0m0 0s
Program build DT stamp : build 2023-09-21 12:33:15
Program name & version  : testgui v0.1
Library name & version : v22 v0.1
Start directory         : /home/sr/Sowebio/informatique/dev/gpl/github/v22/tests
Home directory          : /home/sr
Ada mem. alloc. [bytes]: Ada Cur: [ 4132 ] Max: [ 4708 ]
All mem. alloc. [bytes]: All Cur: [ 15204352 ] Max: [ 15204352 ]

raised V22.RAISE_EXCEPTION.V22_EXCEPTION_TEST : v22.adb:81
[./testgui]
0x496f9e v22__raise_exception at v22.adb:81
0x41c1b1 _ada_testgui at testgui.adb:830
0x488d8f main at b__testgui.adb:1173
[/lib/x86_64-linux-gnu/libc.so.6]
0x7fb0fee29d8e
0x7fb0fee29e3e
[./testgui]
```

```
0x415973_start at ???  
0xfffffffffffffe  
  
-----  
20230921-123354 - INIT    - MSG - testgui > Exception detected, finalize application  
20230921-123354 - SQL T1  - MSG - Closing SQLITE database: v22_testapi_1  
20230921-123354 - SQL T1  - MSG - Closing SQLITE database: v22_testapi_2
```

1.3 Cfg - Configuration files

1.3.1 Close

- Description

Close Cfg file. For sanity only as each setting is instantly flushed to disk.

- Usage

```
procedure Close
```

- Example

```
-----
```

1.3.2 Comment

- Description

Insert a comment Text to the next line.

- Usage

```
procedure Comment [Text : String]
```

- Example

```
-----
```

1.3.3 Delete

- Description

Delete parameter in section. If no other parameter in this section, delete section too.
Avoid reserved chars [] = # inside parameters.

- Usage

```
procedure Delete [Section : String; Parameter : String]
```

- Example

```
-----
```

1.3.4 Get

- Description

Return parameter in section or empty string if not found. Avoid reserved chars [] = # inside parameters.

- Usage

```
function Get [Section : String; Parameter : String] return String
```

- Example

```
[REDACTED]
```

1.3.5 New_Line

- Description

Insert a blank line after to the next line.

- Usage

```
procedure New_Line
```

- Example

```
[REDACTED]
```

1.3.6 Open

- Description

Open and load if exist a configuration file. Create blank if non existent. Default configuration file name is “program name” followed by “.cnf” extension and created in the program start directory.

- Usage

```
function Open [Cfg_File_Read_In : String := ""] return Boolean
```

- Example

```
[REDACTED]
```

1.3.7 Set

- Description

Create or replace an existing parameter in a section. If this latter does not exist, also creating it. New setting is persistent even program quits unexpectedly after. Avoid reserved chars [] = # inside parameters. If reserved chars are passed, the procedure does nothing. An optional trailing comment can also be added.

- Usage

```
procedure Set [Section : String;
              Parameter : String;
              Value : String;
              Comment : String := ""]
```

- Example

1.4 Crl – cURL integration

Crl is a comprehensive binding to libcurl as cURL is an very useful tool when dealing with almost everything around internet.

General information here: <https://curl.se/libcurl/c/libcurl.html>.

The recommended way to talk with libcurl is the “Easy interface”: (<https://curl.se/libcurl/c/libcurl-easy.html>).

1.4.1 Get_Version

- Description

Return cURL version. On Ubuntu 22.04 LTS, the standard libcurl got theses caps:
libcurl/7.81.0 OpenSSL/3.0.2 zlib/1.2.11 brotli/1.0.9 zstd/1.4.8 libidn2/2.3.2
libpsl/0.21.0 [+libidn2/2.3.2] libssh/0.9.6/openssl/zlib nghttp2/1.43.0 librtmp/2.3
OpenLDAP/2.5.16

- Usage

```
function Get_Version return VString;
```

- Example

```
Tio.Put_Line [Crl.Get_Version];
cURL version: libcurl/7.81.0 OpenSSL/3.0.2 zlib/1.2.11 brotli/1.0.9 zstd/1.4.8 libidn2/2.3.2 libpsl/0.21.0 [+libidn2/2.3.2] libssh/0.9.6/openssl/zlib nghttp2/1.43.0 librtmp/2.3 OpenLDAP/2.5.16
```

1.5 Fls – Files management

1.5.1 Backup_File

- Description

Rename file with .bak.n suffix. Iterate n=0..9 searching a free n bak file. If n is free then write .bak.n, if n=9, delete .bak.0

- Usage

```
procedure Backup_File [File_To_Backup : String];
```

- Example

1.5.2 Copy_File

- Description

Copy a Source_Name file to a Target_Name file destination.

Copy_Form is “preserve=all_attributes,mode=overwrite” [full attributes preservation and overwrite file if exists].

- Usage

```
procedure Copy_File [Source_Name, Target_Name : String]
```

- Example

1.5.3 Create_Directory_Tree

- Description

Create a directory tree Dir_Tree. Each non-existent directory named by Dir_Tree is created [possibly including other intermediate directories]. Return False if operation is unsuccessful [i.e. if base directory tree is inconsistent or still don't exist after the creating attempt]. Return True if directory tree already exists or has just been created.

Extra inner slashes are processed i.e. a directory like /home/sr/opt/ytr.lkj////kjghgh will be valid. and will create, from /home/sr/opt :

- Directory ytr.lkj
- And then inner directory kjghgh

- Usage

```
function Create_Directory_Tree [Dir_Tree : String] return Boolean
```

- Example

1.5.4 Delete_Directory_Tree

- Description

Delete a directory tree Dir_Tree. The directory and all of its contents [possibly including other directories] are deleted. Return True if Dir_Tree is successfully deleted

or was already deleted. Return False if operation is unsuccessful [i.e. if base directory tree was non existent or still exists after the deleting attempt].

Dir_Tree must be fully qualified, i.e. starting with a slash [/].

This function prevents deletion of the following root directories: bin, boot, dev, etc, home, lib, lib32, lib64, libx32, lost+found, media, mnt, opt, proc, root, run, sbin, srv, sys, tmp, usr, var. Pay close attention, you can't delete /etc but you are allowed to delete /etc/network !

! With programs ran with root rights, this routine should be used with infinite caution.

! This function uses Ada.Directories.Delete_Tree, which raises an exception if the directory tree to delete contains a *broken* symbolic link [a file like any other]. This latter is seen as *non-existent* and, when the parent directory is deleted, an exception occurs : raised ADA.IO_EXCEPTIONS.USE_ERROR : directory tree rooted at <directory tree> could not be deleted [because *not empty*]. Funny, but not so much. Pure C code problem in Ada RTS. Stacked C calls in Russian puppet mode until a logical problem arises.

- Usage

```
function Delete_Directory_Tree [Dir_Tree : String] return Boolean  
procedure Delete_Directory_Tree [Dir_Tree : String]
```

- Example

1.5.5 Delete_File

- Description

Delete a Name file only if this latter exists. No exception will be raised if the file to delete does not exists.

- Usage

```
procedure Delete_File [Name : String]
```

- Example

1.5.6 Delete_Lines

- Description

Search and remove file lines matching Pattern in File_Name.

- Usage

```
procedure Delete_Lines [File_Name, Pattern : String]
```

- Example
-

1.5.7 Download_File

- Description

Download a file from Url to Dlfile. Do nothing if Dlfile already exists with its size equals Dlsize. Name is purely informational and used to named file in text messages.

Return True is Dlfile present at the right size, False otherwise.

- Usage

```
function Download_File [Url : String;
                      Dlfile : VString;
                      Name : String;
                      Dlsize : Integer := 0] return Boolean;
```

- Example
-

1.5.8 Extract_Directory

- Description

Returns directory from Name.

- Usage

```
function Extract_Directory [Name : String] return String
```

- Example

```
Tio.Put_Line [Extract_Directory ["/etc/ssh/sshd_config"]]
/etc/ssh
```

1.5.9 Extract_Name

- Description

Returns filename from Name.

- Usage

```
function Extract_Filename [Name : String] return VString
```

- Example

```
Tio.Put_Line [Fls.Extract_Filename "/etc/ssh/sshd_config"] then  
sshd_config
```

1.5.10 File_Size

- Description

Return size of Name file.

- Usage

```
function File_Size [Name : String] return Integer
```

- Example

1.5.11 Get_Directory

- Description

Returns current directory.

- Usage

```
function Current_Directory return String
```

- Example

1.5.12 Is_Root_Directory

- Description

This function checks the following root directories: bin, boot, dev, etc, home, lib, lib32, lib64, libx32, lost+found, media, mnt, opt, proc, root, run, sbin, srv, sys, tmp, usr, var. Returns True if Dir_Tree is a root directory.

Dir_Tree must be fully qualified, ie starting with a slash [/].

- Usage

```
function Is_Root_Directory [Dir_Tree : String] return Boolean
```

- Example

```
Tio.Put_Line [Fls.Is_Root_Directory "/etc"];  
True
```

```
Tio.Put_Line [Fls.Is_Root_Directory ["/etc/network"]];  
False
```

1.5.13 Move_File

- Description

Move a Source_Name file to a Target_Name file destination. Copy_Form is “preserve=all_attributes,mode=overwrite” (full attributes preservation and overwrite file if exists).

- Usage

```
procedure Move_File [Source_Name, Target_Name : String]
```

- Example

1.5.14 Rename

- Description

Rename an Old_Name file or directory to a New_Name file or directory. If exists a file New_File, it will be overwritten.

- Usage

```
procedure Rename [Old_Name, New_Name : String]
```

- Example

1.5.15 Search_Lines

- Description

Search at least a line matching Pattern in File_Name and return true if found.

- Usage

```
function Search_Lines [File_Name, Pattern : String] return Boolean
```

- Example

1.5.16 Set_Directory

- Description

Change to a directory Directory. Create Directory if this latter does not exist, return False if operation failed.

- Usage

```
function Set_Directory [Directory : String] return Boolean
```

- Example

```
[REDACTED]
```

1.6 Gui – Gnoga User Interface

1.6.1 Content Group elements usage

Most element come with an On_Change callback, fired once the user stops focusing the given element.

Every item [except button and warning], have an explaining text next to it in the container.

1.6.2 Content List layout example

| | |
|---|---|
| A | B |
| 1 | 2 |
| 3 | 4 |

```
Content_List_Create (*, key);
Content_List_Add_Column (*, "A", key);
Content_List_Add_Column (*, "B", key);
R1 := Content_List_Add_Item (*, key);
Content_List_Add_Text (*, "1", R1, key);
Content_List_Add_Text (*, "2", R1, key);
R2 := Content_List_Add_Item (*, key);
Content_List_Add_Text (*, "3", R2, key);
Content_List_Add_Text (*, "4", R2, key);
```

1.6.3 Clear_Connection_Data

- Description

Delete user connection datas. Should be used when user disconnects.

Connection_Data is a free to use dictionary unique to each user.

- Usage

```
procedure Clear_Connection_Data [Object : in out GGB.Base_Type' Class]
```

- Example

```
[REDACTED]
```

1.6.4 Close_Dialog

- Description

Close current jQuery dialog, removes it from HTML.

- Usage

```
procedure Close_Dialog [Object : in out GGB.Base_Type' Class]
```

- Example



1.6.5 Content_Clear

- Description

Removes any content inside content parent.

- Usage

```
procedure Content_Clear [Object : in out GGB.Base_Type' Class]
```

- Example



1.6.6 Content_Clear_HTML

- Description

Clear HTML in content parent.

- Usage

```
procedure Content_Clear_HTML [Object : in out GGB.Base_Type' Class]
```

- Example



1.6.7 Content_Clear_Text

- Description

Clear text in content parent. Should be used when the only content of the menu is this text. Otherwise, should use Content_Parent instead.

- Usage

```
procedure Content_Clear_Text [Object : in out GGB.Base_Type' Class]
```

- Example
-
-

1.6.8 Content_Clear_Title

- Description

Clear title above content.

- Usage

```
procedure Content_Clear_Title [Object : in out GGB.Base_Type' Class]
```

- Example

1.6.9 Content_Group_Add_Button

- Description

Add a button with a callback. Can be used as a submit button.

- Usage

```
procedure Content_Group_Add_Button [Object : in out GGB.Base_Type' Class;
                                    Text : String;
                                    On_Click : GGB.Action_Event;
                                    Parent_Key : String]
```

- Example

1.6.10 Content_Group_Add_Space

- Description

Add space between rows in form group.

- Usage

```
procedure Content_Group_Add_Space [Object : in out GGB.Base_Type' Class;
                                    Parent_Key : String;
                                    Height : Integer := 8]
```

- Example
-

1.6.11 Content_Group_Add_Title

- Description

Add a title to a form group.

Title from arguments of Content_Group_Create is already on screen and has a higher emphasis.

- Usage

```
procedure Content_Group_Add_Title [Object : in out GGB.Base_Type' Class;
                                    Title : String;
                                    Parent_Key : String]
```

- Example
-

1.6.12 Content_Group_Check_Box_Add

- Description

Add a check box in a group.

- Usage

```
procedure Content_Group_Check_Box_Add [Object : in out
GGB.Base_Type' Class; Name : String; Parent_Key : String;
On_Change : GGB.Action_Event := null]
```

- Example
-

1.6.13 Content_Group_Check_Box_Checked

- Description

Set a check box state in a group.

- Usage

```
procedure Content_Group_Check_Box_Checked [Object : in out
GGB.Base_Type' Class; Name : String; Is_Checked : Boolean]
```

- Example
-

1.6.14 Content_Group_Check_Box_Is_Checked

- Description

Get a check box state in a group.

- Usage

```
function Content_Group_Check_Box_Is_Checked [Object : in out GGB.Base_Type' Class; Name : String] return Boolean
```

- Example
-

1.6.15 Content_Group_Create

- Description

Create a container for forms. This element is displayed in the content container.

Does not need any clearing apart from Content_Clear to delete this element.

- Usage

```
procedure Content_Group_Create [Object : in out GGB.Base_Type' Class; Title : String]
```

- Example
-

1.6.16 Content_Group_Date_Add

- Description

Add a date in a group.

- Usage

```
procedure Content_Group_Date_Add [Object : in out GGB.Base_Type' Class; Name : String; Parent_Key : String; On_Change : GGB.Action_Event := null]
```

- Example
-

1.6.17 Content_Group_Date_Get

- Description

Get a date in a group. Format is YYYY-MM-DD.

- Usage

```
function Content_Group_Date_Get [Object : in out GGB.Base_Type'Class;  
Name : String] return String
```

- Example

1.6.18 Content_Group_Date_Set

- Description

Set a date in a group. Format is YYYY-MM-DD.

- Usage

```
procedure Content_Group_Date_Set [Object : in out GGB.Base_Type'Class;  
Name : String; Date : String]
```

- Example

1.6.19 Content_Group_Drop_Down_Menu_Add

- Description

Add a drop-down menu, with customizable default item, in a group.

- Usage

```
procedure Content_Group_Drop_Down_Menu_Add [Object : in out  
GGB.Base_Type'Class; Name : String; Parent_Key : String; On_Change : GG-  
B.Action_Event := null]
```

- Example

1.6.20 Content_Group_Drop_Down_Menu_Add_Option

- **Description**

Add an item to a drop-down menu. If Enabled is True, this item will be the displayed by default.

- **Usage**

```
procedure Content_Group_Drop_Down_Menu_Add_Option [Object : in out GGB.  
B.Base_Type' Class; Name : String; Option : String; Enabled : Boolean :=  
False]
```

- **Example**

1.6.21 Content_Group_Drop_Down_Menu_Get

- **Description**

Get the selected item in a drop-down menu.

- **Usage**

```
function Content_Group_Drop_Down_Menu_Get [Object : in out  
GGB.Base_Type' Class; Name : String] return String
```

- **Example**

1.6.22 Content_Group_Email_Add

- **Description**

Add an email in a group.

- **Usage**

```
procedure Content_Group_Email_Add [Object : in out GGB.Base_Type' Class;  
Name : String; Parent_Key : String; On_Change : GGB.Action_Event :=  
null]
```

- **Example**

1.6.23 Content_Group_Email_Get

- **Description**

Get an email in a group.

- **Usage**

```
function Content_Group_Email_Get [Object : in out GGB.Base_Type' Class;
Name : String] return String
```

- **Example**

1.6.24 Content_Group_Email_Set

- **Description**

Set an email in a group.

- **Usage**

```
procedure Content_Group_Email_Set [Object : in out GGB.Base_Type' Class;
Name : String; Email : String]
```

- **Example**

1.6.25 Content_Group_Item_Lock

- **Description**

Lock a form in a form group so the user can't write anything.

- **Usage**

```
procedure Content_Group_Item_Lock [Object : in out GGB.Base_Type' Class;
Name : String]
```

- **Example**

1.6.26 Content_Group_Item_Unlock

- **Description**

Unlock a form in a form group.

- Usage

```
procedure Content_Group_Item_Unlock [Object : in out GGB.Base_Type' Class;
                                     Name : String]
```

- Example

1.6.27 Content_Group_Item_Place_Holder

- Description

Set a place-holder for field-type forms.

- Usage

```
procedure Content_Group_Item_Place_Holder [
                                         Object : in out GGB.Base_Type' Class;
                                         Name : String;
                                         Place_Holder : String]
```

- Example

1.6.28 Content_Group_Number_Add

- Description

Add a number in a group.

- Usage

```
procedure Content_Group_Number_Add [Object : in out GGB.Base_Type' Class;
                                      Name : String; Parent_Key : String; On_Change : GGB.Action_Event := null]
```

- Example

1.6.29 Content_Group_Number_Get

- Description

Get a number in a group.

- Usage

```
function Content_Group_Number_Get [Object : in out GGB.Base_Type' Class;
                                    Name : String] return Integer
```

- Example
-

1.6.30 Content_Group_Number_Set

- Description

Set a number in a group.

- Usage

```
procedure Content_Group_Number_Set [Object : in out GGB.Base_Type'Class;
Name : String; Value : Integer]
```

- Example
-

1.6.31 Content_Group_Password_Add

- Description

Add a password in a group.

- Usage

```
procedure Content_Group_Password_Add [Object : in out
GGB.Base_Type'Class; Name : String; Parent_Key : String; On_Change : GG-
B.Action_Event := null]
```

- Example
-

1.6.32 Content_Group_Password_Get

- Description

Get a password in a group.

- Usage

```
function Content_Group_Password_Get [Object : in out GGB.Base_Type'Class;
Name : String] return String
```

- Example
-

1.6.33 Content_Group_Password_Set

- **Description**

Set a password in a group to simulate an existing password in update form.

It is advisable to spend a fairly long fake password, like 20 characters.

- **Usage**

```
procedure Content_Group_Password_Set [  
    Object : in out GGB.Base_Type' Class;  
    Name : String;  
    Password : String]
```

- **Example**

```
Gui.Content_Group_Password_Set [Object, "Password", 20 * "-"];
```

1.6.34 Content_Group_Phone_Add

- **Description**

Add a phone number in a group.

- **Usage**

```
procedure Content_Group_Phone_Add [Object : in out GGB.Base_Type' Class;  
Name : String; Parent_Key : String; On_Change : GGB.Action_Event := null]
```

- **Example**

1.6.35 Content_Group_Phone_Get

- **Description**

Get a phone number in a group.

- **Usage**

```
function Content_Group_Phone_Get [Object : in out GGB.Base_Type' Class;  
Name : String] return String
```

- **Example**

1.6.36 Content_Group_Phone_Set

- **Description**

Set a phone number in a group.

- **Usage**

```
procedure Content_Group_Phone_Set [Object : in out GGB.Base_Type' Class;
Name : String; Phone : String]
```

- **Example**

1.6.37 Content_Group_Text_Add

- **Description**

Add text entry in a group.

- **Usage**

```
procedure Content_Group_Text_Add [Object : in out GGB.Base_Type' Class;
Name : String; Parent_Key : String; On_Change : GGB.Action_Event := null]
```

- **Example**

1.6.38 Content_Group_Text_Get

- **Description**

Get text entry in a group.

- **Usage**

```
function Content_Group_Text_Get [Object : in out GGB.Base_Type' Class;
Name : String] return String;
```

- **Example**

1.6.39 Content_Group_Text_Set

- **Description**

Set text entry in a group.

- Usage

```
procedure Content_Group_Text_Set [Object : in out GGB.Base_Type' Class;
Name : String; Text : String]
```

- Example

1.6.40 Content_Group_Text_Area_Add

- Description

Add text area with customizable height in a group.

- Usage

```
procedure Content_Group_Text_Area_Add [Object : in out
GGB.Base_Type' Class; Name : String; Parent_Key : String; On_Change : GG-
B.Action_Event := null]
```

- Example

1.6.41 Content_Group_Text_Area_Get

- Description

Get text area content in a group.

- Usage

```
function Content_Group_Text_Area_Get [Object : in out
GGB.Base_Type' Class; Name : String] return String
```

- Example

1.6.42 Content_Group_Text_Area_Set

- Description

Set text area content in a group.

- Usage

```
procedure Content_Group_Text_Area_Set [Object : in out
GGB.Base_Type' Class; Name : String; Text : String]
```

- Example
-

1.6.43 Content_Group_Warning_Add

- Description

Add a custom [non form] warning area in a group to display a warning message.

Can be used with an empty Text at first, then later using the setter.

- Usage

```
procedure Content_Group_Warning_Add [Object : in out GGB.Base_Type' Class;
Text : String; Key : String; Parent_Key : String]
```

- Example
-

1.6.44 Content_Group_Warning_Set

- Description

Display a warning message in a group.

- Usage

```
procedure Content_Group_Warning_Set [Object : in out GGB.Base_Type' Class;
Key : String; Text : String]
```

- Example
-

1.6.45 Content_List_Add_Column

- Description

Add a column in the table.

Must be called as much as needed before using Content_List_Add_Item.

See Content List layout example.

- Usage

```
procedure Content_List_Add_Column [Object : in out GGB.Base_Type' Class;
Variable : String; Parent_Key : String]
```

- Example
-

1.6.46 Content_List_Add_Item

- Description

Returns the item index in list.

Columns must be added before using Content_List_Add_Column.

See Content List layout example.

- Usage

```
function Content_List_Add_Item [Object : in out GGB.Base_Type'Class; Parent_Key : String] return Integer
```

- Example
-

1.6.47 Content_List_Add_Text

- Description

This function place a new column in the table at a given row.

The corresponding item must be created before using Content_List_Add_Item.

See Content List layout example.

- Usage

```
procedure Content_List_Add_Text [Object : in out GGB.Base_Type'Class; Value : String; Index : Integer; Parent_Key : String]
```

- Example
-

1.6.48 Content_List_Create

- Description

Create a table for a list of items. This element is displayed in the content container.

Does not need any clearing apart from Content_Clear to delete this element.

Elements can be selected and the index obtained using Content_List_Selected_Row.

See Content List layout example.

- Usage

```
procedure Content_List_Create [Object : in out GGB.Base_Type' Class; Title : String]
```

- Example



1.6.49 Content_List_Selected_Row

- Description

Return the selected row index.

See Content List layout example.

- Usage

```
function Content_List_Selected_Row [Object : in out GGB.Base_Type' Class; Parent_Key : String] return Integer
```

- Example



1.6.50 Content_Load_HTML

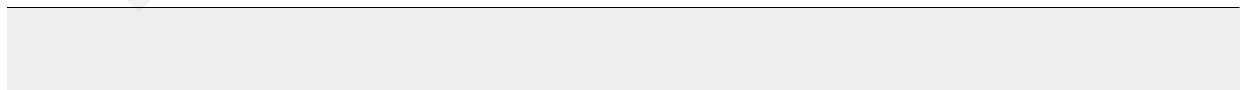
- Description

Displays a HTML encoded file.

- Usage

```
procedure Content_Load_HTML [Object : in out GGB.Base_Type' Class; Text : String]
```

- Example



1.6.51 Content_Parent

- Description

Return the element below menu title, containing all content.

- Usage

```
function Content_Parent [Object : in out GGB.Base_Type'Class] return  
GGV.View_Access
```

- Example

1.6.52 Content_Put_HTML

- Description

Displays a HTML encoded string.

- Usage

```
procedure Content_Put_HTML [Object : in out GGB.Base_Type'Class; Text :  
String]
```

- Example

1.6.53 Content_Put_Text

- Description

Put text in content parent. Should be used when the only content of the menu is this text. Otherwise, should use Content_Parent instead.

- Usage

```
procedure Content_Put_Text [Object : in out GGB.Base_Type'Class; Text :  
String]
```

- Example

1.6.54 Content_Put_Title

- Description

Set title above content.

- Usage

```
procedure Content_Put_Title [Object : in out GGB.Base_Type'Class; Title :  
String]
```

- Example
-

1.6.55 Dialog_Buttons

- Description

Display a one or two Buttons dialog, for user to quit a screen, user choices like Quit/Update or Cancel/Validate, etc.

- Usage

```
procedure Dialog_Buttons [
    Object : in out Gnoga.Gui.Base.Base_Type' Class;
    Key : String;
    Button_Left_Text : String;
    Button_Left_Handler : GGB.Action_Event := null;
    Button_Right_Text : String;
    Button_Right_Handler : GGB.Action_Event := null]
```

- Example

```
Gui.Dialog_Buttons [Object, User_Form_Title, "Quit", On_Quit' Unrestricted_Access];
```

1.6.56 Dialog_Popup

- Description

Create a jQuery dialog, with two potential buttons. Buttons are displayed if their corresponding handler is not null. Confirm button is focused. It is advised to use Close_Dialog in On_Confirm and On_Cancel handlers.

- Usage

```
procedure Dialog_Popup [Object : in out GGB.Base_Type' Class;
    Title : String;
    Content : String;
    Confirm_Text : String := "";
    Cancel_Text : String := "";
    On_Confirm : GGB.Action_Event := null;
    On_Cancel : GGB.Action_Event := null]
```

- Example
-

1.6.57 Footer_Set_Left_Text

- **Description**

Displays text on the left side of the footer.

- **Usage**

```
procedure Footer_Set_Left_Text [Object : in out GGB.Base_Type'Class; Text : String := ""]
```

- **Example**

1.6.58 Footer_Set_Right_Text

- **Description**

Displays text on the right side of the footer.

- **Usage**

```
procedure Footer_Set_Right_Text [Object : in out GGB.Base_Type'Class; Text : String := ""]
```

- **Example**

1.6.59 Get_Connection_Data

- **Description**

Retrieve user connection datas.

Connection_Data is a free to use dictionary unique to each user.

- **Usage**

```
function Get_Connection_Data [Object : in out GGB.Base_Type'Class; Key : String] return String;
```

- **Example**

1.6.60 Header_Application_Menu_Add

- **Description**

Add menu and cascaded menu to application menu.

Key must be unique.

On_Click handler must call Header_Notify_Menu_Click.

- **Usage**

```
procedure Header_Application_Menu_Add [Key : String; Name : String; Parent_Key : String; On_Click : GGB.Action_Event]
```

- **Example**

1.6.61 Header_Notify_Menu_Click

- **Description**

Header module menu callback.

- **Usage**

```
procedure Header_Notify_Menu_Click [Object : in out GGB.Base_Type'Class; Key : String]
```

- **Example**

1.6.62 Header_Notify_User_Menu_Click

- **Description**

Header user menu callback.

- **Usage**

```
procedure Header_Notify_User_Menu_Click [Object : in out GGB.Base_Type'Class]
```

- **Example**

1.6.63 Header_Set_Root

- Description

Set default root module menu.

Key must be unique.

On_Click handler must call Header_Notify_Menu_Click.

- Usage

```
procedure Header_Set_Root [Key : String; Name : String; On_Click : GG-B.Action_Event]
```

- Example

1.6.64 Header_User_Menu_Add

- Description

Add menu to user menu.

On_Click handler must call Header_Notify_User_Menu_Click otherwise.

User navigation menu can't be closed.

- Usage

```
procedure Header_User_Menu_Add [Object : in out GGB.Base_Type'Class; Name : String; On_Click : GGB.Action_Event]
```

- Example

1.6.65 Launch_Web

- Description

Open a new tab in browser to URL.

User's browser might not accept redirection at first, in this case the user needs to enable this.

- Usage

```
Launch_Web [Object : in out GGB.Base_Type'Class; URL : String]
```

- Example

1.6.66 List

- Description

List Table columns listed in Columns_Names [comma separated] with header table titles Columns_Titles [comma separated] and Condition.

Key is the table list unique identifier.

The column tagged with "~" [constant ND] in Columns_Names is the column key for further seeking the record.

Title is the list title.

Some tags are automatically generated in Connection_Data dictionary:

- Key_n storing column tagged with "~" value [see below];
- Key_First storing column tagged with "~" value for the first line;
- Key_Last storing column tagged with "~" value for the last line.

- Usage

```
procedure List [Object : in out GGB.Base_Type'Class;
               DB : in out GSD.Connection'Class;
               Key : String;
               Title : String;
               Table : String;
               Columns_Names : String;
               Columns_Titles : String;
               Condition : String := ""]
```

- Example

```
List [Object, DBM, "Users_List_Key",
      "Users List",
      "Sys_Users",
      "~Login, First_Name, Last_Name, Phone, Email",
      "Identifier, First Name, Name, Phone, Email",
      "ORDER BY Login"];
```

User List

| | Identifier | First name | Name | Phone | Email |
|----|-------------------|-------------------|-------------|--------------|--------------|
| 1 | admin6 | Number | Six | | |
| 2 | admin7 | Number | Seven | | |
| 3 | alpha | Steve | Howe | | |
| 4 | delta | Jon | Anderson | | |
| 5 | foxtrot | Chris | Squire | | |
| 6 | juliet | Bill | Bruford | | |
| 7 | tango | Pete | Townsend | | |
| 8 | uniform | Roger | Daltrey | | |
| 9 | xray | Keith | Moon | | |
| 10 | zoulou | John | Entwistle | | |

When a click event is triggered on the **third line** :

```

Key : constant UXString := "Users_List_Key";
Data_Index : constant Integer := Gui.Content_List_Selected_Row [Object, Key];
Data_Value : constant String := Gui.Get_Connection_Data [Object, Key & "_" &
To_String_Unsigned [Data_Index]];

Results...

Data_Index: 3
Search key is: Users_List_Key_3
Data_Value: alpha

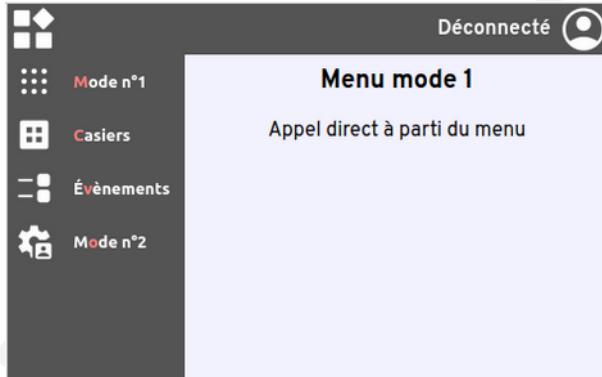
```

1.6.67 Main_Menu

Main_Menu has two modes.

- Mode 1 – Direct mode

Using mode one (or direct mode), selecting a menu on the left-hand bar directly calls up a routine. Example:



A click on “Mode n°1” displays directly the page “Menu mode 1”.

- Mode 2 – sub menu mode

Using mode two (or sub-menu mode), selecting a menu on the left-hand bar displays a sub menu. Each sub menu calling a routine. Example:



Then, click on [or type the ‘r’ letter] the sub menu “Créer” displays this demo page:



When using mode two, you must acknowledge the sub-menu by calling the procedure `Gui.Main_Menu_Notify_Sub_Element_Click [Object, "Preferences_Delete"]`; with the sub-key corresponding to the sub-menu. [see `testgui` code and the call from `Gui.-Main_Menu_Add_Sub_Element [Object, "Preferences_Delete", "Supprimer", "Preferences", Mgt.Demo_Complex_Form_Delete'Unrestricted_Access]`];

1.6.68 Main_Menu_Add_Delimiter_Above

- **Description**

Add a delimiter above a sub-element.

- **Usage**

```
procedure      Main_Menu_Add_Delimiter_Above      [Object      :      in      out
GGB. Base_Type' Class;  Key : String ]
```

- **Example**

1.6.69 Main_Menu_Add_Element

- **Description**

Add an element to a menu.

Key must be unique.

- **Usage**

```
procedure Main_Menu_Add_Element [Object : in out GGB.Base_Type' Class;
                                 Key : String;
                                 Name : String;
                                 Icon_SRC : String;
                                 On_Click : GGB.Action_Event := null]
```

- **Example**

1.6.70 Main_Menu_Add_Sub_Element

- **Description**

Add an element to a sub menu. If parent is "File", and this element is "Edit", then a unique key should be set as "File_Edit".

Key must be unique.

On_Click event procedure must in turn call Main_Menu_Notify_Sub_Element_Click.

- **Usage**

```
procedure Main_Menu_Add_Sub_Element [Object : in out GGB.Base_Type' Class;
                                      Key : String;
                                      Name : String;
                                      Parent_Key : String;
                                      On_Click : GGB.Action_Event];
```

- **Example**

1.6.71 Main_Menu_Clear

- **Description**

Clear Main_Menu content.

- **Usage**

```
procedure Main_Menu_Clear [Object : in out GGB.Base_Type' Class]
```

- Example
-

1.6.72 Main_Menu_Disable_Shortcuts

- Description

Disable Main_Menu shortcuts, for both elements and sub-elements.

- Usage

```
procedure      Main_Menu_Disable_Shortcuts      [Object      :      in      out
GGB. Base_Type' Class ]
```

- Example
-

1.6.73 Main_Menu_Enable_Shortcuts

- Description

Enable Main_Menu shortcuts, allowing both elements and sub-elements shortcuts.

- Usage

```
procedure      Main_Menu_Enable_Shortcuts      [Object      :      in      out
GGB. Base_Type' Class ]
```

- Example
-

1.6.74 Main_Menu_Load

- Description

Load Main_Menu after elements has been added.

- Usage

```
procedure Main_Menu_Load [Object : in out GGB. Base_Type' Class ]
```

- Example
-

1.6.75 Main_Menu_Notify_Sub_Element_Click

- **Description**

Callback to place in sub-elements' handlers.

- **Usage**

```
procedure Main_Menu_Notify_Sub_Element_Click [Object : in out GGB.Base_Type' Class; Key : String]
```

- **Example**

1.6.76 Main_Menu_Set_Clickable

- **Description**

Set an element [or sub-element] clickable.

- **Usage**

```
procedure Main_Menu_Set_Clickable [Object : in out GGB.Base_Type' Class; Key : String]
```

- **Example**

1.6.77 Main_Menu_Set_Unclickable

- **Description**

Set an element [or sub-element] unclickable.

- **Usage**

```
procedure Main_Menu_Set_Unclickable [Object : in out GGB.Base_Type' Class; Key : String]
```

- **Example**

1.6.78 Print

- **Description**

Call system printing on current web view. <<<TODO>>> Don't work, to be fixed.
Tends to stop client-server communication.

- Usage

```
procedure Print [Object : in out GGB.Base_Type' Class]
```

- Example
-
-

1.6.79 Put_User_Icon

- Description

Display the user icon registered by Set_User_Icon.

- Usage

```
procedure Put_User_Icon [Object : in out GGB.Base_Type' Class]
```

- Example
-
-

1.6.80 Set_Application_Icon

- Description

Set the application icon when clicked displays the modules menu.

- Usage

```
procedure Set_Application_Icon [Icon_File : String]
```

- Example
-
-

1.6.81 Set_Browser_Icon

- Description

Set application icon in browser tab. <<<TODO>>> Don't work, to be fixed.

- Usage

```
procedure Set_Browser_Icon [Icon_File : String]
```

- Example
-
-

1.6.82 Set_Browser_Title

- **Description**

Set application title in browser tab.

- **Usage**

```
procedure Set_Browser_Title [Object : in out GGB.Base_Type' Class; Title : String]
```

- **Example**

1.6.83 Set_Connection_Data

- **Description**

Save user connection datas. If Key already exists, the value is replaced.

Connection_Data is a free to use dictionary unique to each user.

- **Usage**

```
procedure Set_Connection_Data [Object : in out GGB.Base_Type' Class; Key : String; Value : String]
```

- **Example**

1.6.84 Set_Debug

- **Description**

Set Gnoga debug mode. This mode must be set before calling Setup to take effect.

- **Usage**

```
procedure Set_Debug [Switch : On_Off]
```

- **Example**

1.6.85 Set_Login

- **Description**

Application access control.

- **Usage**

```
procedure Set_Login [Switch : On_Off]
```

- **Example**

1.6.86 Set_User_Icon

- **Description**

Set the user icon when clicked displays the user menu.

- **Usage**

```
procedure Set_User_Icon [Icon_File : String]
```

- **Example**

1.6.87 Set_User_Name

- **Description**

Set user name, displayed next to the user icon.

- **Usage**

```
procedure Set_User_Name [Object : in out GGB.Base_Type'Class; Name : String]
```

- **Example**

1.6.88 Setup

- **Description**

Set application connection parameters

On_User_Connect is called every time a user calls a web page.

- Usage

```
procedure Setup [On_User_Connect : GGB.Action_Event;
                Host : String := "";
                Port : Integer := 8_080;
                Boot : in String := "boot_jqueryui.html";
                Title : String := "";
                Server_Closed_Content : String := "Server closed." ]
```

- Example

1.6.89 User_Logout

- Description

Disconnect user. This function assumes Setup was called.

- Usage

```
procedure User_Logout [Object : in out GGB.Base_Type' Class]
```

- Example

1.7 Msg – Logging management

To avoid name conflicts with Gnoga, which has a log procedure, the original v20.Log package has been renamed v22.Msg. Then original procedure v20.Msg has been renamed v22.Std as Standard message.

1.7.1 Debug

- Description

Log a debug message. 45 characters max before truncation with a maximum line length of 79.

- Usage

```
procedure Debug [Message : in String]
```

- Example

1.7.2 Error

- **Description**

Log an error message. 45 characters max before truncation with a maximum line length of 79.

- **Usage**

```
procedure Error [Message : in String]
```

- **Example**

```
[REDACTED]
```

1.7.3 Get_Debug

- **Description**

```
Return true if debug status is on.
```

- **Usage**

```
function Get_Debug return Boolean
```

- **Example**

```
[REDACTED]
```

1.7.4 Get_Dir

- **Description**

```
Returns log file directory.
```

- **Usage**

```
function Get_Dir return String
```

- **Example**

```
[REDACTED]
```

1.7.5 New_Line

- **Description**

Log a blank line.

- **Usage**

```
procedure New_Line
```

- Example
-

1.7.6 Set_Debug

- Description

Set debug messages status on/[off].

- Usage

```
procedure Set_Debug [Switch : On_Off]
```

- Example
-

```
Msg. Set_Debug [On]
```

1.7.7 Set_Dir

- Description

Set log file directory.

- Usage

```
procedure Set_Dir [Dir_In : String]
```

- Example
-

1.7.8 Set_Display

- Description

Log to display on/[off].

- Usage

```
procedure Set_Display [Switch : On_Off]
```

- Example
-

```
Msg. Set_Display [On]
```

1.7.9 Set_Disk

- Description

Log to disk on/[off].

- Usage

```
procedure Set_Disk [Switch : On_Off]
```

- Example

```
Msg. Set_Disk [On]
```

1.7.10 Set_Header

- Description

Line header on/[off].

- Usage

```
procedure Set_Header [Switch : On_Off]
```

- Example

```
Msg. Set_Header [On]
```

1.7.11 Set_Task

- Description

Set new current log task name. 7 characters max before truncation.

- Usage

```
function Log_Dir return String
```

- Example

1.7.12 Info

- Description

Log a standard message. 45 characters max before truncation with a maximum line length of 79.

- Usage

```
procedure Info [Message : Boolean]  
procedure Info [Message : On_Off]  
procedure Info [Message : ASCII_Character]
```

```
procedure Info [Message : String]
procedure Info [Message : Integer]
procedure Info [Message : Long_Integer]
procedure Info [Message : Long_Long_Integer]
procedure Info [Message : Money]
```

- Example

1.7.13 Title

- Description

Log a title. 45 characters max before truncation with a maximum line length of 79.

- Usage

```
procedure Title [Message : in String]
```

- Example

1.8 Net – Network management

1.8.1 Command

- Description

Send remote command to host. Returns True if command successful [remote exitcode equal to 0]. If used, SE_Output returns remote console output.

- Usage

```
function Command [Target : in String;
                  Command_In : in String;
                  SE_Output : out String] return Boolean

function Command [Target : in String;
                  Command : in String] return Boolean

procedure Command [Target : in String;
                   Command : in String]
```

- Exception

Error_Command

Raised when send command error

- Example

List files in a directory:

```
Net.Send_Command ["root@i51c1.domain.tld", "cd /root; ls -l"];
```

```
drwxr-xr-x 7 root      root      4.0K Sep  1 10:45 acme.sh
-rw-r--r-- 1 root      root      3.4K Aug  5 09:28 aide.err
-rw-r--r-- 1 root      root     12K Aug  5 09:53 aide.log
-rw-r--r-- 1 root      root      1 Aug  5 09:28 check.gpr
drwxr-xr-x 2 root      root      4.0K Dec 11 15:02 dmf
-rwxr-xr-x 1 root      root      2.7M Dec 14 11:37 gprbuild
drwxr-xr-x 3 root      root      4.0K Aug  5 09:53 opt
-rw-r--r-- 1 root      root     47M Sep 25 11:37 s015.sql
-rw-r--r-- 1 root      root    134 Aug  7 17:14 test.txt
```

Complex command example [massive URL change in wordpress DB]:

```
Net.Command ["root@i152c1", + "cd /srv/www/adm152.temp_domain.tld/sar ; php srdbcli.php -h localhost -n dmf_transfert -u dmf -p " & Pwd_DB_Prod & " -s https://www.old_domain.tld -r https://www.new_domain.tld"];
```

1.8.2 Copy_File

- Description

Copy to distant host. Returns True if copy successful.

Options allows extra parameters, like -r for recursive copy.

- Usage

```
function Copy_File [Target : in String;
                    File_Tx : in String;
                    Directory_Rx : in String;
                    Options : in String := "") return Boolean;

procedure Copy_File [Target : in String;
                     File_Tx : in String;
                     Directory_Rx : in String;
                     Options : in String := "");
```

- Exception

Error_Copy

Raised when send file error

- Example

```
Copy /home/sr/text.txt to root@i51c1.domain.tld/etc/genesis/test.txt
```

```
Net.Copy_File {"root@i51c1.domain.tld", "/home/sr/text.txt", "/etc/genesix"};
```

Recursive copy: Copy directory and subdirectories content from /etc/genesix/templates/files-debian-10/usr to n203c1:/etc/xen-tools/skel. This recursive copy will transfer ./usr/* to n203c1:/etc/xen-tools/skel/usr/*

1.8.3 Delete_Directory_Tree

- Description

Delete a directory tree Dir_Tree. The directory and all of its contents [possibly including other directories] are deleted but adding a '*' at the end of the path preserve the last directory of the path [/one/two/ deletes two but /on/two/* preserve two].

Return True if Dir_Tree is successfully deleted or was already deleted. Return False if operation is unsuccessful [i.e. if base directory tree was non existent or still exists after the deleting attempt].

Dir_Tree must be fully qualified, ie starting with a slash [/]. This function prevents deletion of the following root directories [see Is_Root_Directory for further details]. Pay close attention, you can't delete /etc but you are allowed to delete /etc/network !

Delete a directory tree Dir_Tree. The directory and all of its contents [possibly including other directories] are deleted. Return True if Dir_Tree is successfully deleted or was already deleted. Return False if operation is unsuccessful [i.e. if base directory tree was non existent or still exists after the deleting attempt].

Dir_Tree must be fully qualified, i.e. starting with a slash [/].

This function prevents deletion of the following root directories: bin, boot, dev, etc, home, lib, lib32, lib64, libx32, lost+found, media, mnt, opt, proc, root, run, sbin, srv, sys, tmp, usr, var. Pay close attention, you can't delete /etc but you are allowed to delete /etc/network !

! With programs ran with root rights, this routine should be used with infinite caution.

- Usage

```
function Delete_Directory_Tree [Target : in String;  
                                Dir_Tree : String] return Boolean
```

- Example

1.8.4 Delete_File

- Description

Remove File_To_Delete in remote host Target. Returns True if delete successful.

- Usage

```
function Delete_File [Target : in String;  
                      File_To_Delete : in String] return Boolean;  
  
procedure Delete_File [Target : in String;  
                      File_To_Delete : in String];
```

- Example

```
Copy /home/sr/text.txt to root@i51c1.domain.tld/etc/genesix/test.txt
Net.Delete_File {"root@i51c1.domain.tld", "/home/sr/text.txt"};
```

1.8.5 Directory_Exists

- Description

Returns True if distant directory Name exists.

- Usage

```
function Directory_Exists [Target : in String;
                           Name : String] return Boolean
```

- Example

```
if Net.Directory_Exists {"host", "Directory_to_test"} then
  Tio.Put_Line ["Directory_to_test exists"];
end if;
```

1.8.6 File_Exists

- Description

Returns True if file Name exists.

- Usage

```
function File_Exists [Target : in String;
                           Name : String] return Boolean
```

- Example

```
if Net.File_Exists {"host", "filename_to_test"} then
  Tio.Put_Line ["filename_to_test exists"];
end if;
```

1.8.7 Get_Exception

- Description

Returns Exception status.

- Usage

```
function Get_Exception return On_Off
```

- Example

```
Tio.Put_Line [ Get_Exception];  
On
```

1.8.8 Get_Network_From_Ip

- Description

Returns the network part of a /32 classless IP address.

- Usage

```
function Get_Network_From_Ip [Ip : in String] return String
```

- Example

```
Tio.Put_Line [ Net.Get_Network_From_Ip ["120. 1. 1. 1"]];  
120. 1. 1  
Tio.Put_Line [ Net.Get_Network_From_Ip ["320. 1. 1. 1"]];  
Empty string
```

1.8.9 Is_Ip_Ok

- Description

IP validation

- Usage

```
function Is_Ip_Ok [IP : in String] return Boolean;
```

- Example

```
Tio.Put_Line [Is_Ip_Ok ["320. 1. 1. 1"]];  
False  
Tio.Put_Line [Is_Ip_Ok ["120. 1. 1. 1"]];  
True
```

1.8.10 Is_Ping_Ok

- Description

Return true if target answer to a ping.

- Usage

```
function Is_Ping_Ok [Target : in String] return Boolean;
```

- Example

```
Net.Is_Ping_Ok ("This_host_exists");  
True  
Net.Is_Ping_Ok ("This_host_don't_exist");  
False
```

1.8.11 Is_Root_Directory

- Description

This function checks the following root directories: bin, boot, dev, etc, home, lib, lib32, lib64, libx32, lost+found, media, mnt, opt, proc, root, run, sbin, srv, sys, tmp, usr, var. Returns True if Dir_Tree is a root directory.

Dir_Tree must be fully qualified, ie starting with a slash [/].

- Usage

```
function Is_Root_Directory [Dir_Tree : String] return Boolean
```

- Example

```
Tio.Put_Line [Net.Is_Root_Directory ("/etc")];  
True  
Tio.Put_Line [Net.Is_Root_Directory ("/etc/network")];  
False
```

1.8.12 Is_Ssh_Ok

- Description

Return true if target answer to a ping.

- Usage

```
function Is_Ssh_Ok [Target : in String] return Boolean;
```

- Example

```
Net.Is_Ssh_Ok [+ "This_host_exists_with_valid_Ssh_Credentials"];  
True  
Net.Is_Ssh_Ok [+ "This_host_exists_without_valid_Ssh_Credentials"];
```

```
False
```

1.8.13 Mount

- Description

Mount a Target as host.

If local admin, automatically create local mount point in
- /mnt/<Target>

If local [non root] user, automatically create local mount point in
- /home/<user>/mnt/<Target>

- Usage

```
procedure Mount [Target : String];
```

- Example

```
Local admin case: Mount ["root@i51c1.domain.tld"];  
Mounts target root@i51c1.domain.tld: /  
to /mnt/root@i51c1.domain.tld  
  
Local <user> case [with home at /home/<user>]: Mount ["root@i51c1.domain.tld"];  
Mounts target sr@i51c1.domain.tld: /  
to /home/<user>/mnt/sr@i51c1.domain.tld
```

1.8.14 Mount_Remote

- Description

Mount a Mount_Point targetting Target_To_Mount on Remote_Host with options Mount_Options. All mount options are accepted. Returns true if operation is successful.

- Usage

```
function Mount_Remote [Remote_Host : String;  
                     Target_To_Mount : String;  
                     Mount_Point : String;  
                     Mount_Options : in String := ""] return Boolean  
  
procedure Mount_Remote [Remote_Host : String;  
                     Target_To_Mount : String;  
                     Mount_Point : String;  
                     Mount_Options : in String := ""];
```

- Example

```
if Net.Mount_Remote ["user@remote_host.org", +"/dev/vg/lvm_volume", +"/tmp/mount-point", +"-o ro"] then
```

```
    Tio.Put ("Mount point is mounted read-only");
end if;
```

1.8.15 Set_Exception

- **Description**

Enable Exception processing, which is disabled by default.

- **Usage**

```
procedure Set_Exception [Switch : On_Off := On]
```

- **Example**

```
Private_Key := Sql.Read ("Tbl_Cluster", "Key_Private", "WHERE Number = 1");
Set_Exception;
```

1.8.16 Set_Hostname

- **Description**

Set Hostname for a Target host. Returns true if command ok.

- **Usage**

```
function Set_Hostname [Target : String;
                      Hostname : String] return Boolean
```

- **Example**

```
Private_Key := Sql.Read ("Tbl_Cluster", "Key_Private", "WHERE Number = 1");
if Set_Hostname ("i11c1", "i110c1") then
    Tio.Put ("Hostname is changed");
end if;
```

1.8.17 Set_Key

- **Description**

Set SSH private key used to log in distant hosts with commands like Send_Command and Send_File. Key validity is checked. Returns true if Key is properly set. A call without parameter delete the key previously set.

- **Usage**

```
function Set_Key [Key : String := ""] return Boolean;
procedure Set_Key;
```

- Example

```
Private_Key := Sql.Read ["Tbl_Cluster", "Key_Private", "WHERE Number = 1"];  
if Set_Key [Private_Key] then  
    Tio.Put ["Key is set"];  
end if;
```

1.8.18 Set_Message

- Description

Control message output when using commands like Send_Command and Send_File.
Default is console message enable. A call without parameter enable message output.

- Usage

```
procedure Set_Message [Switch : On_Off := On];
```

- Example

```
- Disable console message when using commands like Send_Command and Send_File.  
Net.Set_Message [Off];
```

1.8.19 Set_Output

- Description

Control console output when using commands like Send_Command and Send_File.
Default is console output enable. A call without parameter enable console output.

- Usage

```
procedure Set_Output [Switch : On_Off := On];
```

- Example

```
- Disable console output when using commands like Send_Command and Send_File.  
Net.Set_Output [Off];
```

1.8.20 Unmount

- Description

Unmount a mount point on a remote host.

The local mountpoint directory is deleted.

- Usage

```
procedure Unmount [Target : String];
```

- Exception

| | |
|---------------|---------------------------|
| Error_Unmount | Raised when unmount error |
|---------------|---------------------------|

- Example

```
Local admin case: Net.Unmount ["root@i51c1.domain.tld"];  
Unmounts /mnt/root@i51c1.domain.tld  
  
Local <user> case [home is /home/user]: Net.Unmount ["root@i51c1.domain.tld"];  
Unmounts /home/<user>/mnt/sr@i51c1.domain.tld
```

1.8.21 Unmount_Remote

- Description

Unmount a Mount_Point on a Remote_Host. Mount_Point is then deleted. Returns true if the whole operation is successful.

- Usage

```
function Unmount_Remote [Remote_Host : String;  
                           Mount_Point : String] return Boolean;  
procedure Unmount_Remote [Remote_Host : String;  
                           Mount_Point : String];
```

- Example

```
if Net.Unmount_Remote ["user@remote_host.org", +"/tmp/mountpoint"] then  
  Tio.Put ["Mount point is unmounted"];  
end if;
```

1.9 Prg – Program management

1.9.1 Command

- Description

Constant storing program command [Arg 0].

- Usage

```
Command : constant String
```

- Example

```
Tio_Line [Command];
```

```
/home/sr/Seafile/Sowebio/informatique/dev/ada/app/gnx/src/gnx-instance
```

1.9.2 Current_Time_Seconds

- **Description**

Returns a duration as seconds since ISO date 197001010. Conforms to Unix time standard. Checked with date +%s. Compliant algorithm until 2070.

Returns a duration in seconds since current time.

- **Usage**

```
function Current_Time_Seconds return Natural
```

- **Example**

```
Log.Msg ["Current time in seconds: " & To_String [Current_Time_Seconds]];  
1646227335
```

1.9.3 Duration_Stamp

- **Description**

Returns a duration as HHhMMmSSs since Time.

- **Usage**

```
function Duration_Stamp [Time : Ada.Calendar.Time] return String
```

- **Example**

```
Log.Msg ["Total execution time: " & Prg.Duration_Stamp [Prg.Start_Time]];
```

1.9.4 Duration_Stamp_Seconds

- **Description**

Returns a duration as seconds since Time.

- **Usage**

```
function Duration_Stamp_Seconds [Time : Ada.Calendar.Time] return Natural
```

- **Example**

1.9.5 Duration_Stamp_Time

- **Description**

Returns a formatted HHhMMmSSs String from Time_Seconds.

- **Usage**

```
function Duration_Stamp_Time [Time_Seconds : Integer] return String
```

- **Example**

```
Tio.Put_Line ["Total execution time: " & Prg.Duration_Stamp_Time [1646315044];  
13h35m34s
```

1.9.6 Generate_Password

- **Description**

Password generation with 64 charset [[A-Z] + [a-z] + [0-9] + '_' + '-']

Search space size greater than $1,26 \times 10^{25}$

Space exploration time: 40000 centuries @ 100 billion tests per second.

Command line with standard tools: < /dev/urandom tr -dc _A-Z-a-z-0-9 | head -c\${1:-14};echo; Generates 14 chars long passwords like: 5fx7_0Fubo-hNa

- **Usage**

```
function Generate_Password return String
```

- **Example**

```
Log.Msg [Prg.Generate_Password];  
5fx7_0Fubo-hNa
```

1.9.7 Get_Handler_Ctrl_C

- **Description**

Activate Ctrl-C interrupt handler. If returns On, Ctrl-C is activated and, when pressed, application is properly finalize. If returns Off, Ctrl-C is inhibited and application continue.

- **Usage**

```
function Get_Handler_Ctrl_C return On_Off;
```

- Example

Pressing Ctrl-C in console:

```
20230930-120934 - INIT      - MSG - v22 Framework - GUI test program
20230930-120934 - INIT      - MSG - Copyright [C] Sowebio SARL 2020-2023, according to LGPLv3
20230930-120934 - INIT      - MSG - testgui v0.1 - v22 v0.1 - build 2023-09-30 12:08:43

20230930-120934 - INIT      - MSG - TestGui.Init.App > Configuration file testgui.cfg loaded
20230930-120934 - INIT      - MSG - TestGui.On_Connect > Starting Gnoga server

^C ~ Ctrl-C Pressed
20230930-120936 - INIT      - MSG - testgui > Ctrl-C detected, program interrupt is inhibited
```

1.9.8 Get_Version

- Description

Returns formatted program version : "<space>v.minor.major".

- Usage

```
function Get_Version return String;
```

- Example

```
Log.Msg ["Program version: " & Prg.Get_Version];
Program version: v2.16
```

1.9.9 Get_Version_Major

- Description

Returns Major version.

- Usage

```
function Get_Version_Major return Natural;
```

- Example

```
Log.Msg [Prg.Get_Version_Major];
2
```

1.9.10 Get_Version_Minor

- Description

Returns Minor version.

- Usage

```
function Get_Version_Minor return Natural;
```

- Example

```
Log. Msg [Prg. Get_Version_Minor]; P  
16
```

1.9.11 Is_User_Not_Root

- Description

Returns true if program user's not root.

- Usage

```
function Is_User_Not_Root return Boolean
```

- Example

```
sr@ro8 ~/Seafolder/Sowebio/informatique/github/aide/bin > aide
```

1.9.12 Name

- Description

Return program name.

- Usage

```
function Name return String
```

- Example

```
sr@ro8 ~/Seafolder/Sowebio/informatique/github/aide/bin > aide  
aide
```

1.9.13 Path

- Description

Return program path.

- Usage

```
function Path return String
```

- Example

```
sr@ro8 ~/Seafolder/Sowebio/informatique/github/aide/bin > aide  
/home/sr/Seafolder/Sowebio/informatique/github/aide/bin
```

1.9.14 Set_Handler_Ctrl_C

- **Description**

Activate Ctrl-C interrupt handler. If Switch is On, Ctrl-C is activated and, when pressed, application is properly finalize. If Switch is Off, Ctrl-C is inhibited and application continue.

- **Usage**

```
procedure Set_Handler_Ctrl_C [Switch : On_Off];
```

- **Example**

Pressing Ctrl-C in console:

```
20230921-122701 - INIT      - MSG - v22 Framework - GUI test program
20230921-122701 - INIT      - MSG - Copyright [C] Sowebio SARL 2020-2023, according to LGPLv3
20230921-122701 - INIT      - MSG - testgui v0.1 - v22 v0.1 - build 2023-09-21 12:26:24

20230921-122701 - INIT      - MSG - testgui > testgui.cfg has been loaded
20230921-122701 - INIT      - MSG - Starting Gnoga server
^C ← Ctrl-C Pressed
20230921-122703 - INIT      - MSG - testgui > Ctrl-C detected, finalize application
```

1.9.15 Set_Exit_Status

- **Description**

Set errorlevel return code. Each call is cumulative. Four calls with 1, 2, 4 and 8 set 15 ie msb-00001111-lsb. Can be used everywhere in the program without special call at its end.

Convention : 1 = no or bad command, 128 = runtime exception [8th bit].

- **Usage**

```
procedure Set_Exit_Status [Code : Natural]
```

- **Example**

1.9.16 Set_Version

- **Description**

Set program version.

- **Usage**

```
procedure Set_Version [Major : Natural; Minor : Natural]
```

- **Example**

1.9.17 Start_Dir

- Description

Constant storing current directory at start.

- Usage

```
Start_Dir : constant String
```

- Example

1.9.18 Start_Time

- Description

Constant storing Time at program start.

- Usage

```
Start_Time : constant Ada.Calendar.Time
```

- Example

1.9.19 Time_Stamp

- Description

Returns current timestamp as YYYYMMDD-HHMMSS

- Usage

```
function Time_Stamp return String
```

- Example

1.10 Sql – Databases management

1.10.1 General notes

This SQL package is a high-level API to simplify development. It includes, among others, the following features:

- Redundancy-free integration with low-level binding Gnoga.Server.Database;
- Standardized interface for all target databases;

- Database version management with table, index, relationship and field creation, followed by automatic update;
- Integrated data dictionary in Sys_Schema table;
- Set and Get configuration parameters in Sys_Config dedicated table;
- General purpose SQL API to ease the programmer.

See testapi demo program for further details.

1.10.2 MySQL notes

<<<TODO>>>

1.10.3 SQLite notes

A comprehensive "SQLite digest manual" is available to ease SQLite newcomers. See Sowebio Github repository.

To ease customization, SQLite DB is directly compiled and linked against sqlite3.c source located in src/sql.

1.10.4 v20 to v22 transition

List of obsolete v20 functions, superseded by Gnoga.Server.Database functions.

- Column_Integer, Column_Text

Use Gnoga.Server.Database.Field_Value and Gnoga.Server.Database.Field_Decimals.

- Column_Count

Use Gnoga.Server.Database.Number_Of_Fields.

- Column_Type

Use Gnoga.Server.Database.Field_Type.

- Error

Use Gnoga.Server.Database.Error_Message.

- Exec

Use Gnoga.Server.Database.Execute_Query.

- Last_Insert_RowID

Use Gnoga.Server.Database.Insert_ID.Insert_ID.

- Open

Use Gnoga.Server.Connect.

- Prepare

Use Gnoga.Server.Query.

- Reset
Use Gnoga.Server.Close.
- Step
Use Gnoga.Server.Next.

1.10.5 Close

- Description
Close a database or all database[s] when no database object specified.
- Usage

```
procedure Close [DB : in out GSD.Connection' Class]
procedure Close
```

- Example

```
Sql.Close;
20230911-144939 - SQL T1 - MSG - Closing SQLITE database: v22_testapi_1
20230911-144939 - SQL T1 - MSG - Closing SQLITE database: v22_testapi_2
```

1.10.6 Column_Exists

- Description
Return true if Column_Name exists in Table_Name.
Return False if Column_Name or Table_Name does not exist.
- Usage

```
function Column_Exists [DB : in out GSD.Connection' Class;
Table_Name : String;
Column_Name : String] return Boolean
```

- Example

```
Tio.Put ["Column_Exists: "];
Tio.Put_Line [Column_Exists [DB, "test_table", "Existing_Column"]]; -- Existing column
Column_Exists: True

Tio.Put ["Column_Exists: "];
Tio.Put_Line [Column_Exists [DB, "test_table", "azeazeaze"]]; -- Non existing column
Column_Exists: False
```

1.10.7 Delete

- **Description**

Delete a row in Table_Name specifying a Where_Condition.

- **Usage**

```
procedure Delete [DB : in out GSD.Connection' Class;
                  Table_Name : String;
                  Where_Condition : String]
```

- **Example**

```
-- Delete row for Number = 1234 in table Cluster
Sql.Delete ["Cluster", "Number = 1234"];
```

1.10.8 From_Money

- **Description**

Convert type Money to Long_Long_Integer for accurate storage in database.

- **Usage**

```
function From_Money [DB_Money : Money] return Long_Long_Integer
```

- **Example**

1.10.9 Get_Config

- **Description**

Get configuration Value from Parameter stored in Sys_Config table.

The Sys_Config table must be already created.

Returns an empty string if the Sys_Config table or parameter does not exist

- **Usage**

```
function Get_Config [DB : in out GSD.Connection' Class;
                     Parameter : String] return String
```

- **Example**

```
-- Get parameter's value 'Schema_Version' [previously set to '0.1']
Sql.Get_Config ["Schema_Version"];
0.1
```

1.10.10 Get_Database_Brand

- Description

Returns the Database_Type of DB.

- Usage

```
function Get_Database_Brand [DB : in out GSD.Connection' Class]
                           return Database_Brand

type Database_Brand is [None, MySQL, SQLite, Unknown]
```

- Example

1.10.11 Get_Database_Main

- Description

Get the main application database. The main database owns Sys_Config, Sys_Schema and Sys_Users system tables.

- Usage

```
function Get_Database_Main return String
```

- Example

1.10.12 Get_Version

- Description

Returns MySQL or SQLite database version.

- Usage

```
function Get_Version [DB : in out GSD.Connection' Class] return String
```

- Example

```
Tio.Put_Line [DB, Sql.Get_Version [MySQL_Handle]];
MySQL: v10.3.39-MariaDB-0+deb10u1
Tio.Put_Line [DB, Sql.Get_Version [SQLITE_Handle]];
SQLite: v3.43.0
```

1.10.13 Index_Exists

- Description

Return true if Index_Name exists for Table_Name.
Return False if Index_Name or Table_Name does not exist.
Names are case insensitive for MySQL and case sensitive for SQLite.

- Usage

```
function Index_Exists [DB : in out GSD.Connection' Class;
                      Table_Name : String;
                      Index_Name : String] return Boolean
```

- Example

```
Tio.Put("Index_Exists: ");
Tio.Put_Line [Sql.Index_Exists +"key"]]; -- Existing index

Tio.Put("Index_Exists: ");
Tio.Put_Line [Sql.Column_Exists +"key1"]]; -- Non existing index

...
Index_Exists: True
Index_Exists: False
```

1.10.14 Insert

- Description

Create a row in Table_Name with Columns_Values.

The special character ^ [or constant CD as Column delimiter] is used to separate column/value pairs and the special character ~ [or constant ND as Name/value delimiter] is used to distinguish the name of a column from its value. See example below.

A non existent Table or Column don't raise exception but an error is logged.

- Usage

```
procedure Insert [DB : in out GSD.Connection' Class;
                  Table_Name : String;
                  Columns_Values : String]
```

- Example

```
-- Fill Number with 1234 and Domain with genesix.org in table Cluster
Sql.Insert [DB, "Cluster", "Number~1234" & "^" & "Domain~genesix.org"]
```

1.10.15 Last_RowID

- **Description**

Returns last existing RowID in Table_Name or 0 if Table_Name does not exist.

- **Usage**

```
function Last_RowID [DB : in out GSD.Connection' Class;
                      Table_Name : String] return Integer
```

- **Example**

```
Tio.Put_Line [Sql.Row_Count [DB, "Table_test"]];  
12
```

1.10.16 Open

- **Description**

Open or create a database, passing a schema version for automatic schema update.

If schema version is upper than the version stored in Database, returns Open_Need_Update as a database schema update is needed.

URI conforms to RFC 3986 URI. See examples below:

```
MySQL: db: db_name?host=192.168.0.243&port=3306&user=user_name&password=user_password  
SQLite: file: data.db or file: data.db?mode=ro&cache=private  
see https://www.sqlite.org/c3ref/open.html for more information about sqlite options.
```

DB_Version is major.minor format.

Returns Database_Status.

Schema_Load listing and Schema_Update are therefore only launched when necessary.

To update the database schema in table Cluster with a new column named 'Thingy':

- Increment Sql.Open version parameter from 1.0 to 1.1;
- Add at the appropriate place in the source: Sql.Schema_Load [Sql.Column_Name, "Thingy", "TEXT"].

See example below.

- **Usage**

```
function Open [DBM : in out GSD.MySQL.Connection;
              URI : String := "";
              Version : String := "";
```

```

Rank : Database_Rank := Main] return Database_Status;

function Open [DBS : in out GSD.SQLite.Connection;
               URI : String := "";
               Version : String := "";
               Rank : Database_Rank := Main] return Database_Status;

type Database_Rank is [Main, Secondary];

type Database_Status is [None,
                        Open_Failed,
                        Open_Failed_Parameter_Invalid,
                        Open_Success,
                        Open_Need_Update];

```

- Example - Before schema update

Version is 1.0. If database does not exist, it will be created.

```

if Sql.Open [DBS, "file:sqlite_test.db", "1.0"] = Open_Need_Update then
  -- Cluster table -----
  Sql.Schema_Load [Sql.Table_Name,           "Tbl_Cluster". Comment => "Clusters table"];
  Sql.Schema_Load [Sql.Column_Name,          "Number", "INTEGER", "Cluster number [1] 1...240"];
  Sql.Schema_Load [Sql.Column_Constraint,    "Number", "UNIQUE"];
  Sql.Schema_Load [Sql.Table_Constraint,     "Number", "PRIMARY KEY"];

  Sql.Schema_Load [Sql.Column_Name,          "Key_Name",        "TEXT",      "Cluster key name"];
  Sql.Schema_Load [Sql.Column_Name,          "Key_Private",    "BLOB",     "Cluster private key"];
  Sql.Schema_Load [Sql.Column_Name,          "Key_Public",     "BLOB",     "Cluster public key"];
  Sql.Schema_Load [Sql.Column_Name,          "Supervisor_Instance", "INTEGER", "Supervisor instance"];
  Sql.Schema_Load [Sql.Column_Constraint,    "Supervisor_Instance", "REFERENCES Tbl_Instance[Number]"];
  Sql.Schema_Load [Sql.Column_Name,          "Comment",        "TEXT",      "Comment"];

  Sql.Schema_Load [Sql.Index_Name,           "Idx_Cluster_Number", "Number"];
  Sql.Schema_Load [Sql.Index_Constraint,     "Idx_Cluster_Number", "UNIQUE"];

  Sql.Schema_Update [DBS];
end if;

Results:

Database sqlite_test needs creation or update
Create Table: Sys_Config - Create Column: Parameter TEXT UNIQUE PRIMARY KEY
CREATE TABLE Sys_Config [Parameter TEXT UNIQUE PRIMARY KEY]
Table: Sys_Config - Create Column: Value TEXT
Table: Sys_Config - Creating Index: Idx_Config_Parameter Parameter
Create Table: Sys_Schema - Create Column: Table_Name TEXT
CREATE TABLE Sys_Schema [Table_Name TEXT ]
Table: Sys_Schema - Create Column: Column_Name TEXT
Table: Sys_Schema - Create Column: Column_Type TEXT
Table: Sys_Schema - Create Column: Column_Constraint TEXT
Table: Sys_Schema - Create Column: Version TEXT
Table: Sys_Schema - Create Column: Comment TEXT
Create Table: Tbl_Cluster - Create Column: Number INTEGER UNIQUE PRIMARY KEY
CREATE TABLE Tbl_Cluster [Number INTEGER UNIQUE PRIMARY KEY]
Table: Tbl_Cluster - Create Column: Key_Name TEXT
Table: Tbl_Cluster - Create Column: Key_Private BLOB
Table: Tbl_Cluster - Create Column: Key_Public BLOB
Table: Tbl_Cluster - Create Column: Supervisor_Instance INTEGER REFERENCES Tbl_Instance[number]
Table: Tbl_Cluster - Create Column: Comment TEXT
Table: Tbl_Cluster - Creating Index: Idx_Cluster_Number Number UNIQUE

```

| | | | | | |
|-------------|---------------------|---------|---------------------------------|------|----------------------------|
| Tbl_Cluster | Number | INTEGER | UNIQUE | +1.0 | Cluster number (1) 1...240 |
| Tbl_Cluster | Key_Name | TEXT | | +1.0 | Cluster key name |
| Tbl_Cluster | Key_Private | BLOB | | +1.0 | Cluster private key |
| Tbl_Cluster | Key_Public | BLOB | | +1.0 | Cluster public key |
| Tbl_Cluster | Supervisor_Instance | INTEGER | REFERENCES Tbl_Instance(Number) | +1.0 | Supervisor instance |
| Tbl_Cluster | Comment | TEXT | | +1.0 | Comment |

- Example - A schema update is needed

Version is upgraded to 1.1 and we add the Thingy1 and Thingy2 fields, in bold below:

```

if Sql.Open [DBS, "file:sqlite_test.db", "1.1"] = Open_Need_Update then
    -- Cluster table -----
    Sql.Schema_Load [Sql.Table_Name,          "Tbl_Cluster", Comment => "Clusters table"];
    Sql.Schema_Load [Sql.Column_Name,          "Number",      "INTEGER", "Cluster number [1] 1..240"];
    Sql.Schema_Load [Sql.Column_Constraint,   "Number",      "UNIQUE"];
    Sql.Schema_Load [Sql.Table_Constraint,   "Number",      "PRIMARY KEY"];

    Sql.Schema_Load [Sql.Column_Name,          "Key_Name",    "TEXT",     "Cluster key name"];
    Sql.Schema_Load [Sql.Column_Name,          "Key_Private", "BLOB",     "Cluster private key"];
    Sql.Schema_Load [Sql.Column_Name,          "Key_Public",   "BLOB",     "Cluster public key"];
    Sql.Schema_Load [Sql.Column_Name,          "Supervisor_Instance", "INTEGER", "Supervisor instance"];
    Sql.Schema_Load [Sql.Column_Constraint,   "Supervisor_Instance", "REFERENCES Tbl_Instance(Number)"];
    Sql.Schema_Load [Sql.Column_Name,          "Comment",     "TEXT",     "Comment"];
    Sql.Schema_Load [Sql.Column_Name,          "Thingy1",     "TEXT",     "Thingy1 created at v1.1"];
    Sql.Schema_Load [Sql.Column_Name,          "Thingy2",     "TEXT",     "Thingy2 created at v1.1"];

    Sql.Schema_Load [Sql.Index_Name,           "Idx_Cluster_Number", "Number"];
    Sql.Schema_Load [Sql.Index_Constraint,   "Idx_Cluster_Number", "UNIQUE"];

    Sql.Schema_Update [DBS];
end if;

Results:

Database sqlite_test needs creation or update
Table: Tbl_Cluster - Create Column: Thingy1 TEXT
Table: Tbl_Cluster - Create Column: Thingy2 TEXT

```

| | | | | | |
|-------------|---------------------|---------|---------------------------------|------|-------------------------|
| Tbl_Cluster | Key_Name | TEXT | | +1.1 | Cluster key name |
| Tbl_Cluster | Key_Private | BLOB | | +1.1 | Cluster private key |
| Tbl_Cluster | Key_Public | BLOB | | +1.1 | Cluster public key |
| Tbl_Cluster | Supervisor_Instance | INTEGER | REFERENCES Tbl_Instance(Number) | +1.1 | Supervisor instance |
| Tbl_Cluster | Comment | TEXT | | +1.1 | Comment |
| Tbl_Cluster | Thingy1 | TEXT | | +1.1 | Thingy1 created at v1.1 |
| Tbl_Cluster | Thingy2 | TEXT | | +1.1 | Thingy2 created at v1.1 |

- Notes

Although implementation reserves have been provided for, the table or column deletion function has not yet been implemented.

1.10.17 Ping

- Description

Ping opened databases to reset timeout, to avoid the infamous MySQL error "server has gone away". This does not apply to SQLite databases.

- Usage

```
procedure Ping
```

- Example

```

Task SQL_Ping;
task body SQL_Ping is
begin
```

```

        while true loop
            delay 3600.0; -- Wait 1 hour between pings
            Msg.Dbg ["TestGui.SQL_Ping > Sent"];
            Sql.Ping;
        end loop;
    end SQL_Ping;

```

1.10.18 Properties

- **Description**

Returns database properties record.

- **Usage**

```

function Properties [DB_Name : String] return Database_Line

type Database_Line is record
    Brand : Database_Brand := None;
    Status : Database_Status := None;
    URI : String;
    Name : String;
    Host : String;
    Port : Natural;
    User : String;
    Password : String;
    File : String;
    Version : String;
    DBM : GSD.MySQL.Connection;
    DBS : GSD.SQLite.Connection;
end record;

```

- **Example**

1.10.19 Read

- **Description**

Returns an extraction from Table_Name with comma delimited Columns and standard SQL Condition [like WHERE, ORDER BY, LIMIT].

The extraction is formatted with standard v22 CD constant as Column delimiter and RD constant as Row delimiter.

Return an empty string if condition is not met.

- **Usage**

```

function Read [DB : in out GSD.Connection' Class;
              Table_Name : String;
              Columns : String;
              Condition : String := ""] return String

```

- Example

```
Sql.Read [DB, "Cluster", "Number, Domain"];
Sql.Read [DB, "Cluster", "Number, Domain", "WHERE Number = 1234"];

-- Used in combination with Field_Display

Field_Display [Sql.Read ["Cluster", "Number,Domain"], CD, RD, "Cluster number, Domain name"];
Cluster number  Domain name
-----
1              domain1
2              domain2
3              domain3
4              domain4
1234          genesix2.org
```

1.10.20 Row_Count

- Description

Returns counted rows in Table_Name with Options.

Option:

- '*' is all rows, included null-ed;
- 'DISTINCT Column name' counts not null-ed and distinct rows.

- Usage

```
function Row_Count [DB : in out GSD.Connection' Class;
                    Table_Name : String;
                    Option : String := "*"] return Integer
```

- Example

```
Tio.Put_Line [DB, Sql.Row_Count [DB, "Table_test"]];

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```

1.10.21 Schema_Load

- Description

Load a schema. Commands will be executed by Schema_Update in code source order.

- Usage

```
procedure Schema_Load [Command : in Schema_Command := Null_Command;
                       Name : in String := "";
                       Attribute : in String := "";
                       Comment : in String := ""]
```

- Example

```

Sql.Schema_Load [Sql.Table_Name,           "Cluster"];
Sql.Schema_Load [Sql.Column_Name,          "Number",   "INTEGER"];
Sql.Schema_Load [Sql.Column_Constraint,    "Number",   "UNIQUE"];
Sql.Schema_Load [Sql.Table_Constraint,     "Number",   "PRIMARY KEY"];
Sql.Schema_Load [Sql.Column_Name,          "Domain",   "TEXT"];
Sql.Schema_Load [Sql.Column_Name,          "Email",    "TEXT"];
Sql.Schema_Load [Sql.Column_Name,          "Manager",  "INTEGER"];
Sql.Schema_Load [Sql.Index_Name,           "Idx",      "Number"];
Sql.Schema_Load [Sql.Index_Constraint,     "Idx",      "UNIQUE"];

```

1.10.22 Schema_Update

- Description

Create and delete tables, table constraints, columns, columns constraints, index, index constraints on database schema after loading schema by Schema_Load.

<<<TODO>>> : implement delete and backup DB before update or delete.

- Usage

```
procedure Schema_Update [DB : in out GSD.Connection' Class]
```

- Example

```

if Sql.Schema_Need_Update ["Sqlite_Update_Test", 0, 1] then

    Sql.Schema_Load [Sql.Table_Name,           "Cluster"];
    Sql.Schema_Load [Sql.Column_Name,          "Number",   "INTEGER"];
    Sql.Schema_Load [Sql.Column_Constraint,    "Number",   "UNIQUE"];
    Sql.Schema_Load [Sql.Table_Constraint,     "Number",   "PRIMARY KEY"];
    Sql.Schema_Load [Sql.Column_Name,          "Domain",   "TEXT"];
    Sql.Schema_Load [Sql.Column_Name,          "Email",    "TEXT"];
    Sql.Schema_Load [Sql.Column_Name,          "Manager",  "INTEGER"];
    Sql.Schema_Load [Sql.Index_Name,           "Idx",      "Number"];
    Sql.Schema_Load [Sql.Index_Constraint,     "Idx",      "UNIQUE"];

    Sql.Schema_Update;

end if;

```

1.10.23 Search

- Description

Return True if Condition verified.

- Usage

```
function Search [DB : in out GSD.Connection' Class;
                Table_Name : String;
                Condition : String] return Boolean
```

- Example

```

if Sql.Search [DB, "Cluster", "Number = 1234"] then
    Tio.Put_Line ["Search 'Number = 1234': Found"];

```

```

end if;
if not Sql.Search [DB, "Cluster", "WHERE Number = 9999"] then
    Tio.Put_Line ["Search 'Number = 9999': Not found"];
end if;

Search 'Number = 1234': Found
Search 'Number = 9999': Not found

if Sql.Search [DB, "Cluster", "Login = 'sr'"] then
    Tio.Put_Line ["Search 'Login = sr': Found"];
end if;

Search 'Login = sr': Found

```

1.10.24 Set_Config

- Description

Store configuration Parameter and Value to Sys_Config table.
The new Value will replaced the eventually existing one.
The Sys_Config table will be created if needed.

- Usage

```
procedure Set_Config [DB : in out GSD.Connection' Class;
                      Parameter : String;
                      Value : String]
```

- Example

```
-- Set '0.1' value in parameter 'Schema_Version'
Sql.Set_Config [DB, "Schema_Version", "0.1"];
```

1.10.25 Set_Database_Main

- Description

Set the main application database. The main database owns Sys_Config, Sys_Schema and Sys_Users system tables.

The default main database name is the name of the program. I.e if the binary program's name is "testgui", the default main database name is set to "testgui".

- Usage

```
procedure Set_Database_Main [Database_Name : String]
```

- Example

1.10.26 Table_Exists

- Description

Return true if Table_Name exists.

- Usage

```
function Table_Exists [DB : in out GSD.Connection' Class;
                      Table_Name : String] return Boolean
```

- Example

```
Tio.Put("Table_Exists: ");
Tio.Put_Line [Table_Exists [DB, "test_table"]]; -- Existing table
Table_Exists: True

Tio.Put("Table_Exists: ");
Tio.Put_Line [Table_Exists [DB, "test_table1"]]; -- Non existing table
Table_Exists: False
```

1.10.27 To_Money

- Description

Convert Bigint database storage [Long_Long_Integer] to Money type.

- Usage

```
function To_Money [DB_Integer : Long_Long_Integer] return Money
```

- Example

1.10.28 Update

- Description

Update one or more row in Table_Name with Columns_Values specifying a Where_Condition.

The special character ^ [or constant ND as Name/value delimiter] is used to separate column/value pairs and the special character ~ [or constant CD as Column delimiter] is used to distinguish the name of a column from its value. See example below.

A non existent Table or Column don't raise exception but an error is logged.

- Usage

```
procedure Update [DB : in out GSD.Connection' Class;
                  Table_Name : String;
```

```
    Columns_Values : String;
    Where_Condition : String]
```

- Example

```
-- Update Domain column with genesix2.org value for Number = 1234 in table Cluster
Sql.Update [DB, "Cluster", "Domain~genesix2.org", "Number = 1234"];
```

1.11 Sys – System management

1.11.1 Command_Path

- Description

Return full qualified command path or an empty string if not found.

- Usage

```
function Command_Path [Command_Name : String] return VString;
```

- Example

```
Sys.Command_Path ["mc"];
/usr/bin/mc
```

1.11.2 Get_Alloc_Ada

- Description

Return current and max allocations done from Ada excluding others languages. Format of returned string : Ada Cur: [868] Max: [1600].

- Usage

```
function Get_Alloc_Ada return String;
```

- Example

```
Prg.Get_Alloc_Ada;
Ada Cur: [ 868 ] Max: [ 1600 ]
```

1.11.3 Get_Alloc_All

- Description

Return current and max allocations done from all languages including Ada. Format of returned string: Ada Cur: [868] Max: [1600]. This uses system calls to find out the program's resident size (RSS) information, both the peak and the current size.

- Usage

```
function Get_Alloc_All return String;
```

- Example

```
Sys. Get_Alloc_All;
All Cur: [ 2514944 ] Max: [ 2514944 ]
```

1.11.4 Get_Env

- Description

Returns String value of String environment variable Name

- Usage

```
function Get_Env [Name : String] return VString
```

- Example

1.11.5 Get_Home

- Description

Returns HOME path without trailing slash.

- Usage

```
function Get_Home return VString
```

- Example

```
Sys. Get_Home - for user 'sr'
"/home/sr"
```

1.11.6 Get_Memory_Dump

- Description

Dump information about memory usage. Size is the number of the biggest memory users we want to show. Report indicates which sorting order is used, depending of the following options:

- Prg.All_Reports;
- Prg.Memory_Usage;
- Prg.Allocations_Count;
- Prg.Sort_Total_Allocs;
- Prg.Marked_Blocks;

❖ You must activate memory monitor with Set_Memory_Monitor before using this function.

- Usage

```
procedure Get_Memory_Dump [Size : Positive;
                           Report_View : Report := Memory_Usage]

Prg. Get_Memory_Dump [1];
```

- Example

Displaying all report options :

```
Prg. Get_Memory_Dump [1];

Traceback elements allocated: 2480
Validity elements allocated: 1

Ada Allocs: 60608 bytes in 1258 chunks
Ada Free: 60008 bytes in 1248 chunks
Ada Current watermark: 600 in 10 chunks
Ada High watermark: 1600

1 biggest memory users at this time:
Results include bytes and chunks still allocated
Traceback elements allocated: 2480
Validity elements allocated: 1

Prg. Get_Memory_Dump [1, Prg. Allocations_Count];

Traceback elements allocated: 2798
Validity elements allocated: 1

Ada Allocs: 68456 bytes in 1419 chunks
Ada Free: 67588 bytes in 1405 chunks
Ada Current watermark: 868 in 14 chunks
Ada High watermark: 1600

1 biggest number of live allocations:
Results include bytes and chunks still allocated
  5.5%: 48 bytes in 1 chunks at 0x000000000040C509 0x000000000040C33B
  0x000000000043B74A 0x000000000043D42F 0x000000000042B7A7 0x0000000000407090
  0x000000000040C2BE 0x0000000000474D27 0x00000000004053C8

Prg. Get_Memory_Dump [1, Prg. Sort_Total_Allocs];

Traceback elements allocated: 3106
Validity elements allocated: 1

Ada Allocs: 75816 bytes in 1573 chunks
Ada Free: 74948 bytes in 1559 chunks
Ada Current watermark: 868 in 14 chunks
Ada High watermark: 1600

1 biggest number of allocations:
Results include total bytes and chunks allocated,
even if no longer allocated - Deallocation are ignored

Prg. Get_Memory_Dump [1, Prg. Marked_Blocks];

Traceback elements allocated: 3414
Validity elements allocated: 1
```

```
Ada Allocs: 83192 bytes in 1727 chunks
Ada Free: 82324 bytes in 1713 chunks
Ada Current watermark: 868 in 14 chunks
Ada High watermark: 1600

Special blocks marked by Mark_Traceback
 0.0%: 0 chunks / 1 at 0x000000000040C509 0x000000000040C33B 0x000000000043B74A
0x000000000043DB1E 0x00000000004126A5 0x000000000041AC80 0x000000000041ED3D
0x0000000000405B71 0x000000000040C2BE 0x0000000000474D27 0x00000000004053C8
```

1.11.7 Get_System_Name

- Description

Returns system name like "Debian" or "Ubuntu" or "System not handled [unprocessed system string returned]".

- Usage

```
function Get_System_Name return String;
```

- Example

```
Sys.Get_System_Name - for system "Debian 11 GNU/Linux 11"
"debian"
```

1.11.8 Get_System_Version

- Description

Returns system version like 10, 11 for Debian or 18.04, 20.04, 22.04 for Ubuntu or "System not handled [unprocessed system string returned]". For Ubuntu systems, sub-version like 18.04.6 and LTS string are omitted.

- Usage

```
function Get_System_Version return String;
```

- Example

```
Sys.Get_System_Version - for system "Debian 11 GNU/Linux 11"
"11"

Sys.Get_System_Version - for system "Ubuntu 22.04 LTS"
"22.04"
```

1.11.9 Install_Packages

- Description

Install packages for Debian, Ubuntu or derivatives distributions.

- Usage

```
function Install_Packages [Packages_List : String;
                           Host_Name : VString := "" ] return Boolean;

function Install_Packages [Packages_List : VString;
                           Host_Name : VString := "" ] return Boolean;
```

- Example

```
if not Sys.Install_Packages ["curl, libtool, libcurl4, libcurl4-openssl-dev, libssl-dev"] then
    Log.Err ["At least one package has not been installed."];
end if;
```

1.11.10 Is_Command

- Description

Return true if command exists and reachable from path.

- Usage

```
function Is_Command [Package_Name : String] return Boolean
```

- Example

```
if not Sys.Is_Command ["mc"] then
    Log.Err ["Midnight Commander not available."];
end if;
```

1.11.11 Is_Package

- Description

Return true if Package_Name is installed.

- Usage

```
function Is_Package [Package_Name : String] return Boolean
```

- Example

```
if not Sys.Is_Package ["curl"] then
    Log.Err ["Package Curl is missing."];
end if;
```

1.11.12 Purge_Packages

- Description

Purge packages for Debian, Ubuntu or derivatives distributions.

- Usage

```
function Purge_Packages [Packages_List : String;
                           Host_Name : String := ""] return Boolean;
```

- Example

```
if not Sys.Purge_Packages ("exim4-base, exim4-config, exim-4-daemon-light") then
  Log.Err ("At least one package has not been purged.");
end if;
```

1.11.13 Reset_Memory_Monitor

- Description

Reset all internal data (i.e. reset all displayed counters. This is in general not needed, unless you want to know what memory is used by specific parts of your application.

◊ You must activate memory monitor with Set_Memory_Monitor before using this function.

- Usage

```
procedure Reset_Memory_Monitor
```

- Example

```
Sys.Reset_Memory_Monitor;
```

1.11.14 Set_Env

- Description

Set an environment variable Name.

- Usage

```
procedure Set_Env [Name : String; Value : String]
```

- Example

1.11.15 Set_Memory_Monitor

- Description

If Activate_Monitor is true, the program will monitor all memory allocations and deallocations, and through the Get_Memory_Dump procedure below be able to report the memory usage. The overhead is almost null when the monitor is disabled.

- Usage

```
procedure Set_Memory_Monitor [Switch : On_Off]
```

- Example

Activate memory monitor :

```
Prg. Set_Memory_Monitor [On];
```

Disable memory monitor :

```
Prg. Set_Memory_Monitor [Off];
```

1.11.16 Shell_Execute

- Description

Executes shell command. Return the exit code if passed from the executed command. Without Output parameter, the command console output is displayed by default but can be redirected. If Output is used, then the executed command output is return in this parameter.

- Usage

```
procedure Shell_Execute [Command : String]  
procedure Shell_Execute [Command : String;  
                        Result : out Integer]  
procedure Shell_Execute [Command : String;  
                        Result : out Integer;  
                        Output : out String]
```

- Example

```
-----  
declare  
  SE_Result : Integer := 0;  
begin  
  Sys.Shell_Execute ["find test.cfg", SE_Result];  
  Tio.Put_Line(SE_Result);  
  Tio.Line;  
end;  
  
0 <- found  
  
-----  
declare  
  SE_Result : Integer := 0;  
begin  
  Sys.Shell_Execute ["find i.dont.exist", SE_Result];  
  Tio.Put_Line(SE_Result);  
  Tio.Line;  
end;
```

```

1 <- not found

-----
declare
  SE_Result : Integer := 0;
  SE_Output : VString := "+"";
begin
  Sys.Shell_Execute ["cat test.cfg", SE_Result, SE_Output];
  if SE_Result = 0 then
    Tio.Put_Line [SE_Output];
    Tio.Line;
  end if;
end;

[Section_1]
Parameter_11 = Value_11
[Section_2]
Parameter_21 = Value_21
[Section_3]
Parameter_31 = Value_31
... which is the content of test.cfg.

```

1.12 Tio - Text console management

```

Max_Row : constant Natural := 24;
Max_Column : constant Natural := 79;

subtype Row is Natural range 0..Max_Row;
subtype Column is Natural range 0..Max_Column;

```

1.12.1 Animated_Delay

- Description

Animated delay in seconds with markers each 5 and 10 seconds.

- Usage

```
procedure Animated_Delay [Delay_Seconds : Positive];
```

- Example

```

Animated_Delay [27];
....!....|....!....|... /< animated wheel with /-\|/-| characters
.1s !5s |10s

When finished
....!....|....!....|....!...

```

1.12.2 Ansi

- Description

Get ANSI state for v20 display functions and procedures.

- Usage

```
function Ansi return Boolean;
```

- Example

1.12.3 Ansi_Off

- Description

Set ANSI state off for v20 display functions and procedures.

- Usage

```
procedure Ansi_Off;
```

- Example

1.12.4 Ansi_On

- Description

Set ANSI state on for v20 display functions and procedures.

- Usage

```
procedure Ansi_On;
```

- Example

1.12.5 Beep

- Description

Send a beep.

- Usage

```
procedure Beep
```

- Example

1.12.6 Clear_Screen

- Description

Clear the screen.

- Usage

```
procedure Clear_Screen
```

- Example

```
-- Clear the screen  
Clear_Screen;
```

1.12.7 Confirm_Twice

- Description

Double check by user before action. Returns True if user has validate.

- Usage

```
function Confirm_Twice [User_Prompt_1 :  
                      String ; User_Prompt_2 : String] return Boolean;
```

- Example

```
if Tio.Confirm_Twice [Name & ".Create: Do you want to create the " & Name,  
                     Name & ".Create: Confirm creation of " & Name] then  
    ... Some operations ...  
    Tio.Put_Line [Name & ".Create: " & Name & " " & Value & " created"];  
end if;
```

1.12.8 Cursor_Line_Backward

- Description

Move the cursor backward X rows.

- Usage

```
procedure Cursor_Line_Backward [X : Row]
```

- Example

1.12.9 Cursor_Line_Erase

- Description

Erase the current line from the current cursor position to the end of the line.

- Usage

```
procedure Cursor_Line_Erase [X : Row]
```

- Example

1.12.10 Cursor_Line_Forward

- Description

Move the cursor forward X rows.

- Usage

```
procedure Cursor_Line_Forward [X : Row]
```

- Example

1.12.11 Cursor_Line_Move

- Description

Move the cursor at the specified X,Y coordinates.

- Usage

```
procedure Cursor_Move [X : Row; Y : Column]
```

- Example

1.12.12 Cursor_Restore

- Description

Restore the previous saved cursor position.

- Usage

```
procedure Cursor_Restore
```

- Example
-

1.12.13 Cursor_Save

- Description

Save the current cursor position.

- Usage

```
procedure Cursor_save
```

- Example
-

1.12.14 New_Line

- Description

Create a new blank line, or more than one when Spacing is passed.

- Usage

```
procedure New_Line [Spacing : Positive]
```

- Example
-

1.12.15 Get_Immediate

- Description

Get a character validated by [Enter]

- Usage

```
procedure Get_Immediate [C : out Character]
```

- Example
-

```
procedure Pause is
  Dummy : Character;
begin
  Tio.Put_Line {"Press any key to continue..."};
  Tio.Get_Immediate(Dummy);
```

```
end Pause;
```

1.12.16 Get_Password

- Description

Returns a password blind typed

- Usage

```
function Get_Password return String
```

- Example

```
Pass := Tio.Get_Password;  
Password:
```

1.12.17 Pause

- Description

Displays *Press any key to continue or [Ctrl-C] to abort...* waiting for user input.

- Usage

```
procedure Pause
```

- Example

```
procedure Test_Pause is  
begin  
    Pause;  
end Test_Pause;
```

1.12.18 Put

- Description

Print to the console.

- Usage

```
procedure Put (B : Boolean)  
procedure Put (B : On_Off)  
procedure Put (C : Character)  
procedure Put (V : String)  
procedure Put (I : Integer)
```

```
procedure Put [I : Long_Integer]
procedure Put [I : Long_Long_Integer]
procedure Put [M : Money]
```

- Example

```
[REDACTED]
```

1.12.19 Put_Line

- Description

Print to the console then add a new line.

- Usage

```
procedure Put_Line [B : Boolean]
procedure Put_Line [B : On_Off]
procedure Put_Line [C : Character]
procedure Put_Line [V : String]
procedure Put_Line [I : Integer]
procedure Put_Line [I : Long_Integer]
procedure Put_Line [I : Long_Long_Integer]
procedure Put_Line [M : Money]
```

- Example

```
[REDACTED]
```

1.12.20 Set_Cursor

- Description

Display or hide the cursor console.

- Usage

```
procedure Set_Cursor [Switch : On_Off]
```

- Example

```
procedure Set_Cursor [Off];
```

1.13 Tio - Text files management

```
subtype File is Ada.Text_IO.File_Type;
Copy_Form : constant String := "preserve=no_attributes,mode=overwrite";
```

1.13.1 Append

- Description

Append a file.
File mode is “Out” [write mode].

- Usage

```
procedure Append [Handle : in out File; Name : String]
```

- Example

```
Append [File_Tmp_Handle, "./toto"];
while not Tio.End_Of_File [File_Tmp_Handle] loop
    Tio.Put_Line [File_Tmp_Handle, "This is a new line of data"];
end loop;
Close [File_Tmp_Handle];
```

1.13.2 Close

- Description

Close a file.

- Usage

```
procedure Close [Handle : in out File]
```

- Example

```
Tio.Open [File_Tmp_Handle, "./toto"];
while not Tio.End_Of_File [File_Tmp_Handle] loop
    Tio.Get_Line [File_Tmp_Handle, Line_Buffer];
end loop;
Tio.Close [File_Tmp_Handle];
```

1.13.3 Create

- Description

Create a file.

File mode is “Out” [write mode].

- Usage

```
procedure Create [Handle : in out File; Name : String]
```

- Example

```
.../  
    File_Tmp_Handle : Tio.File;  
begin  
    Tio.Create [File_Tmp_Handle, +"./toto"];  
    Tio.Put_Line [File_Tmp_Handle, "Write a first line in ./toto"];  
    Tio.Put_Line [File_Tmp_Handle, "Write a second line in ./toto"];  
    Tio.Close [File_Tmp_Handle];  
.../
```

1.13.4 End_Of_File

- Description

Return true if end of file is reached.

- Usage

```
function End_Of_File [Handle : File] return Boolean
```

- Example

1.13.5 End_Of_Line

- Description

Return true if end of line is reached.

- Usage

```
function End_Of_Line [Handle : File] return Boolean
```

- Example

1.13.6 Flush

- Description

Flush file buffer to disk.

- Usage

```
procedure Flush [Handle : in File]
```

- Example

1.13.7 Get_Line

- Description

Get the current line and then move the file pointer to the next line.

- Usage

```
procedure Get_Line [Handle : File; V : out String]
```

- Example

```
Tio.Create [File_Tmp_Handle, +"./toto"];
while not Tio.End_Of_File [File_Tmp_Handle] loop
    Tio.Get_Line [File_Tmp_Handle, Line_Buffer];
end loop;
Tio.Close [File_Tmp_Handle];
```

1.13.8 Is_Open

- Description

Returns true if Handle file is open.

- Usage

```
function Is_Open [Handle : in File] return Boolean
```

- Example

1.13.9 Line

- Description

Create a new blank line, or more when Spacing is passed.

- Usage

```
procedure New_Line [Handle : File; Spacing : Positive]
```

- Example

1.13.10 Open_Conf

- Description

Special Open function for config files and others valuable files.

Ensure that the complete directory tree structure exists before creating file. Creating this directory tree if needed. Creates or Append files if needed.

Always make backup before Append. If Wipe_Before_Process is True, the file Name is backup-ed before being deleted.

- Usage

```
procedure Open_Conf [Handle : in out File;
                     Name : String;
                     Wipe_Before_Process : Boolean := False;
                     Permissions : VString := " "];
```

- Example

```
.../...
File_Tmp_Handle : Tio.File;
begin
  Tio.Open_Conf [File_Tmp_Handle, +"./toto", True, +"0600"];
  Tio.Put_Line [File_Tmp_Handle, "Write a first line in ./toto"];
  Tio.Put_Line [File_Tmp_Handle, "Write a second line in ./toto"];
  Tio.Close [File_Tmp_Handle];
.../...
```

1.13.11 Open_Read

1.13.12 Description

Open a file. File mode is “In” [read mode].

- Usage

```
procedure Open_Read [Handle : in out File; Name : String]
```

- Example

```
.../...

File_Tmp_Handle : Tio.File;

begin
    Tio.Open_Read [File_Tmp_Handle, +". ./toto"];
    while not Tio.End_Of_File [File_Tmp_Handle] loop
        Tio.Get_Line [File_Tmp_Handle, Line_Buffer];
    end loop;
    Tio.Close [File_Tmp_Handle];
.../...
```

1.13.13 Put

- Description

Write to a file.

- Usage

```
procedure Put [Handle : File; C : Character]
procedure Put [Handle : File; S : String]
```

- Example

1.13.14 Put_Line

- Description

Write a file and then add a new line.

- Usage

```
procedure Put_Line [Handle : File; C : Character]
procedure Put_Line [Handle : File; S : String]
```

- Example

1.13.15 Read_File

- Description

Read a text file File_To_Read and returning a String buffer. LF (line feed) are preserved.

- Usage

```
function Read_File [File_Name : String] return String
```

- Example

```
[REDACTED]
```

1.13.16 Reset

- Description

Reset the file pointer to the start of the file.

- Usage

```
procedure Reset [Handle : in out File]
```

- Example

```
[REDACTED]
```

1.13.17 Write_File

- Description

Write a text file File_To_Write with Content. LF in content are preserved and used as line feed. Read Open_Conf documentation for implementation details.

- Usage

```
procedure Write_File [File_Name : String;
                      Content : String;
                      Permissions : String := ""]
```

- Example

```
[REDACTED]
```

1.14 Uxs – UXStrings extensions

Uxs is a package extending UXString.

The functions are now directly integrated in UXStrings.

Null_String : Null_UXString

1.14.1 Char_Count

- Description

Count each char in String_To_Process relative to Char_Set_Pattern.

- Usage

```
function Char_Count [String_To_Process : String;
                     Char_Set_Pattern : String] return Integer;
```

- Example

```
Tio.Put_Line [Uxs.Char_Count ["alpha", "ap"]];  
3
```

1.14.2 Ends_With

- Description

Check if String Item ends with another String Pattern.

- Usage

```
function Ends_With [Item : String; Pattern : Character] return Boolean;
```

- Example

```
- Check String with String pattern  
if Uxs.Ends_With ["package", "age"] then  
  Tio.Put_Line ["Match ! "];  
end if;
```

1.14.3 Field_* guidelines

Field_* functions deal with string [String_To_Process] forming lists of fields separated by a delimiting character [Field_Delimiter].

Use only Field_Delimiter characters between 0dec and 127dec, due to some keyboard available characters encoding with 2 chars.

Some recommended Field_Delimiter characters are listed in v20.ads but also above in the v20 documentation : Delimiter characters.

1.14.4 Field_By_Index

- Description

Return a field indexed by Index_Field and delimited by Field_Delimiter.

- Usage

```
function Field_By_Index [String_Input : String;
                        Index_Field : Integer;
                        Field_Delimiter : String] return String;
```

- Example

```
Tio.Put_Line [Uxs.Field_By_Index ("alpha:bravo:charlie", 2, ":" )];
bravo
```

1.14.5 Field_By_Name

- Description

Return a field from a search string and delimited by Field_Delimiter. Returns an empty String if not found.

- Usage

```
function Field_By_Name [String_Input : String;
                        Field_To_Search : String;
                        Field_Delimiter : String] return String;
```

- Example

```
Tio.Put_Line [Uxs.Field_By_Name ("alpha:bravo:charlie", "rav", ":" )];
bravo
```

1.14.6 Field_Count

- Description

Count fields in String_To_Process and return fields number.

⇒ To handle one field case without trailing Field_Delimiter, if String_To_Process not empty and Field_Delimiter not found, Field_Count returns 1.

- Usage

```
function Field_Count [String_To_Process : String;
                        Field_Delimiter : String] return Integer;
```

- Example

```
Tio.Put_Line [uxs.Field_Count ("alpha:bravo:charlie", ":" )];
3
```

1.14.7 Field_Included

- **Description**

Returns True if all Items_List are included in String_To_Process list, which is delimited by Field_Delimiter.

- **Usage**

```
function Field_Included [String_To_Process : String;
                           Items_List : string;
                           Field_Delimiter : String] return Boolean;
```

- **Example**

```
Tio.Put_Line [Uxs.Field_Count ("alpha,bravo,charlie", "alpha,charlie", "", "")];  
True
```

1.14.8 Field_Display

- **Description**

Formatted display of a string fields structured in rows and columns. Optional header names are separated by commas.

Constants declaration abstract in v22 [related to Field_* functions] :

```
ND : constant String := "~"; -- Name/value delimiter  
CD : constant String := "^"; -- Column delimiter  
RD : constant String := "\\"; -- Row delimiter
```

- **Usage**

```
procedure Field_Display [String_To_Process : String;
                           Column_Delimiter : String;
                           Row_Delimiter : String;
                           Custom_Header : String := ""];
```

- **Example**

Combined example with Uxs.Field_Display and Sql.Read functions :

```
Uxs.Field_Display [Sql.Read ["Cluster", "Number,Domain"], CD, RD, "Cluster number, Domain name"];  
  
Cluster number  Domain name  
-----  
1              domain1  
2              domain2  
3              domain3  
4              domain4
```

1.14.9 Field_Search

- Description

Search Field_To_Search in String_To_Process and return True if found.

- Usage

```
function Field_Search [String_To_Process : String;
                      Field_To_Search : String;
                      Field_Delimiter : String] return Boolean;
```

- Example

```
Tio.Put_Line [Uxs.Field_Search ("alpha:bravo:charlie", "bravo", ":")];
True
```

1.14.10 Is_Numeric

- Description

Return True if Item string is numeric.

- Usage

```
function Is_Numeric [Item : in String] return Boolean;
```

- Example

```
tio.Put_Line [uxs.Is_Numeric ("12AZE12")];
False
tio.Put_Line [uxs.Is_Numeric ("1212")];
True
```

1.14.11 Replace_Char

- Description

Replace all Char_In by Char_Out in String_To_Process.

- Usage

```
function Replace_Char [String_To_Process : String;
                      Char_In : Character;
                      Char_Out : Character] return String;
```

- Example

```
Replace_Char [+ABCDEFGH", 'D', 'Z'];
"ABCZEFGH"
```

1.14.12 Starts_With

- Description

Check if String Item starts with another String Pattern.

- Usage

```
function Starts_With [Item : String; Pattern : Character] return Boolean;
```

- Example

```
- Check String with String pattern
if Ends_With ["package", "pac"] then
  Tio.Put_Line ["Match !"];
end if;
```

1.14.13 Script_Chars

- Description

Script each char in String_To_Process relative to Char_List.

- Usage

```
function Script_Chars [String_To_Process : String ; Char_List : String]
return String
```

- Example

```
Tio.Put_Line [Uxs.Script_Chars ["ABCDEFGH", "BDF"]];
"ACEGH"
```

1.14.14 Tail_After_Match

- Description

Extract a String from Source starting from Pattern+1 position to the end.
If Pattern not found, return Source unchanged.

- Usage

```
function Tail_After_Match [Source : String;
                           Pattern : Character] return String;
```

```
function Tail_After_Match [Source : String;
                           Pattern : String] return String;
```

- Examples

```
Path := "/etc/genesix/gnx-startup";
Tio.Put_Line [Uxs.Tail_After_Match [Path, '/']];
"gnx-startup"

Put_Line [Uxs.Tail_After_Match [Path, "ix"]];
"/gnx-startup"

Put_Line [Uxs.Tail_After_Match [Path, "gene"]];
"six/gnx-startup"

Tio.Put_Line [Uxs.Tail_After_Match [Path, "etc/genesix/gnx-startu"]];
"p"

Tio.Put_Line [Uxs.Tail_After_Match [Path, "/etc/genesix/gnx-startu"]];
"p"

Tio.Put_Line [Uxs.Tail_After_Match [Path, "/etc/genesix/gnx-startup"]];
empty string

Tio.Put_Line [Uxs.Tail_After_Match [Path, "/etc/genesix/gnx-startupp"]];
empty string

Tio.Put_Line [Uxs.Tail_After_Match [Path, "/etc/geneseven"]];
empty string
```

1.14.15 To_Hex

- Description

Convert a Byte or a String to a String hexadecimal output.

- Usage

```
function To_Hex [Byte : Interfaces.Unsigned_8] return String
function To_Hex [String_In : String] return String
```

- Example

```
tio.Put_Line [Uxs.To_Hex ["ABCDEF"]];
41 42 43 44 45 46
```

1.14.16 To_Hex_From_Val

- Description

Convert an ASCII String value ranging 0..127 to a String hexadecimal output.

- Usage

```
function Ascii_Value_To_Hex [Input : String] return String
```

- Example

```
tio.Put_Line [Uxs.To_Hex_From_Val ["61"]];  
3D
```

1.14.17 To_Integer

- Description

Convert a String to an Integer.
Leading and trailing spaces are trimmed before conversion.
Returns 0 if String is empty or contains non numeric character.

- Usage

```
function To_Integer [V : String] return Integer
```

- Example

```
tio.Put_Line [Uxs.To_Integer ["22"]];  
22
```

1.14.18 To_String

- Description

Convert a Boolean, an On_Off type, an Integer, a Char or a String type into String type.

- Usage

```
function To_String [B : Boolean] return String  
function To_String [B : On_Off] return String  
function To_String [I : Integer] return String  
function To_String [I : Long_Integer] return String;  
function To_String [I : Long_Long_Integer] return String;  
function To_String [C : ASCII_Character] return String
```

- Example

```
tio.Put_Line [Uxs.To_String [22]];  
"22"
```

1.14.19 To_Val

- Description

Convert a String to String ASCII decimal values formatted output.

- Usage

```
function To_Val [String_To_Convert : String] return String
```

- Example

```
Tio.Put_Line [Uxs.To_Val ["ABCDEF"]];  
65 66 67 68 69 70
```

1.14.20 Trim_Both

- Description

Returns an all trimmed spaces String of String Source.

- Usage

```
function Trim_Both [Source : String] return String
```

- Example

```
Tio.Put_Line [Uxs.Trim_Right [" AB CD " ]];  
"AB CD"
```

1.14.21 Trim_Left

- Description

Returns a trimmed leading spaces String of String Source.

- Usage

```
function Trim_Left [Source : String] return String
```

- Example

```
Tio.Put_Line [Uxs.Trim_Left [+ " ABCD " ]];  
"ABCD "
```

1.14.22 Trim_Right

- Description

Returns a trimmed trailing spaces VString of VString Source.

- Usage

```
function Trim_Right [Source : String] return String
```

- Example

```
Tio.Put_Line [Uxs.Trim_Right +" ABCD "];  
" ABCD"
```

1.14.23 Trim_Slashes

- Description

Returns an all trimmed slashes String of String Source.

- Usage

```
function Trim_Slashes [Source : String] return String
```

- Example

```
Tio.Put_Line [Uxs.Trim_Slashes "/"];  
"  
Tio.Put_Line [Uxs.Trim_Slashes "I"];  
"I"  
Tio.Put_Line [Uxs.Trim_Slashes "/i"];  
"i"  
Tio.Put_Line [Uxs.Trim_Slashes "////////i////////"];  
"i"
```

2 Gnoga component

The Gnoga API is too large to be fully reproduced here. Please refer to the automatically generated HTML documentation available from GnatStudio menu.

2.1 Server.Database

2.1.1 Types

```
type Connection is limited interface;  
type Connection_Access is access all Connection' Class;
```

```

type Recordset is interface;
type Recordset_Access is access all Recordset'Class;

type Field_Description is record
    Column_Name : String;
    Data_Type   : String;
    Can_Be_Null : Boolean;
    Default_Value : String;
end record;

package Field_Description_Arrays is new Ada.Containers.Indefinite_Vectors (Natural,
Field_Description);
subtype Field_Description_Array_Type is Field_Description_Arrays.Vector;

```

2.1.2 Exceptions

```

Connection_Error : Unable to connect to MYSQL Server or Not connected to Server
Database_Error : Unable to switch to specified Database
Table_Error : Unable to locate table or table has no fields
Query_Error : Unable to execute query
Empty_Recordset_Error : The recordset is currently empty
Empty_Row_Error : Attempt to read value from Row before calling Next
End_Of_Recordset : Attempt to go pass the last row in recordset
No_Such_Field : The value for a field name was requested that does not exits
Null_Field : The value for a Null field was requested
NotImplemented : If a database method is called that is not implemented by the specific database engined used this exception will be raised.

```

2.1.3 Affected_Rows

- Description

Returns the number of rows affected by an Execute_Query.

- Usage

```
function Affected_Rows (C : Connection) return Natural
```

- Example

2.1.4 Close

- Description

Close current recordset and free resources.

- Usage

```
procedure Close (RS : in out Recordset)
```

- Example

2.1.5 Disconnect

- Description

Disconnect from server.

- Usage

```
procedure Disconnect (C : in out Connection)
```

- Example

2.1.6 Error_Message

- Description

Returns the last error message that has occurred on this connection.

- Usage

```
function Error_Message (C : Connection) return String
```

- Example

2.1.7 Escape_String

- Description

Prepares a string for safe storage in a query.

- Usage

```
function Escape_String (C : Connection; S : String) return String
```

- Example

2.1.8 Execute_Query

- Description

Execute an SQL Query with no result set.

- Usage

```
procedure Execute_Query [C : in out Connection; SQL : String ]
```

- Example

2.1.9 Execute_Update

- Description

Executes an SQL Query and returns the number of affected row.

- Usage

```
function Execute_Update [C : in out Connection; SQL : String ] return Natural
```

- Example

2.1.10 Field_Decimals

- Description

Returns the decimal portion of a field size if it exists or 0. For example: if the Data_Type = float[10,2] it will return 2.

- Usage

```
function Field_Decimals [Field : Field_Description] return Natural
```

- Example

2.1.11 Field_Descriptions

- Description

Return an array of Field_Description records describe the fields of a table.

- Usage

```
function Field_Descriptions [C : Connection; Table_Name : String] return Field_Description_Array_Type
```

- Example

2.1.12 Field_Name

- Description

Return name of field.

- Usage

```
function Field_Name [RS : Recordset; Field_Number : Natural] return String
```

- Example

2.1.13 Field_Options

- Description

Returns the field options portion of a data type, for example: If the Field.Data_Type = enum['N','Y'] then will return 'N','Y' as this is described in the database in the same way as field size, this may be used for a string representation of the size as well. For example varchar[80] will return the string 80. This is also used for descriptions like decimal[10,2], etc.

- Usage

```
function Field_Options [Field : Field_Description] return String
```

- Example

2.1.14 Field_Options

- Description

Returns the field size portion of a data type, for example: If the Field.Data_Type = varchar[80] then will return 80. If the Data_Type does not have a size portion will return 0. If the Data_Type is a numeric with decimals, e.g. decimal[10,2] then it will return the non-decimal portion.

- Usage

```
function Field_Size [Field : Field_Description] return Natural
```

- Example
-

2.1.15 Field_Type

- Description

Returns the field type portion of a data type, for example: If the Field.Data_Type = Varchar[80] then will return Varchar.

- Usage

```
function Field_Type [Field : Field_Description] return String
```

- Example
-

2.1.16 Field_Value

- Description

Return value of field, if Handle_Nulls is true, Null values will return as empty Strings.

- Usage

```
function Field_Value [RS : Recordset; Field_Number : Natural; Handle_Nulls : Boolean := True] return String
function Field_Value [RS : Recordset; Field_Name : String; Handle_Nulls : Boolean := True] return String
```

- Example
-

2.1.17 Field_Values

- Description

Return map of all values for current row, NULL values are set to an empty String.

- Usage

```
function Field_Values [RS : Recordset] return Gnoga.Types.Data_Map_Type
```

- Example
-

2.1.18 ID_Field_String

- Description

Returns the proper type format for the ID field.

For MySQL = "id INTEGER PRIMARY KEY AUTO_INCREMENT".

For SQLite = "id INTEGER PRIMARY KEY AUTOINCREMENT".

- Usage

```
function ID_Field_String [C : Connection] return String
```

- Example
-

2.1.19 Insert_ID

- Description

Returns the last value assigned to an auto increment field upon insert.

- Usage

```
function Insert_ID [C : Connection] return Natural
```

- Example
-

2.1.20 Is_Null

- Description

Return True if value of field is null.

- Usage

```
function Is_Null [RS : Recordset; Field_Number : Natural] return Boolean  
function Is_Null [RS : Recordset; Field_Name : String] return Boolean
```

- Example
-

2.1.21 Iterate

- Description

- [1] Iterate through all rows in the result set of the query
- [2] Iterate through all rows in the recordset
- [3] Iterate through all rows in the result set of the query
- [4] Iterate through all rows in the recordset

- Usage

- [1] procedure Iterate [C : in out Connection; SQL : in String; Process : not null access procedure [RS : Recordset'Class]]

- [2] procedure Iterate [RS : in out Recordset; Process : not null access procedure [RS : Recordset'Class]]

- [3] procedure Iterate [C : in out Connection; SQL : String; Process : not null access procedure [Row : Gnoga.Types.Data_Map_Type]]

- [4] procedure Iterate [RS : in out Recordset; Process : not null access procedure [Row : Gnoga.Types.Data_Map_Type]]

- Example

2.1.22 List_Of_Tables

- Description

- Return an array of table names

- Usage

- function List_Of_Tables [C : Connection] return Gnoga.Types.Data_Array_Type

- Example

2.1.23 List_Fields_Of_Table

- Description

- Return an array of field names for table.

- Usage

- function List_Fields_Of_Table [C : Connection; Table_Name : String] return Gnoga.-Types.Data_Array_Type

- Example
-

2.1.24 Next

- Description

Go to next row or Go to next row and return true if not End of Recordset.

- Usage

```
procedure Next [RS : in out Recordset]
function Next [RS : in out Recordset] return Boolean
```

- Example
-

2.1.25 Number_Of_Fields

- Description

Return number of fields [columns] in recordset.

- Usage

```
function Number_Of_Fields [RS : Recordset] return Natural
```

- Example
-

2.1.26 Query

- Description

Execute query that returns Recordset.

- Usage

```
function Query [C : Connection; SQL : String] return Recordset'Class
```

- Example
-

2.2 Application, Types, Gui, Server, Client

The Gnoga framework's root package is Gnoga. There are five child packages making up the five areas of Gnoga development.

Gnoga. Application and its children are related to initializing and managing the life cycle of Gnoga applications.

Gnoga. Types contains Gnoga specific types used throughout the framework.

Gnoga. Gui contains the user-interface portions of Gnoga. It is further divided into:

- Gnoga. Gui. Base - Common base functionality and events to all UI objects
- Gnoga. Gui. Document - Binding to root element of DOM in a window
- Gnoga. Gui. Element - General binding to all UI objects
- Gnoga. Gui. Element. Common - Common UI elements
- Gnoga. Gui. Element. Form - Form-related UI elements
- Gnoga. Gui. Element. Canvas - Binding to a drawing canvas
- Gnoga. Gui. Element. Multimedia - Multimedia bindings
- Gnoga. Gui. Element. SVG - SVG canvas binding
- Gnoga. Gui. Location - Browser window location control
- Gnoga. Gui. Navigator - Browser application control
- Gnoga. Gui. Screen - Desktop screen properties
- Gnoga. Gui. View - Layout control of UI elements
- Gnoga. Gui. Window - Control of connection to UI

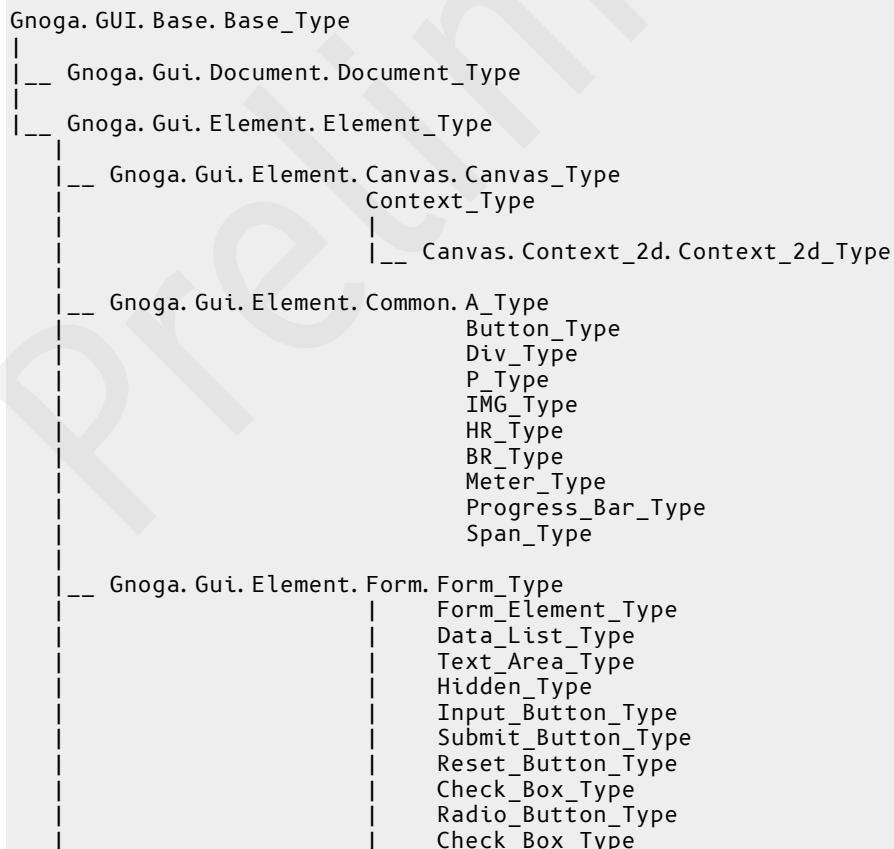
Gnoga. Server - Server side bindings and features

- Gnoga. Server - Application settings and directories
- Gnoga. Server. Connection - Low level control of connection to UI
- Gnoga. Server. Database - Database bindings [MySQL and SQLite3]
- Gnoga. Server. Migration - Database schema migration interface
- Gnoga. Server. Model - Active Record implementation for Database access
- Gnoga. Server. Template_Parser - Template parsing [Python or simple text]

Gnoga. Client - Non GUI client side bindings

- Gnoga. Client. Storage - Local storage on client side
- Gnoga. Client. Bind_Page - Dynamically create Gnoga objects for an HTML page

2.3 Hierarchy for GUI Types



```

| Input_Type
| Text_Type
| Email_Type
| Password_Type
| URL_Type
| Search_Type
| Color_Picker_Type
| Date_Type
| Time_Type
| Month_Type
| Week_Type
| Date_Time_Type
| Date_Time_Local_Type
| Number_Type
| Range_Type
| Label_Type
| Selection_Type
| Option_Type
| Option_Group
| Gnoga.Gui.Element.IFrame.IFrame_Type
| Gnoga.Gui.Element.List.Ordered_List_Type
| Gnoga.Gui.Element.List.Unordered_List_Type
| Gnoga.Gui.Element.List.List_Item_Type
| Gnoga.Gui.Element.List.Definition_List_Type
| Gnoga.Gui.Element.List.Term_Type
| Gnoga.Gui.Element.List.Description_Type
| Gnoga.Gui.Element.Multimedia.Multimedia_Type
| Gnoga.Gui.Element.Multimedia.Audio_Type
| Gnoga.Gui.Element.Multimedia.Video_Type
| Gnoga.Gui.Element.Phrase.Phase_Type [Abbr, Code, Strong, Em, Dfn, Samp,
| Kbd, Var, Marked, Del, Ins, S, Q, Big, Small, Time, Tt, Cite, I, B, U, Sub, Sup]
| Gnoga.Gui.Element.Section.Section_Type [Address, Article, Aside, Header, Main, Nav, P, Pre, Section, BlockQuote, H1, H2, H3, H4, H5, H6, HGroup]
| Gnoga.Gui.Element.Style.Style_Block.Style_Type
| Gnoga.Gui.Element.SVG.SVG_Type
| Gnoga.Gui.Element.Table.Table_Type
| Gnoga.Gui.Element.Table.Table_Row_Type
| Gnoga.Gui.Element.Table.Table_Column_Type
| Gnoga.Gui.Element.Table.Table_Heading_Type
| Gnoga.Gui.Element.Table.Table_Header_Type
| Gnoga.Gui.Element.Table.Table_Body_Type
| Gnoga.Gui.Element.Table.Table_Footer_Type
| Gnoga.Gui.Element.Table.Table_Group_Type
| Gnoga.Gui.Element.Table.Table_Column_Type
| Gnoga.Gui.Location.Location_Type
| Gnoga.Gui.Module - Place holder for 3rd party extensions
| Gnoga.Gui.Navigator
| Gnoga.Gui.Plugin - Place holder for 3rd part JS bindings
| Gnoga.Gui.Plugin.included - Ace_Editor
| Gnoga.Gui.Plugin.included - Boot_Strip
| |
| | Gnoga.Gui.Plugin.included.Container_Type
| | Gnoga.Gui.Plugin.included.Fluid.Container_Type

```

```

    Row_Type
    Jumbotron_Type
    Table_Type
    Form_Group_Type
    Check_Box_Type
    Radio_Button_Type
    jQuery - Additional to Gnoga's use
    jQueryUI - Interactions, Effects, Utilities
    |__ jQueryUI.Widget.Accordian_Type
        jQueryUI Button
        Dialog_Type
        Progress_Bar_Type
        jQueryUI Menu
        jQueryUI Select Menu
        Tabs_Type
        jQueryUI Tool Tips
    MacGap - Native Mac OS X functionality
    __ Gnoga.Gui.Screen
    __ Gnoga.Gui.View.View_Base_Type
        View_Type
        |__ View.Card.Card_View_Type
            Tab_Type
            Tab_Item_Type
        |__ View.Console.Console_View_Type
        |__ View.Docker.Docker_View_Type
    __ Gnoga.Gui.Window.Window_Type

```

2.4 Property and Method Overview

2.4.1 Base_Type

- * Properties
 - Height
 - Width
- * Framework Properties:
 - Buffer_Connection
 - Connection_Data [ro]
 - Connection_ID
 - DOM_Selector [ro]
 - Dynamic
 - ID
 - ID_Type [ro]
 - Parent
 - Unique_ID [ro]
 - Valid [ro]
- * Generic Client Side Access to Properties
 - Property
- * Methods
 - Focus
 - Blur
- * Framework Methods
 - Flush_Buffer
- * Generic Client Side Execution of Methods
 - Execute

2.4.2 Element_Type

All of Base_Type Plus:

```
* Properties - General
- Access_Key
- Advisory_Title
- Class_Name
- Draggable
- Editable
- Inner_HTML
- Outer_HTML [ro]

* Properties - Text Content
- Language_Code
- Tab_Index
- Spell_Check
- Text
- Text_Direction

* Properties - Visibility and Layout
- Hidden
- Visible
- Display
- Clear_Side [wo]
- Layout_Float [wo]
- Overflow
- Overflow_X [wo]
- Overflow_Y [wo]
- Resizable
- Position
- Verticle_Align [wo]
- Box_Sizing
- Z_Index [wo]
- Margin [wo]
- Padding [wo]

* Properties - Position
- Height [from Base_Type]
- Width [from Base_Type]
- Position_Top [ro]
- Position_Left [ro]
- Offset_From_Top [ro]
- Offset_From_Left [ro]
- Left
- Right
- Top
- Bottom
- Box_Height
- Box_Width
- Minimum_Height
- Minimum_Width
- Maximum_Height
- Maximum_Width
- Inner_Height
- Inner_Width
- Outer_Height [ro]
- Outer_Width [ro]
- Outer_Height_To_Margin [ro]
- Outer_Width_To_Margin [ro]
- Client_Width [ro]
- Client_Height [ro]
- Client_Left [ro]
- Client_Top [ro]
- Offset_Width [ro]
- Offset_Height [ro]
- Offset_Left [ro]
- Offset_Top [ro]
```

```

- Scroll_Width [ro]
- Scroll_Height [ro]
- Scroll_Left
- Scroll_Top

* Properties - Style - Color
- Color
- Opacity
- Background_Attachment
- Background_Color
- Background_Image
- Background_Position
- Background_Origin
- Background_Repeat
- Background_Clip
- Background_Size
- Border [wo]
- Border_Radius [wo]
- Shadow [wo] / Shadow_None
- Outline [wo]
- Cursor

* Properties - Style - Text
- Font [wo]
- Text_Alignment [wo]

* Framework Properties:
- Auto_Place
- First_Child
- Next_Sibling
- HTML_Tag [ro]

* Generic Client Side Access to Properties
- Style
- Attribute

* Methods
- Click
- Add_Class
- Remove_Class
- Toggle_Class
- Place_Inside_Top_Of
- Place_Inside_Bottom_Of
- Place_Before
- Place_After
- Remove

```

2.4.3 Events

```

* Object Events
- On_Resize
- On_Scroll

* Form Events
- On_Focus
- On_Blur
- On_Change
- On_Focus_In
- On_Focus_Out
- On_Input
- On_Reset
- On_Search
- On_Select
- On_Submit

* Mouse Events
- On_Click

```

```

- On_Mouse_Click
- On_Mouse_Right_Click
- On_Context_Menu
- On_Double_Click
- On_Mouse_Double_Click
- On_Mouse_Enter
- On_Mouse_Leave
- On_Mouse_Over
- On_Mouse_Out
- On_Mouse_Down
- On_Mouse_Up
- On_Mouse_Move

* Drag and Drop Events
- On_Drag_Start
- On_Drag
- On_Drag_End
- On_Drag_Enter
- On_Drag_Leave
- On_Drop

* Keyboard Events
- On_Character
- On_Wide_Character
- On_Key_Down
- On_Key_Up
- On_Key_Press

* Clipboard Events
- On_Copy
- On_Cut
- On_Paste

* Generic Events
- On_Create
- On_Destroy
- On_Child_Added
- On_Child_Removed
- On_Message

```

3 UXStrings component

3.1 Types

◊ in v22, simply use String type instead of UXStrings.

```

type Encoding_Scheme is [ASCII_7, Latin_1, UTF_8, UTF_16BE, UTF_16LE];
-- Supported encoding schemes

subtype UTF_16_Encoding_Scheme is Encoding_Scheme range UTF_16BE .. UTF_16LE;
-- Supported UTF-16 encoding schemes

subtype ASCII_Character is Ada.Characters.Handling.ISO_646;
subtype ASCII_Character_Array is String with Dynamic_Predicate => [for all Item of
ASCII_Character_Array => Item in ASCII_Character];
-- Characters in ISO/IEC 646

subtype Latin_1_Character is Character;
subtype Latin_1_Character_Array is String;
-- Characters in ISO/IEC 8859-1

subtype BMP_Character is Wide_Character;
subtype BMP_Character_Array is Wide_String;
-- Characters in Unicode Basic Multilingual Plane
-- [Could be also named UCS_2_Character [Universal Coded Character Set]?]

```

```

subtype Unicode_Character is Wide_Wide_Character;
subtype Unicode_Character_Array is Wide_Wide_String;
-- Characters in Unicode planes
-- [Could be also named UCS_4_Character?]

subtype UTF_8_Character_Array is Ada.Strings.UTF_Encoding.UTF_String;
subtype UTF_16_Character_Array is Ada.Strings.UTF_Encoding.UTF_String;
-- Array of 8 bits values representing UTF encodings [UTF-8, UTF-16BE, or UTF-16LE]

type UXString is tagged private with
  Constant_Indexing => Element,
  Iterable => [First => First, Next => Next, Has_Element => Has_Element, Element => Element],
  String_Literal => From_Uncode;
-- Container type of Unicode characters with dynamic size usually named string

Null_UXString : constant UXString;
-- Represent the null string

```

3.2 Functions and procedures

3.2.1 Append

- **Description**

Update Source to the concatenation of Source and New_Item.

- **Usage**

```

procedure Append [Source : in out UXString;
                  New_Item : UXString]

procedure Append [Source : in out UXString;
                  New_Item : Unicode_Character]

```

- **Example**

3.2.2 Character_Set_Version

- **Description**

Returns an implementation-defined identifier that identifies the version of the character set standard that is used for categorizing characters by the implementation.

- **Usage**

```
function Character_Set_Version return UXString
```

- **Example**

3.2.3 Count

- **Description**

Return the number of non overlapping occurrences of Pattern matching Source with respect of Mapping.

Return the number of occurrences of characters in parameter Set matching Source

- **Usage**

```
function Count [Source : UXString;
               Pattern: UXString;
               Mapping : Wide_Wide_Character_Mapping := Identity]
return Natural

function Count [Source : UXString;
               Pattern : UXString;
               Mapping : Wide_Wide_Character_Mapping_Function]
return Natural

function Count [Source : UXString;
               Set : Wide_Wide_Character_Set] return Natural
```

- **Example**

3.2.4 Delete

- **Description**

Return Source whom characters with positions from Low to High are removed.

Update Source whom characters with positions from Low to High are removed

- **Usage**

```
function Delete [Source : UXString;
                 From : Positive; Through : Natural] return UXString

procedure Delete [Source : in out UXString;
                  From : Positive; Through : Natural]
```

- **Example**

3.2.5 Element

- **Description**

Return the Unicode character of Source at Index position

- Usage

```
function Element [Source : UXString; Index : Positive] return Unicode_Character;
```

- Example

3.2.6 Ends_With

- Description

Return True if Source ends with pattern with respect case of sensitivity.

- Usage

```
function Ends_With [Source : UXString; Pattern : UXString; Sensitivity : Case_Sensitivity := Sensitive] return Boolean;
```

- Example

3.2.7 Equal_Case_Insensitive

- Description

Returns True if the strings consist of the same sequence of characters after applying locale-independent simple case folding, as defined by documents referenced in the note in Clause 1 of ISO/IEC 10646:2011. Otherwise, returns False.

- Usage

```
function Equal_Case_Insensitive [Left, Right : UXString] return Boolean
```

- Example

3.2.8 Find_Token

- Description

Set First to position of the first character inside or outside Set matches Source starting at From position. Set Last to position of the last character inside or outside Set matches Source with respect of Test membership

Set First to position of the first character inside or outside Set matches Source. Set Last to position of the last character inside or outside Set matches Source with respect of Test membership.

- Usage

```
procedure Find_Token [Source : UXString;
```

```

        Set : Wide_Wide_Character_Set;
        From : Positive; Test : Membership;
        First : out Positive; Last   : out Natural)

procedure Find_Token [Source : UXString;
        Set : Wide_Wide_Character_Set;
        Test : Membership; First : out Positive;
        Last : out Natural]

```

- Example
-

3.2.9 First

- Description

Return the position of the first character of Source (actually 1).

- Usage

```
function First [Source : UXString] return Positive;
```

- Example
-

3.2.10 From_ASCII

- Description

Return an UXString from the ASCII character Item.

Return an UXString from the array of ASCII characters Source.

- Usage

```
function From_ASCII [Item : ASCII_Character] return UXString
```

```
function From_ASCII [Source : ASCII_Character_Array] return UXString
```

- Example
-

3.2.11 From_BMP

- Description

Return an UXString from the BMP character parameter Item.

Return an UXString from the array of BMP characters parameter Source.

- Usage

```
function From_BMP [Item : BMP_Character] return UXString  
function From_BMP [Source : BMP_Character_Array] return UXString
```

- Example

3.2.12 From_Latin_1

- Description

Return an UXString from the Latin 1 character parameter Item.
Return an UXString from the array of Latin 1 characters parameter Source.

- Usage

```
function From_Latin_1 [Item : Latin_1_Character] return UXString  
function From_Latin_1 [Source : Latin_1_Character_Array] return UXString
```

- Example

3.2.13 From_Unicode

- Description

Return an UXString from the Unicode character parameter Item.
Return an UXString from the array of Unicode characters parameter Source.

- Usage

```
function From_Unicode [Item : Unicode_Character] return UXString  
function From_Unicode [Source : Unicode_Character_Array] return UXString
```

- Example

3.2.14 From_UTF_8

- Description

Return an UXString from the array of UTF-8 characters parameter Source,
leading BOM characters are suppressed if any.

- Usage

```
function From_UTF_8 [Source : UTF_8_Character_Array] return UXString
```

- Example

3.2.15 From_UTF_16

- Description

Return an UXString from the array of UTF-16 characters parameter Source according to the encoding scheme specified by Input_Scheme, leading BOM characters are suppressed if any.

- Usage

```
function From_UTF_16 [Source : UTF_16_Character_Array;
                      Input_Scheme : UTF_16_Encoding_Scheme]
return UXString
```

- Example

3.2.16 Get_ASCII

- Description

Return the ASCII character of Source at Index position, if the character is not in ASCII set then Substitute is returned

- Usage

```
Q_L : Latin_1_Character renames Ada.Characters.Latin_1.Question

function Get_ASCII [Source : UXString;
                     Index : Positive;
                     Substitute : in ASCII_Character := Q_L]
return ASCII_Character
```

- Example

3.2.17 Get_BMP

- Description

Return the BMP character from Source at Index position, if the character is not in BMP set then Substitute is returned.

- Usage

```
Inv_Q_B : BMP_Character renames Ada.Characters.Wide_Latin_1.Inverted_
_Question

function Get_BMP [Source : UXString;
                  Index : Positive;
                  Substitute : in BMP_Character := Inv_Q_B]
return BMP_Character
```

- Example

3.2.18 Get_Latin_1

- Description

Return the Latin 1 character from Source at Index position, if the character is not in latin 1 set then Substitute is returned.

- Usage

```
Inv_Q_L : Latin_1_Character renames Ada.Characters.Latin_1.Inverted_-
Question

function Get_Latin_1 [Source : UXString;
                     Index : Positive;
                     Substitute : in Latin_1_Character := Inv_Q_L]
return Latin_1_Character
```

- Example

3.2.19 Get_Unicode

- Description

Return the Unicode character from Source at Index position.

- Usage

```
function Get_Unicode [Source : UXString;
                      Index : Positive] return Unicode_Character
```

- Example

3.2.20 Has_Element

- **Description**

Return True if a character of Source is present at Index position [actually Index <= Length [Source]].

- **Usage**

```
function Has_Element [Source : UXString;
                      Index : Positive] return Boolean
```

- **Example**

3.2.21 Head

- **Description**

Return the first characters from Source up to Count concatenated with Pad characters if needed.

Update Source to the first characters from Source up to Count concatenated with Pad characters if needed.

- **Usage**

```
function Head [Source : UXString;
               Count : Natural;
               Pad : Unicode_Character := Wide_Wide_Space]
return UXString

procedure Head [Source : in out UXString;
                Count : Natural;
                Pad : Unicode_Character := Wide_Wide_Space]
```

- **Example**

3.2.22 Index

- **Description**

[1] Return the position of the first character where Pattern matches Source with respect of Going direction and Mapping

[2] Return the position of the first character where Pattern matches Source with respect of Going direction and Mapping.

[3] Return the position of the first character inside or outside Set matches Source with respect of Going direction and Test membership.

[4] Return the position of the first character where Pattern matches Source starting at From position with respect of Going direction and Mapping.

[5] Return the position of the first character where Pattern matches Source starting at From position with respect of Going direction and Mapping.

[6] Return the position of the first character inside or outside Set matches Source starting at From position with respect of Test membership.

- Usage

```
[1] function Index [Source : UXString; Pattern : UXString;
                  Going : Direction := Forward;
                  Mapping : Wide_Wide_Character_Mapping := Identity]
return Natural

[2] function Index [Source : UXString;
                  Pattern : UXString;
                  Going : Direction := Forward;
                  Mapping : Wide_Wide_Character_Mapping_Function]
return Natural

[3] function Index [Source : UXString;
                  Set : Wide_Wide_Character_Set;
                  Test : Membership := Inside;
                  Going : Direction := Forward]
return Natural

[4] function Index [Source : UXString;
                  Pattern : UXString; From : Positive;
                  Going : Direction := Forward;
                  Mapping : Wide_Wide_Character_Mapping := Identity]
return Natural

[5] function Index [Source : UXString;
                  Pattern : UXString;
                  From : Positive;
                  Going : Direction := Forward;
                  Mapping : Wide_Wide_Character_Mapping_Function]
return Natural

[6] function Index [Source : UXString;
                  Set : Wide_Wide_Character_Set;
                  From : Positive
                  Test : Membership := Inside;
                  Going : Direction := Forward]
return Natural;

With Ada.Strings - Direction is [Forward, Backward]
type Alignment is [Left, Right, Center]
type Truncation is [Left, Right, Error]
type Membership is [Inside, Outside]
type Trim_End is [Left, Right, Both]
```

- Example

3.2.23 Index_Non_Bank

- **Description**

Return the position of the first non space character of Source with respect of Going direction.

Return the position of the first non space character of Source starting at From position with respect of Going direction.

- **Usage**

```
function Index_Non_Bank [Source : UXString;
                           Going : Direction := Forward] return Natural

function Index_Non_Bank [Source : UXString;
                           From : Positive;
                           Going : Direction := Forward] return Natural
```

- **Example**

3.2.24 Insert

- **Description**

Return Source with New_Item inserted at position ahead of parameter Before.
Update Source with New_Item inserted at position ahead of parameter Before.

- **Usage**

```
function Insert [Source : UXString;
                  Before : Positive;
                  New_Item : UXString] return UXString

procedure Insert [Source : in out UXString;
                  Before : Positive; New_Item : UXString]
```

- **Example**

3.2.25 Is_ASCII, Is_ISO_646

- **Description**

Return True if all the characters of Source are in ASCII set.

Return True if the character of Source at Index position is in ASCII set.

- **Usage**

```
function Is_ASCII [Source : UXString] return Boolean
```

```
function Is_ASCII [Source : UXString; Index : Positive] return Boolean  
function Is_ISO_646 [Item : UXString] return Boolean renames Is_ASCII
```

- Example

3.2.26 Is_Basic

- Description

Return True if source is basic [with no diacritical mark].

- Usage

```
function Is_Basic [Source : UXString] return Boolean
```

- Example

3.2.27 Is_BMP

- Description

Return True if all the characters of Source are in BMP set.

Return True if the character of Source at Index position is in BMP set.

- Usage

```
function Is_BMP [Source : UXString] return Boolean  
function Is_BMP [Source : UXString; Index : Positive] return Boolean
```

- Example

3.2.28 Is_Empty

- Description

Return True if Source is empty [equal to Null_UXString].

- Usage

```
function Is_Empty [Source : UXString] return Boolean
```

- Example

3.2.29 Is_Latin_1

- Description

Return True if all the characters of Source are in Latin 1 set.

Return True if the character of Source at Index position is in Latin 1 set.

- Usage

```
Inv_Q_L : Latin_1_Character renames Ada.Characters.Latin_1.Inverted_Question;
```

```
function Is_Latin_1 [Source : UXString] return Boolean
```

```
function Is_Latin_1 [Source : UXString; Index : Positive] return Boolean
```

- Example

3.2.30 Is_Lower

- Description

Return True if Source is lowercase.

- Usage

```
function Is_Lower [Source : UXString] return Boolean
```

- Example

3.2.31 Is_Unicode

- Description

Return True if all the characters of Source are in Unicode set [actually True].

Return True if the character of Source at Index position is in Unicode set [actually True].

- Usage

```
function Is_Unicode [Source : UXString] return Boolean
```

```
function Is_Unicode [Source : UXString; Index : Positive] return Boolean
```

- Example

3.2.32 Is_Upper

- Description

Return True if Source is lowercase.

- Usage

```
function Is_Upper [Source : UXString] return Boolean;
```

- Example

3.2.33 Last

- Description

Return the position of the last character of Source (actually Length [Source]).

- Usage

```
function Last [Source : UXString] return Natural;
```

- Example

3.2.34 Length

- Description

Return the number of [Unicode] characters.

- Usage

```
function Length [Source : UXString] return Natural;
```

- Example

3.2.35 Less_Case_Insensitive

- Description

Performs a lexicographic comparison of strings Left and Right, converted to lower case.

- Usage

```
function Less_Case_Insensitive [Left, Right : UXString] return Boolean;
```

- Example
-

3.2.36 Next

- Description

Return the position of the next character of Source after Index position (actually Index + 1).

- Usage

```
function Next [Source : UXString; Index : Positive] return Positive  
procedure Next [Source : UXString; Index : in out Positive]
```

- Example
-

3.2.37 Overwrite

- Description

Return Source whom characters starting at Position are replaced with parameter New_Item

Update Source whom characters starting at Position are replaced with parameter New_Item

- Usage

```
function Overwrite [Source : UXString;  
                    Position : Positive;  
                    New_Item : UXString] return UXString  
procedure Overwrite [Source : in out UXString;  
                      Position : Positive;  
                      New_Item : UXString]
```

- Example
-

3.2.38 Prepend

- Description

Update Source to the concatenation of New_Item and Source

- Usage

```
procedure Prepend [Source : in out UXString;  
                   New_Item : UXString]
```

```
procedure Prepend [Source : in out UXString;  
                   New_Item : Unicode_Character]
```

- Example

3.2.39 Remove

- Description

[1] Return Source where every occurrence of Pattern have been removed with respect of case sensitivity.

[2] Update Source where every occurrence of Pattern have been removed with respect of case sensitivity.

[3] Return Source where every occurrence of Pattern have been removed with respect of case sensitivity.

[4] Update Source where every occurrence of Pattern have been removed with respect of case sensitivity.

- Usage

```
[1] function Remove [Source : UXString; Pattern : Unicode_Character; Sen-  
sitivity : Case_Sensitivity := Sensitive] return UXString
```

```
[2] procedure Remove [Source : in out UXString; Pattern : Unicode_Charac-  
ter; Sensitivity : Case_Sensitivity := Sensitive]
```

```
[3] function Remove [Source : UXString; Pattern : UXString; Sensitivity :  
Case_Sensitivity := Sensitive] return UXString
```

```
[4] procedure Remove [Source : in out UXString; Pattern : UXString; Sen-  
sitivity : Case_Sensitivity := Sensitive]
```

- Example

3.2.40 Replace

- Description

[1] Return a string which has had the before character replaced with the after character wherever the before character is found with respect of sensitivity.

[2] Update Source which has had the before character replaced with the after character wherever the before character is found with respect of sensitivity.

[3] Return a string which has had the before text replaced with the after text wherever the before text is found with respect of sensitivity.

[4] Update Source which has had the before text replaced with the after text wherever the before text is found with respect of case sensitivity

- Usage

```
[1] function Replace [Source : UXString; Before, After : Unicode_Character; Sensitivity : Case_Sensitivity := Sensitive] return UXString
```

```
[2] procedure Replace [Source : in out UXString; Before, After : Unicode_Character; Sensitivity : Case_Sensitivity := Sensitive]
```

```
[3] function Replace [Source : UXString; Before, After : UXString; Sensitivity : Case_Sensitivity := Sensitive] return UXString
```

```
[4] procedure Replace [Source : in out UXString; Before, After : UXString; Sensitivity : Case_Sensitivity := Sensitive]
```

- Example

3.2.41 Replace_ASCII

- Description

Update Source such as the character at Index position is set to the ASCII character parameter By.

- Usage

```
procedure Replace_ASCII [Source : in out UXString;
                        Index : Positive;
                        By : ASCII_Character]
```

- Example

3.2.42 Replace_Latin_1

- Description

Update Source such as the character at Index position is set to the Latin 1 character parameter By.

- Usage

```
procedure Replace_Latin_1 [Source : in out UXString;
                           Index : Positive;
                           By : Latin_1_Character]
```

- Example

3.2.43 Replace_BMP

- Description

Update Source such as the character at Index position is set to the BMP character parameter By.

- Usage

```
procedure Replace_BMP [Source : in out UXString;
                      Index : Positive;
                      By : BMP_Character]
```

- Example

3.2.44 Replace_Slice

- Description

Return Source whom characters with positions from Low to High are replaced with parameter By.

Update Source whom characters with positions from Low to High are replaced with parameter By.

- Usage

```
function Replace_Slice [Source : UXString;
                       Low : Positive;
                       High : Natural;
                       By : UXString] return UXString

procedure Replace_Slice [Source : in out UXString;
                        Low : Positive;
                        High : Natural;
                        By : UXString]
```

- Example

3.2.45 Replace_Unicode

- Description

Update Source such as the character at Index position is set to the Unicode character parameter By.

- Usage

```
procedure Replace_Unicode [Source : in out UXString;
                           Index : Positive;
                           By : Unicode_Character];
```

- Example

3.2.46 Set

- Description

Set Target to an UXString from the array of Unicode characters parameter Source.

- Usage

```
procedure Set [Target : out UXString; Source : Unicode_Character_Array]
```

- Example

3.2.47 Slice

- Description

Return the slice at positions Low through High from Source.

Set Target to the slice at positions Low through High from Source.

- Usage

```
function Slice [Source : UXString;
                Low : Positive;
                High : Natural] return UXString

procedure Slice [Source : UXString;
                 Target : out UXString;
                 Low : Positive;
                 High : Natural]
```

- Example

3.2.48 Split

- Description

[1] Return a string list resulting in splitting Source into substrings wherever Separator occurs.

[2] Return a string list resulting in splitting Source into substrings wherever Separator occurs.

[3] Return a string list resulting in splitting Source into substrings wherever Separator occurs with respect of Test membership.

- Usage

```
[1] function Split [Source : UXString; Separator : Unicode_Character;
Sensitivity : Case_Sensitivity := Sensitive] return UXStrings.Lists.UXString_List

[2] function Split [Source : UXString; Separator : UXString;
Sensitivity : Case_Sensitivity := Sensitive] return UXStrings.Lists.UXString_List

[3] function Split [Source : UXString; Separator : Wide_Wide_Character_Set;
Test : Membership := Inside] return UXStrings.Lists.UXString_List
```

- Example

3.2.49 Tail

- Description

Return the last characters from Source up to Count concatenated with Pad characters if needed

Update Source to the last characters from Source up to Count concatenated with Pad characters if needed

- Usage

```
function Tail [Source : UXString;
              Count : Natural;
              Pad : Unicode_Character := Wide_Wide_Space]
return UXString

procedure Tail [Source : in out UXString;
                Count : Natural;
                Pad : Unicode_Character := Wide_Wide_Space]
```

- Example

3.2.50 To_ASCII, To_ISO_646

- Description

Return an array of ASCII characters from Source, if a character is not in ASCII set then Substitute is returned.

- Usage

```
Q_L : Latin_1_Character renames Ada.Characters.Latin_1.Question  
  
function To_ASCII [Source : UXString;  
                  Substitute : in ASCII_Character := Q_L]  
return ASCII_Character_Array  
  
function To_ISO_646 [Item : UXString;  
                     Substitute : Ada.Characters.Handling.ISO_646 := Q_L]  
return ASCII_Character_Array renames To_ASCII
```

- Example

3.2.51 To_Basic

- Description

Returns the letter corresponding to Item but with no diacritical mark, if Item is a letter but not a basic letter; returns Item otherwise.

- Usage

```
function To_Basic [Item : UXString] return UXString
```

- Example

3.2.52 To_BMP

- Description

Return an array of BMP characters from Source, if a character is not in BMP set then Substitute is returned.

- Usage

```
Inv_Q_B : BMP_Character renames Ada.Characters.Wide_Latin_1.Inverted_-  
Question  
  
function To_BMP [Source : UXString;  
                 Substitute : in BMP_Character := Inv_Q_B]  
return BMP_Character_Array
```

3.2.53 To_Latin_1

- **Description**

Return an array of Latin 1 characters from Source, if a character is not in latin 1 set then Substitute is returned.

- **Usage**

```
Inv_Q_L : Latin_1_Character renames Ada.Characters.Latin_1.Inverted_-  
Question  
  
function To_Latin_1 [Source : UXString;  
                     Substitute : in Latin_1_Character := Inv_Q_L]  
return Latin_1_Character_Array
```

- **Example**

3.2.54 To_Lower

- **Description**

Returns the corresponding lower-case value for Item if Is_Upper[Item], and returns Item otherwise.

- **Usage**

```
function To_Lower [Item : UXString] return UXString
```

- **Example**

3.2.55 To_Uncode

- **Description**

Return an array of Unicode characters from Source.

- **Usage**

```
function To_Uncode [Source : UXString] return Unicode_Character_Array
```

- **Example**

3.2.56 To_Upper

- Description

Returns the corresponding upper-case value for Item if Is_Lower[Item] and Item has an upper-case form, and returns Item otherwise.

- Usage

```
function To_Upper [Item : UXString] return UXString
```

- Example

```
-----
```

3.2.57 To_UTF_8

- Description

Return an array of UTF-8 characters from Source, prepend UTF-8 BOM if Output_BOM is set to True.

- Usage

```
function To_UTF_8 [Source : UXString;
                  Output_BOM : Boolean := False]
return UTF_8_Character_Array
```

```
-----
```

3.2.58 To_UTF_16

- Description

Return an array of UTF-16 characters from Source according to the encoding scheme specified by Output_Scheme, prepend UTF-16 BOM if Output_BOM is set to True.

- Usage

```
function To_UTF_16 [Source : UXString;
                   Output_Scheme : UTF_16_Encoding_Scheme;
                   Output_BOM : Boolean := False]
return UTF_16_Character_Array
```

- Example

3.2.59 Translate

- Description

Return Source updated with respect of Mapping.

Update Source with respect of Mapping.

Return Source updated with respect of Mapping

Update Source with respect of Mapping

- Usage

```
function Translate [Source : UXString;
                    Mapping : Wide_Wide_Character_Mapping]
return UXString

procedure Translate [Source : in out UXString;
                     Mapping : Wide_Wide_Character_Mapping]

function Translate [Source : UXString;
                    Mapping: Wide_Wide_Character_Mapping_Function]
return UXString

procedure Translate [Source : in out UXString;
                     Mapping : Wide_Wide_Character_Mapping_Function]
```

3.2.60 Trim

- Description

Return Source with Space characters removed from left, right or both with respect of Side.

Update Source with Space characters removed from left, right or both with respect of Side.

Return Source with leading characters in Left and trailing characters in Right removed

Update Source with leading characters in Left and trailing characters in Right removed

- Usage

```
function Trim [Source : UXString; Side : Trim_End] return UXString

procedure Trim [Source : in out UXString; Side : Trim_End]

function Trim [Source : UXString;
              Left : Wide_Wide_Character_Set;
              Right : Wide_Wide_Character_Set] return UXString

procedure Trim [Source : in out UXString;
              Left : Wide_Wide_Character_Set;
              Right : Wide_Wide_Character_Set]

With Ada.Strings - type Trim_End is [Left, Right, Both]
```

- Example
-

3.2.61 &

- Description

Return the concatenation of Left and Right.

- Usage

```
function "&" [Left : UXString; Right : UXString] return UXString  
  
function "&" [Left : UXString;  
              Right : Unicode_Character] return UXString  
  
function "&" [Left : Unicode_Character;  
              Right : UXString] return UXString
```

- Example
-

3.2.62 *

- Description

Return Right string duplicated Left times

Return Right character duplicated Left times

- Usage

```
function "*" [Left : Natural; Right : UXString] return UXString  
  
function "*" [Left : Natural; Right : Unicode_Character] return UXString
```

- Example
-

3.2.63 =

- Description

Return True if Left equals Right.

- Usage

```
function "=" [Left : UXString; Right : UXString] return Boolean
```

- Example
-

3.2.64 <

- Description

Return True if Left is less than Right.

- Usage

```
function "<" [Left : UXString; Right : UXString] return Boolean
```

- Example
-

3.2.65 <=

- Description

Return True if Left is less or equal than Right.

- Usage

```
function "<=" [Left : UXString; Right : UXString] return Boolean
```

- Example
-

3.2.66 >

- Description

Return True if Left is greater than Right.

- Usage

```
function ">" [Left : UXString; Right : UXString] return Boolean
```

- Example
-

3.2.67 >=

- Description

Return True if Left greater or equal than Right.

- Usage

```
function ">=" [Left : UXString; Right : UXString] return Boolean
```

- Example
-

Preliminary

<https://this-page-intentionally-left-blank.org>

v22 Ada Framework User Manual



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FAQ

With the Wildebeest and the Penguin, there's no Bull.
Number Six



1 Constants

1.1 ANSI colors for console

This constants conforms to ISO 6429 standard :

```
CONSOLE_COLOR_GREEN  : constant String := ESC & "[1; 32m";
CONSOLE_COLOR_RED   : constant String := ESC & "[1; 31m";
CONSOLE_COLOR_YELLOW : constant String := ESC & "[1; 33m";
CONSOLE_COLOR_RESET  : constant String := ESC & "[0m";
```

1.2 Control characters

Common control characters :

```
HT  : constant String := Character' Val[9]  & ""; -- 09d 09h Tab
LF  : constant String := Character' Val[10] & ""; -- 10d 0Ah Line Feed
CR  : constant String := Character' Val[13] & ""; -- 13d 0Dh Carriage return
ESC : constant String := Character' Val[27] & ""; -- 27d 1Bh Escape
DQ  : constant String := Character' Val[34] & ""; -- 34d 22h Double quote
CRLF : constant String := CR & LF;
```

1.3 Delimiter characters

V22 conventional delimiter characters :

```
ND : constant String := "~"; -- 126d 7Eh Name/value delimiter
CD : constant String := "^"; -- 94d 5Eh Column delimiter
RD : constant String := "\"; -- 92d 5Ch Row delimiter
VD : constant String := ","; -- 44d 2Ch Virgule [comma] delimiter
SD : constant String := ":"; -- 58d 3Ah String delimiter
SP : constant String := " "; -- 32d 20h Space
```

⇒ Some of these delimiters are heavily used in the v20.Vst.Field_* functions.

1.4 Flag files

Useful names for testing mounts or install completed :

```
ACCESS_OK : constant String := "access_ok_dont_delete_this_file";
INSTALL_OK : constant String := "install_ok_dont_delete_this_file";
```

1.5 Redirection

Output redirections for standard and error outputs.

```
STD_OUT_REDIRECT : constant String := " 1>/dev/null";
ERR_OUT_REDIRECT : constant String := " 2>/dev/null";
STD_ERR_OUT_REDIRECT : constant String := " 2>/dev/null 1>/dev/null";
```

2 Conventional exit codes

- 1 -h or --help switches
- 2 invalid switch
- 3 invalid parameter
- 4 SQL error
- 5 reserved for future use
- 6 reserved for future use
- 7 reserved for future use
- 8 reserved for future use
- 9 if an exception occurs during execution

Exit codes greater than 9 are reserved to applications using v22. Typically, an application may use a base exit code by class command with local increment. Example: exit code for command "service backup" [backup being the first command of class service] could be Base_Exit_Code_Service + 1 :

```
Base_Exit_Code_App :      constant Positive := 10;
Base_Exit_Code_Cluster :   constant Positive := 20;
Base_Exit_Code_Db :        constant Positive := 30;
Base_Exit_Code_Domain:    constant Positive := 40;
Base_Exit_Code_Group :    constant Positive := 50;
Base_Exit_Code_Help :     constant Positive := 60;
Base_Exit_Code_Instance : constant Positive := 70;
Base_Exit_Code_Info :     constant Positive := 80;
Base_Exit_Code_Ip :       constant Positive := 90;
Base_Exit_Code_Node :     constant Positive := 100;
Base_Exit_Code_Owner :    constant Positive := 110;
Base_Exit_Code_Remote :   constant Positive := 120;
Base_Exit_Code_Service :  constant Positive := 130;
Base_Exit_Code_User :    constant Positive := 140;
```

3 Converting reminder

3.1 Converting Integer to String with Character'Val and Integer'Image

65 is ASCII code for 'A' :

```

Tio.Put_Line [Integer' Image (65)];
The string "65"

Tio.Put_Line [Character' Val(65)];
The string "A"

```

3.2 Converting a character to its ASCII value

65 is ASCII code for 'A' :

```

Tio.Put_Line [Character' Pos(' A' )];
The string "65"

```

3.3 Converting String from and to Long_Integer

```

procedure Test is

    Test_String : String := "";
    Test_Long_Integer : Long_Integer := 10737418240;

begin

    Test_String := To_String (Test_Long_Integer); -- Test_Long_Integer'Image
    Msg.Std (Test_String);

    Msg.Std (Test_Long_Integer);

    -- Non qualified expression conversion
    Test_Long_Integer := Long_Integer'Value ("10737418240");

    -- Qualified expression conversion
    Test_Long_Integer := Long_Integer'Value [String' ("10737418240")];

end Test;

```

4 Gnoga component

4.1 Callstack to display text

Simplified pathway to display a simple text:

```

TestGui
    Gui.Content_Set_Title [Object, "User Help Title"];
    Gui.Content_Set_Text [Object, "This is the help text"];
|
V

v22. Gui

    procedure Content_Set_Title [Object : in out GGB.Base_Type'Class; Ti-
tle : String] is
        App : constant App_Access := App_Access [Object.Connection_Data];
    begin
        App.Content_Header.Text [Title];
    end Content_Set_Title;

```

```

procedure Content_Set_Text [Object : in out GGB.Base_Type'Class;
Text : String] is
    App : constant App_Access := App_Access [Object.Connection_Data];
begin
    App.Content_Text.Text [Text];
end Content_Set_Text;
|
V

Gnoga.Gui.View
Content_Text : aliased GGV.View_Type;
|
V

Gnoga.Gui.Element [968]

procedure Text [Element : in out Element_Type; Value : in String] is
begin
    Element.jQuery_Execute ["text ' " & Escape_Quotes [Value] & " ' ]; "
end Text;

```

4.2 Gnoga tips

From <https://github.com/alire-project/gnoga/blob/master/TIPS.md>

Many tips will be found also in source code specification for types and subprograms.

4.2.1 Want to take an HTML snapshot of your page

```
Gnoga.Server.Template_Parser.Write_String_To_File ("site.html", Main_Window.Document.Document_Element.Outer_HTML);
```

4.2.2 Hidden and remove

Use View.Hidden to remove from browser, then View.Remove to remove from DOM. When View finalizes on the Ada side it will also tell the browser to reclaim the elements memory as well.

4.2.3 Add scrollbars

```
View.Overflow or View.Overflow_X or View.Overflow_Y with Visible, Hidden, Scroll, Auto.
```

4.2.4 Best results with the Grid view

When using the Grid view you always get best results when placing Views in to the grids instead of using the individual cell directly. When encapsulating what you want in to another container [especially if its size is known] will get a more predictable layout of the underlying table.

4.2.5 Gnoga side memory leaks

If I create an object dynamically and add it to the DOM via create on a parent. If I later free that object manually and replace it with a newly created version [still set to dynamic], does that cause any memory leaks?

If you free the memory Ada's runtime will finalize the object which will remove any references to it in the Gnoga cache on the browser side. If you leaving "dangling pointer" on the Ada side you will of course have a leak. [Unless of course they were marked dynamic before creation and so the parent Gnoga view has a reference and will deallocate it when it finalizes]

4.2.6 Browser side memory

Does the DOM remember every object I add to a parent or will freeing it remove it completely from the DOM? On the browser side elements created by the Gnoga framework have a reference in a global cache called gnoga[]. When the Gnoga object on the Ada side is finalized, the reference in the cache is removed. As long as that element is not in the DOM, the browser will release the object's memory as part of its garbage collection on the browser side.

4.2.7 Using Dynamic

Would something like this cause any problems [memory leak or otherwise]? If you are using dynamic you shouldn't be deallocating manually. If you do then when the garbage collection starts with App.Console is finalized it will try to deallocate already deallocated blocks of memory. Unless you have extreme memory constraints, just overwrite the pointer since the parent view will take care of things or do not use dynamic and deallocate on connection close.

4.2.8 Raw JS execution

Use Gnoga.Server.Connection.Execute_Script for raw JS execution [there is both a procedure and function version]. You can get the Connection ID from any object on a connection [View.Connection_ID, etc].

4.2.9 Define window Title and the closed connection message

To define at connection time the window Title and the closed connection message use Main_Window.Document.Title and Gnoga.Server.Connection.HTML_On_Close.

4.2.10 Don't use Unrestricted_Access

In general if you find yourself needing to use Unrestricted_Access you are likely going to have issues. For the "tutorials" it was used since it was wanted to keep everything to a single procedure, etc. but perhaps was not the smartest thing to have laying around. Try and keep handlers at package level when possible is a good principle to live by.

4.2.11 Get a hold on a child element, on the gnoga side, knowing its ID?

```
My_Button.Attach_Using_Parent [View, ID => "my_button"];
```

4.2.12 Setting any callbacks to null before deleting visual elements

That would remove any race conditions.

4.2.13 Prevent the user to close the browser window

There is no way to prevent the user to close the browser window.

4.2.14 Knowing what row the submit button was on

An On_Submit_Handler is set in the table widget. It gets called for the submit buttons. How to access anything in the handler that lets me know what row the submit button was on and how to access the view data structure for the row?

You will need to add an On_Focus handler to the forms, you can write a single handler and just attach to all the widgets. Have it store the ID or a pointer to the last focused widget. The browser doesn't store or report the focus so no other way to get it.

4.2.15 Remove first, then release it

Just freeing an object on the Gnoga side will not remove it from the DOM, that is intended. You need to call Remove first.

4.2.16 Avoid flickering

To avoid two visual elements to disappear and then reappear, somewhat slowly and flickering. Create visual element that is hidden. Fill it in. Hide first and show second. Can either delete the old one or recycle it.

4.2.17 Colors

Colors in Gnoga.Types.Colors can be displayed or chosen from www.w3schools.com/cssref/css_colors.asp or www.w3schools.com/colors/colors_picker.asp.

4.2.18 Use browser console

Want to see what is going on in the browser console ? Turn debug on in your boot page `<script>var gnoga_debug = true;</script>` or use `debug.html`.

4.2.19 Proper use of know what row the submit button was on

Trying to use Connection_Data in a handler bounded to On_Destroy_Handler did not work when closing the browser window because at that point Object.Connection_Data returns null. Use instead On_Before_Unload_Handler. Note: it is not effective when only closing the connection.

4.2.20 How about reloading the whole page when On_Resize is called?

Call Main_Window.Location.Reload.

4.2.21 The browser refresh button case

If the user clicks the refresh button on the browser, it breaks the connection and creates a new one. This is extremely annoying, since the program starts over from scratch. Refresh implies a lost connection and new session on web browsers, that is expected functionality. Local storage could be used on the browser side [Gnoga.Client.Storage] to store session information or any other data on the client side and use that data after a refresh or even weeks later to restore them to some state in your software.

4.2.22 Display text when connection is closed

HTML_On_Close text is displayed only when connection is broken and not when connection is closed. In order to display some text before closing connection, remove current view, create a new one with your text and then close connection, for instance:
App.My_View.Remove; View.Create [App.My_Window.all];
View.Put_Line ("Application exited.");
App.My_Window.Close_Connection;

4.2.23 Generate Gnoga Api documentation

You want to browse through Gnoga API, generate them with gnatdoc: \$ make rm-docs
\$ open docs/html/gnoga_rm/index.html or, in GnatStudio, just use : Analyse > Documentation > Generate Project.

4.2.24 Gnoga makefile usage

Command "make" alone or "make help" prints main make targets and make environment variables.

4.2.25 How to create a button of a specified size?

Button.Create [Parent => Parent, Content => Content]; creates a button of the default size for Content, with a thin border with rounded corners. Adding

Button.Box_Width [Value => Button_Size]; Button.Box_Height [Value => Button_Size]; has no effect. But also adding Button.Border; results in a button of the desired size, with a fairly thick, black border with square corners. Adding [Width => "thin"] to the call to Border may be desirable.

4.2.26 How do I add a class attribute to an element in code?

Use the class property: Gnoga.Gui.Element.Class, which replaces all class with the value of Class or the method Gnoga.Gui.Element.Add_Class which will add a class but not remove other classes that may already apply to the element.

4.2.27 Latency

Take care of latency, many subprograms do query the client side and wait for an answer, so they can be very slow if server and client are far from each other!

4.3 Icons making

Go to website <https://fonts.google.com/icons>

Settings:

- Fill = on
- Optical size = 48px

Clic on icon "x", download it in SVG, a vector size independent format, as x.svg
Repeat as needed

When finished, run ./cv [see below] in the download directory to convert theses svg icons in the proper v22 icon format (png, 128x128 px, transparent and negative):

```

Color: #ffffff
Size: 128x128
Density: 1200

Convert apps.svg > apps.png
Convert browse_activity.svg > browse_activity.png
Convert dataset.svg > dataset.png
Convert event_list.svg > event_list.png
Convert group.svg > group.png
Convert indeterminate_check_box.svg > indeterminate_check_box.png
Convert local_convenience_store.svg > local_convenience_store.png
Convert person.svg > person.png
Convert point_of_sale.svg > point_of_sale.png
Convert query_stats.svg > query_stats.png
Convert settings_account_box.svg > settings_account_box.png
Convert settings.svg > settings.png
Convert whatshot.svg > whatshot.png

```

- cv file

```

#!/bin/env bash

color="#ffffff"
size=128
density=1200

echo ""
echo "Color: $color"
echo "Size: ${size}x${size}"
echo "Density: $density"
echo ""

files="./*.svg"
for file in $files
do
    output="${file##*/}" # delete residual path [./]
    output="${output%.*}" # delete extension [.svg]
    echo "Convert $output.svg > $output.png"
    convert -background none -density $density -resize "$size"x"$size" $file /tmp/output.png
    convert /tmp/output.png +level-colors $color, /tmp/output.png
    convert /tmp/output.png -fill $color -opaque white ico-$output.png
done

# eof

```

4.4 Events sorted by packages

From Pascal [Blady] document “Premiers pas avec Gnoga”.

| Events | Packages | Lines |
|----------------------|-------------------------------------|--------------|
| On_Connect_Handler | gnoga-application-multi_connect.ads | 74 |
| On_Resize_Handler | gnoga-gui-base.ads | 345 |
| On_Scroll_Handler | gnoga-gui-base.ads | 350 |
| On_Focus_Handler | gnoga-gui-base.ads | 357 |
| On_Blur_Handler | gnoga-gui-base.ads | 362 |
| On_Change_Handler | gnoga-gui-base.ads | 367 |
| On_Focus_In_Handler | gnoga-gui-base.ads | 371 |
| On_Focus_Out_Handler | gnoga-gui-base.ads | 375 |
| On_Input_Handler | gnoga-gui-base.ads | 379 |
| On_Reset_Handler | gnoga-gui-base.ads | 383 |
| On_Search_Handler | gnoga-gui-base.ads | 390 |
| On_Select_Handler | gnoga-gui-base.ads | 394 |
| On_Submit_Handler | gnoga-gui-base.ads | 398 |

| Events | Packages | Lines |
|-------------------------------|--------------------------------------|--------------|
| On_Click_Handler | gnoga-gui-base.ads | 407 |
| On_Mouse_Click_Handler | gnoga-gui-base.ads | 412 |
| On_Context_Menu_Handler | gnoga-gui-base.ads | 418 |
| On_Mouse_Right_Click_Handler | gnoga-gui-base.ads | 423 |
| On_Double_Click_Handler | gnoga-gui-base.ads | 429 |
| On_Mouse_Double_Click_Handler | gnoga-gui-base.ads | 434 |
| On_Mouse_Enter_Handler | gnoga-gui-base.ads | 440 |
| On_Mouse_Leave_Handler | gnoga-gui-base.ads | 445 |
| On_Mouse_Over_Handler | gnoga-gui-base.ads | 450 |
| On_Mouse_Out_Handler | gnoga-gui-base.ads | 455 |
| On_Mouse_Down_Handler | gnoga-gui-base.ads | 460 |
| On_Mouse_Up_Handler | gnoga-gui-base.ads | 466 |
| On_Mouse_Move_Handler | gnoga-gui-base.ads | 472 |
| On_Drag_Start_Handler | gnoga-gui-base.ads | 480 |
| On_Drag_Handler | gnoga-gui-base.ads | 489 |
| On_Drag_End_Handler | gnoga-gui-base.ads | 493 |
| On_Drag_Enter_Handler | gnoga-gui-base.ads | 497 |
| On_Drag_Leave_Handler | gnoga-gui-base.ads | 501 |
| On_Drop_Handler | gnoga-gui-base.ads | 505 |
| On_Character_Handler | gnoga-gui-base.ads | 516 |
| On_Wide_Character_Handler | gnoga-gui-base.ads | 521 |
| On_Key_Down_Handler | gnoga-gui-base.ads | 526 |
| On_Key_Up_Handler | gnoga-gui-base.ads | 531 |
| On_Key_Press_Handler | gnoga-gui-base.ads | 536 |
| On_Copy_Handler | gnoga-gui-base.ads | 543 |
| On_Cut_Handler | gnoga-gui-base.ads | 547 |
| On_Paste_Handler | gnoga-gui-base.ads | 551 |
| On_Create_Handler | gnoga-gui-base.ads | 557 |
| On_Destroy_Handler | gnoga-gui-base.ads | 563 |
| On_Child_Added_Handler | gnoga-gui-base.ads | 572 |
| On_Child_Removed_Handler | gnoga-gui-base.ads | 577 |
| On_Message_Handler | gnoga-gui-base.ads | 582 |
| On_Resize | gnoga-gui-base.ads | 601 |
| On_Create | gnoga-gui-base.ads | 604 |
| On_Destroy | gnoga-gui-base.ads | 608 |
| On_Child_Added | gnoga-gui-base.ads | 612 |
| On_Child_Removed | gnoga-gui-base.ads | 616 |
| On_Message | gnoga-gui-base.ads | 621 |
| On_Media_Abort_Handler | gnoga-gui-element-multimedia.ads | 139 |
| On_Media_Error_Handler | gnoga-gui-element-multimedia.ads | |
| On_Can_Play_Handler | gnoga-gui-element-multimedia.ads | 151 |
| On_Can_Play_Through_Handler | gnoga-gui-element-multimedia.ads | 157 |
| On_Duration_Change_Handler | gnoga-gui-element-multimedia.ads | 164 |
| On_Emptied_Handler | gnoga-gui-element-multimedia.ads | 170 |
| On_Ended_Handler | gnoga-gui-element-multimedia.ads | 176 |
| On_Loaded_Data_Handler | gnoga-gui-element-multimedia.ads | 182 |
| On_Loaded_Meta_Data_Handler | gnoga-gui-element-multimedia.ads | 188 |
| On_Load_Start_Handler | gnoga-gui-element-multimedia.ads | 194 |
| On_Pause_Handler | gnoga-gui-element-multimedia.ads | 200 |
| On_Play_Handler | gnoga-gui-element-multimedia.ads | 205 |
| On_Playing_Handler | gnoga-gui-element-multimedia.ads | 210 |
| On_Progress_Handler | gnoga-gui-element-multimedia.ads | 215 |
| On_Rate_Change_Handler | gnoga-gui-element-multimedia.ads | 221 |
| On_Seeked_Handler | gnoga-gui-element-multimedia.ads | 227 |
| On_Seeking_Handler | gnoga-gui-element-multimedia.ads | 233 |
| On_Stalled_Handler | gnoga-gui-element-multimedia.ads | 239 |
| On_Suspend_Handler | gnoga-gui-element-multimedia.ads | 245 |
| On_Time_Update_Handler | gnoga-gui-element-multimedia.ads | 251 |
| On_Volume_Change_Handler | gnoga-gui-element-multimedia.ads | 257 |
| On_Waiting_Handler | gnoga-gui-element-multimedia.ads | 262 |
| On_Message | gnoga-gui-element-multimedia.ads | 273 |
| On_Resize | gnoga-gui-plugin-ace_editor.ads | 157 |
| On_Open_Handler | gnoga-gui-plugin-jqueryui-widget.ads | |
| On_Close_Handler | gnoga-gui-plugin-jqueryui-widget.ads | 150 |
| On_Message | gnoga-gui-plugin-jqueryui-widget.ads | 164 |
| On_Resize | gnoga-gui-view-card.ads | 100 |
| On_Child_Added | gnoga-gui-view-console.ads | 66 |



| Events | Packages | Lines |
|-------------------------------|-----------------------------|--------------|
| On_Resize | gnoga-gui-view-docker.ads | 119 |
| On_Child_Added | gnoga-gui-view.ads | 187 |
| On_Abort_Handler | gnoga-gui-window.ads | 270 |
| On_Error_Handler | gnoga-gui-window.ads | 274 |
| On_Before_Unload_Handler | gnoga-gui-window.ads | 278 |
| On_Hash_Change_Handler | gnoga-gui-window.ads | 283 |
| On_Orientation_Change_Handler | gnoga-gui-window.ads | 288 |
| On_Storage_Handler | gnoga-gui-window.ads | 293 |
| On_Resize | gnoga-gui-window.ads | 304 |
| On_Child_Added | gnoga-gui-window.ads | 309 |
| On_Message | gnoga-gui-window.ads | 314 |
| On_Connect_Handler | gnoga-server-connection.ads | 111 |
| On_Post_Request_Handler | gnoga-server-connection.ads | 134 |
| On_Post_Handler | gnoga-server-connection.ads | |
| On_Post_File_Handler | gnoga-server-connection.ads | 152 |

4.5 Keyboard handling with On_Key_Pressed

On_Connect_Pressed handler is set in the On_Connect handler, which is itself set on Gui.Setup procedure, usually the first Gnoga procedure called in v22 application.

On_Key_Pressed is useful to directly get ASCII codes from keyboard. On_Key_Pressed reflects ASCII table for printable characters as lowercase and uppercase letters, numbers and punctuation.

On_Key_Pressed is not relevant for characters lower than 32.

- Example

a is 97, A is 65, & is 38 and so on.

4.6 Keyboard handling with On_Key_Down

On_Connect_Down handler is set in the On_Connect handler, which is itself set on Gui.Setup procedure, usually the first Gnoga procedure called in v22 application.

On_Key_Down is not intended to manipulate ASCII codes like On_Key_Pressed but useful to get the keyboard state. By example pressing [a] or [Shift] + [a] always returns a Key_Code value of 65 but pressing [Shift] only returns Key_Code 16.

On_Key_Down reflects Keyboard Key codes and not ASCII codes.

| Key | Key code | | | | | |
|--------------|-----------------|-------------|----|----|----|--|
| Backspace | 8 | Arrow Up | 38 | :: | 59 | |
| Tab | 9 | Arrow Right | 39 | =+ | 61 | |
| Enter | 13 | Arrow Down | 40 | a | 65 | |
| Shift | 16 | Insert | 45 | b | 66 | |
| CTRL | 17 | Delete | 46 | c | 67 | |
| ALT | 18 | 0 | 48 | d | 68 | |
| Pause/ Break | 19 | 1 | 49 | e | 69 | |
| Caps Lock | 20 | 2 | 50 | f | 70 | |
| ESC | 27 | 3 | 51 | g | 71 | |
| Page Up | 33 | 4 | 52 | h | 72 | |
| Page Down | 34 | 5 | 53 | i | 73 | |
| End | 35 | 6 | 54 | j | 74 | |
| Home | 36 | 7 | 55 | k | 75 | |
| Arrow Left | 37 | 8 | 56 | l | 76 | |
| | | 9 | 57 | m | 77 | |



| | | | | | |
|-------------|----|-------------|-----|---------------|-----|
| n | 78 | 4[Num Lock] | 100 | F9 | 120 |
| o | 79 | 5[Num Lock] | 101 | F10 | 121 |
| p | 80 | 6[Num Lock] | 102 | F11 | 122 |
| q | 81 | 7[Num Lock] | 103 | F12 | 123 |
| r | 82 | 8[Num Lock] | 104 | Num Lock | 144 |
| s | 83 | 9[Num Lock] | 105 | Scroll Lock | 145 |
| t | 84 | *[Num Lock] | 106 | My Computer | 182 |
| u | 85 | +[Num Lock] | 107 | My Calculator | 183 |
| v | 86 | -[Num Lock] | 109 | ,< | 188 |
| w | 87 | .[Num Lock] | 110 | .> | 190 |
| x | 88 | /[Num Lock] | 111 | /? | 191 |
| y | 89 | F1 | 112 | `~ | 192 |
| z | 90 | F2 | 113 | [{ | 219 |
| Windows | 91 | F3 | 114 | \ | 220 |
| Right Click | 93 | F4 | 115 |]} | 221 |
| 0[Num Lock] | 96 | F5 | 116 | "" | 222 |
| 1[Num Lock] | 97 | F6 | 117 | | |
| 2[Num Lock] | 98 | F7 | 118 | | |
| 3[Num Lock] | 99 | F8 | 119 | | |

On_Key_Down gets theses information through this structure:

```
type Keyboard_Event_Record is record
    Message : Keyboard_Message_Type := Unknown;
    Key_Code : Integer;
    Key_Char : Wide_Character;
    Alt      : Boolean          := False;
    Control  : Boolean          := False;
    Shift    : Boolean          := False;
    Meta     : Boolean          := False;
end record;
```

With:

```
type Keyboard_Message_Type is [Unknown, Key_Down, Key_Up, Key_Press];
```

4.7 HTTPS/TLS setup

4.7.1 Direct connection

Using layouts_ssl.adb from Gnoga examples.

- create TLS certificate

Delete server.crt et server.key.

With the station name, for example, "ro6.genesix.org", create the certificate via Let's Encrypt with your favorite generator1 and install it, for example according to this tree structure:



```

    └── ro6.genesix.org.csr
        └── ro6.genesix.org.csr.conf
            └── ro6.genesix.org.key
    └── html
        └── debug.html
        └── favicon.ico
        └── robots.txt
    └── js
        └── boot.js
        └── jquery.min.js
    └── layouts_ssl
    └── layouts_ssl.adb
    └── test_ssl.gpr

```

- Changes to layouts_ssl.adb

For a "true" https experience, it may be preferable to choose port 443 instead of 8443. Since ports below 1024 require root rights via sudo, this option should be considered depending on your rights.

Comment in layouts_ssl.adb, around line 143:

```

Gnoga.Server.Connection.Secure.Register_Secure_Server
[Certificate_File => Gnoga.Server.Application_Directory & "/test_ssl/server.crt",
 Key_File => Gnoga.Server.Application_Directory & "/test_ssl/server.key",
 Port      => 8_443, Disable_Insecure => False];

```

And replace with:

```

Gnoga.Server.Connection.Secure.Register_Secure_Server
[Certificate_File => "certs/ro6.genesix.org.cer",
 Key_File => "certs/ro6.genesix.org.key",
 Port      => 443, Disable_Insecure => False];

```

Where Port => 8443 if you don't have sudo or root rights.

- Create test_ssl_ins.gpr

Puisque gnoga.gpr est déjà installé dans l'environnement de développement :

Comment in:

```
with ".../src/gnoga.gpr"
```

Replace with:

```

-      with ".../src/gnoga.gpr"
+      with "gnoga.gpr"

```

4.7.2 Connection through proxy

- Without load balancer

For standard use with a single database.

```
#-----  
# demo01.v22.soweb.io - proxy websocket  
#-----  
#  
# 20170613 - Initial release  
# 20170716 - Error management  
# 20170731 - DNS-01 method  
# 20231102 - Proxy websocket  
#  
#-----  
  
# For a working websocket proxy, HTTP protocol must be exclusively HTTP 1.1 with no session cache  
  
map $http_upgrade $connection_upgrade {  
    default upgrade;  
    close;  
}  
  
# http port 80 switching to https 443  
server {listen 80; server_name demo01.v22.soweb.io; return 301 https://$server_name$request_uri; }  
  
server {  
    #-----  
    # Server settings  
    #-----  
  
    server_name           demo01.v22.soweb.io;  
    access_log  /var/log/nginx/demo01.v22.soweb.io.access.log;  
    error_log   /var/log/nginx/demo01.v22.soweb.io.error.log;  
  
    location / {  
        proxy_pass http://localhost:8001;  
        proxy_http_version 1.1;  
        proxy_set_header Upgrade $http_upgrade;  
        proxy_set_header Connection $connection_upgrade;  
        proxy_set_header Host $host;  
    }  
  
    #-----  
    # SSL Settings  
    #-----  
  
    listen 443 ssl; # ssl in parameter is preferable to 'ssl on', according to the nginx doc  
    ssl_protocols TLSv1.2 TLSv1.3; # Authorized TLS versions  
  
    # Site certificates  
    ssl_certificate      /etc/acme/certs/demo01.v22.soweb.io/fullchain.cer;  
    ssl_certificate_key  /etc/acme/certs/demo01.v22.soweb.io/demo01.v22.soweb.io.key;  
    ssl_trusted_certificate /etc/acme/certs/demo01.v22.soweb.io/fullchain.cer; # For OCSP Stapling  
  
    # Specifies that server ciphers should be preferred over client ciphers when using the SSLv3 and TLS protocols.  
    ssl_prefer_server_ciphers on;  
  
    # https://wiki.mozilla.org/Security/Server_Side_TLS  
    # Cipher suites [TLS 1.2] : ECDHE-ECDSA-AES128-GCM-SHA256; ECDHE-RSA-AES128-GCM-SHA256; ECDHE-ECDSA-AES256-GCM-SHA384; ECDHE-RSA-AES256-GCM-SHA384; ECDHE-ECDSA-CHACHA20-POLY1305; ECDHE-RSA-CHACHA20-POLY1305; DHE-RSA-AES128-GCM-SHA256; DHE-RSA-AES256-GCM-SHA384  
    # Cipher suites [TLS 1.3] : TLS_AES_128_GCM_SHA256; TLS_AES_256_GCM_SHA384; TLS_CHACHA20_POLY1305_SHA256  
  
    ssl_ciphers ECDHE-ECDSA-AES128-GCM-SHA256: ECDHE-RSA-AES128-GCM-SHA256: ECDHE-ECDSA-AES256-GCM-SHA384: ECDHE-RSA-AES256-GCM-SHA384: ECDHE-ECDSA-CHACHA20-POLY1305: ECDHE-RSA-CHACHA20-POLY1305: DHE-RSA-AES128-GCM-SHA256: DHE-RSA-AES256-GCM-SHA384: TLS_AES_128_GCM_SHA256: TLS_AES_256_GCM_SHA384: TLS_CHACHA20_POLY1305_SHA256;  
  
    # Disable session ticket  
    ssl_session_tickets off; # See https://community.letsencrypt.org/t/errors-from-browsers-with-ssl-session-tickets-off-nginx/18124/4  
  
    # Strong Diffie-Hellman group  
    ssl_dhparam /etc/ssl/certs/dhparam.pem;  
  
    # Certificate validity check at TLS handshake  
    # OCSP = Online Certificate Status Protocol - RFC4366  
    ssl_stapling on;  
    ssl_stapling_verify on;  
    ssl_stapling_responder http://r3.o.lencr.org; # See https://letsencrypt.org/docs/lencr.org  
  
    # If resolver not added, the resolver defaults to the server's DNS default.  
    # ipv6=off to avoid "OCSP response not successful [6: unauthorized] while requesting certificate status"  
    resolver 80.67.169.12 80.67.169.40 ipv6=off valid=300s; # Resolver for ssl_stapling - ns0.fdn.fr ns1.fdn.fr  
    resolver_timeout 15s; # Short resolution timeout [default is 30s]
```

```

#-----
# Headers
#-----

# Force browser to strictly HTTPS
add_header Strict-Transport-Security "max-age=63072000; includeSubdomains" always;
}

#-----
# EOF
#-----

```

- With load balancer

For a loaded application with, for example, database replication.

```

#-----
# demo01.v22.soweb.io - proxy websocket
#-----

# 20170613 - Initial release
# 20170716 - Error management
# 20170731 - DNS-01 method
# 20231102 - Proxy websocket
#


# For a working websocket proxy, HTTP protocol must be exclusively HTTP 1.1 with no session cache
map $http_upgrade $connection_upgrade {
    default upgrade;
    '' close;
}

upstream websocket {
    server 192.168.1.11:8001;
    server 192.168.1.12:8001;
    server 192.168.1.13:8001;
    #server ...
    #server ...

    # always after servers declarations
    keepalive 50;
}

# http port 80 switching to https 443
server {listen 80; server_name demo01.v22.soweb.io; return 301 https://$server_name$request_uri; }

server {

    #-----
    # Server settings
    #-----

    server_name           demo01.v22.soweb.io;
    access_log  /var/log/nginx/demo01.v22.soweb.io.access.log;
    error_log   /var/log/nginx/demo01.v22.soweb.io.error.log;

    location / {
        proxy_pass http://websocket;
        proxy_http_version 1.1;
        proxy_set_header Upgrade $http_upgrade;
        proxy_set_header Connection $connection_upgrade;
        proxy_set_header Host $host;
    }

    #-----
    # SSL Settings
    #-----

    listen 443 ssl; # ssl_in parameter is preferable to 'ssl on', according to the nginx doc
    ssl_protocols TLSv1.2 TLSv1.3; # Authorized TLS versions

    # Site certificates
    ssl_certificate      /etc/acme/certs/demo01.v22.soweb.io/fullchain.cer;
    ssl_certificate_key  /etc/acme/certs/demo01.v22.soweb.io/demo01.v22.soweb.io.key;
    ssl_trusted_certificate /etc/acme/certs/demo01.v22.soweb.io/fullchain.cer; # For OCSP Stapling

    # Specifies that server ciphers should be preferred over client ciphers when using the SSLv3 and TLS protocols.
    ssl_prefer_server_ciphers on;

    # https://wiki.mozilla.org/Security/Server_Side_TLS
}
```



```

# Cipher suites [TLS 1.2] : ECDHE-ECDSA-AES128-GCM-SHA256; ECDHE-RSA-AES128-GCM-SHA256; ECDHE-ECDSA-AES256-
GCM-SHA384; ECDHE-RSA-AES256-GCM-SHA384; ECDHE-ECDSA-CHACHA20-POLY1305; ECDHE-RSA-CHACHA20-POLY1305; DHE-RSA-
AES128-GCM-SHA256; DHE-RSA-AES256-GCM-SHA384
# Cipher suites [TLS 1.3] : TLS_AES_128_GCM_SHA256; TLS_AES_256_GCM_SHA384; TLS_CHACHA20_POLY1305_SHA256

ssl_ciphers ECDHE-ECDSA-AES128-GCM-SHA256; ECDHE-RSA-AES128-GCM-SHA256; ECDHE-ECDSA-AES256-GCM-SHA384; ECDHE-
RSA-AES256-GCM-SHA384; ECDHE-ECDSA-CHACHA20-POLY1305; ECDHE-RSA-CHACHA20-POLY1305; DHE-RSA-AES128-GCM-SHA256; DHE-
RSA-AES256-GCM-SHA384; TLS_AES_128_GCM_SHA256; TLS_AES_256_GCM_SHA384; TLS_CHACHA20_POLY1305_SHA256;

# Disable session ticket
ssl_session_tickets off; # See https://community.letsencrypt.org/t/errors-from-browsers-with-ssl-session-
tickets-off-nginx/18124/4

# Strong Diffie-Hellman group
ssl_dhparam /etc/ssl/certs/dhparam.pem;

# Certificate validity check at TLS handshake
# OSCP = Online Certificate Status Protocol - RFC4366
ssl_stapling on;
ssl_stapling_verify on;
ssl_stapling_responder http://r3.o.lencr.org; # See https://letsencrypt.org/docs/lencr.org

# If resolver not added, the resolver defaults to the server's DNS default.
# ipv6=off to avoid "OCSP response not successful [6: unauthorized] while requesting certificate status"
resolver 80.67.169.12 80.67.169.40 ipv6=off valid=300s; # Resolver for ssl_stapling - ns0.fdn.fr ns1.fdn.fr
resolver_timeout 15s; # Short resolution timeout [default is 30s]

#-----
# Headers
#-----

# Force browser to strictly HTTPS
add_header Strict-Transport-Security "max-age=63072000; includeSubdomains" always;
}

#-----
# EOF
#-----

```

Implementation notes

Weinberg's Second Law : If builders built buildings the way programmers wrote programs, then the first woodpecker that came along would destroy civilization.
Gerald Weinberg



1 Introduction

Implementation notes is subject to change. To be seen for now as a working document.

2 Ada

2.1 Ada.Containers.Vectors with records

2.1.1 Declarations

2.1.2 Write

2.1.3 Read

```
DB_Index := Databases.First_Index;
Msg.Dbg ("Test DB_Properties: " & Databases[DB_Index].Name);
```

2.1.4 Iterates

```
DB_Cursor : Databases_List.Cursor := Databases_List.No_Element;
begin
  while DB_Cursor /= Databases_List.No_Element loop
    DB_Cursor := Next [DB_Cursor];
  end loop;
  DB_Index := To_Index [DB_Cursor];

  for I of Databases loop
    if I.Name = DB_Name then
      exit;
    end if;
  end loop;
```

2.1.5 Search

```
- Test
DBI := Sql.DB_Index ["v23"];
if DBI /= Sql.Databases_List.No_Index then
    Msg.Debug ["DB_Index found: " & From_Latin_1 [DBI'Image]];
    Msg.Debug ["URI from Index: " & Sql.Databases[DBI].URI];
else
    Msg.Error ["DB_Index not found: v23"];
end if;

- DB_Index not implemented in the API, as it required the Databases container instance
to be public

function DB_Index [DB_Name : String] return Databases_List.Extended_Index is
    use Databases_List; -- for operators
    DB_Index : Databases_List.Extended_Index := Databases_List.No_Index;
begin

    for C in Databases.Iterate loop
        --Msg.Debug ["Index: " & From_Latin_1 [Databases_List.Extended_Index'Image (To_Index [C])]];
        if Databases(C).Name = DB_Name then
            DB_Index := Databases_List.Extended_Index (To_Index (C));
            exit;
        end if;
    end loop;
    return DB_Index;
end DB_Index;

function DB_Properties [DB_Name : String] return Database_Line is
    use Databases_List; -- for operators
    DB_Index : Databases_List.Extended_Index := Databases_List.No_Index;
    DB_Record : Database_Line;
begin
    for C in Databases.Iterate loop
        --Msg.Debug ["Index: " & From_Latin_1 [Databases_List.Extended_Index'Image (To_Index [C])]];
        if Databases(C).Name = DB_Name then
            DB_Record := Databases(C);
            exit;
        end if;
    end loop;
    return DB_Record;
end DB_Properties;
```

3 API Rest

geta : aws ada api rest

max url length : 2K [some browsers] or 8K per convention

https://en.wikibooks.org/wiki/Ada_Programming/Libraries/Web/AWS

[https://github.com/BrentSeidel/BBS-BBB-Ada](https://github.com/BrentSeidel/BBS-BBB-Ada/tree/master)
<https://github.com/BrentSeidel/BBS-Ada>

<https://docs.adacore.com/aws-docs/aws>

<https://restfulapi.net/rest-put-vs-post>
<https://www.baeldung.com/rest-http-put-vs-post>

<https://blog.apilayer.com/an-ultimate-guide-to-http-put-vs-post-in-rest-api-in-2023>

Use get & post [see API IONOS]

4 Configuration file

4.1 MySQL

```
# -----
# testgui.cfg - Configuration file
#
#
# 20230920-181257 - First release
#
#
[Connection]
Domain = 192.168.0.36 #localhost
Port = 8080
Tls_Certificate = A relative path to .cer file
Tls_Private_Key = A relative path to .key file

[Database]
Type = MySQL
Host = 192.168.0.243
Port = 3306
Name = testgui
User = user_testgui
Password = user_pass

# -----
# EOF
# -----
```

4.2 SQLite

```
# -----
# testgui.cfg - Configuration file
#
#
# 20230920-181257 - First release
#
#
[Connection]
Domain = 192.168.0.36 #localhost
Port = 8080
Tls_Certificate = A relative path to .cer file
Tls_Private_Key = A relative path to .key file

[Database]
Type = SQLite
Name = testgui

# -----
# EOF
# -----
```

5 CRC

<https://crccalc.com> [outil interactif 8/16/32 bits]

<https://sourceforge.net/p/avr-ada/wiki/CRC>

5.1 CRC 16

<https://srecord.sourceforge.net/crc16-ccitt.html>

<http://computer-programming-forum.com/44-ada/ce7afed4795fb0e4.htm>

<https://www.avrfreaks.net/s/topic/a5C3l000000UaabEAC/t154443>

https://www.nongnu.org/avr-libc/user-manual/group__util__crc.html

<https://www.carnetdumaker.net/snippets/29>

5.2 CRC 32

<https://rosettacode.org/wiki/CRC-32>

6 Databases

6.1 Introduction

<<<TODO>>>

6.2 Benchmarking

6.2.1 Locust

<https://simonwillison.net/2022/Oct/23/datasette-gunicorn/#benchmarking-sqlite>

6.2.2 Exists

- Description

Returns True if file or directory Name exists.

- Usage

```
function Exists [Name : String] return Boolean
```

- Example

```
if Fls.Exists [HAC_Dir & "/hac"] then
  Tio.Put_Line ["HAC installation is done : "]");
end if;
```

7 Database MySQL

7.1 Charset and collation

Charset must be : utf8mb4

Collation must be : utf8mb4_unicode_520_ci

Never use utf8mb4_general_ci. For new implementations, always use utf8mb4_unicode_520_ci against the older utf8mb4_unicode_ci. See your preferred search engine for details.

7.2 Transactions sequences

```
DB.Execute_Query ("START TRANSACTION");
DB.Execute_Query ("SAVEPOINT SV_Index_Exists");
<<<work>>>
DB.Execute_Query ("COMMIT");

<<<TODO>>>
```

8 Database SQLite

8.1 Transactions sequences

```
DB.Execute_Query ("BEGIN TRANSACTION");
DB.Execute_Query ("SAVEPOINT SV_Index_Exists");
<<<work>>>
DB.Execute_Query ("COMMIT");

<<<TODO>>>
```

8.2 Compatibility with MySQL

8.2.1 Problem description

Number_Of_Rows is not implemented in SQLite: this is acceptable because it is clearly expressed in the doc and it can be implemented with the reservations below.

Affected_Rows is not implemented correctly for SQLite: this is annoying because it's not expressed at all as Gnoga doc says: executes a SQL query and returns the number of rows affected, but affected Rows calls sqlite3_total_changes() which only handles modifications [i.e. only INSERT, UPDATE or DELETE] and not the result of the query. A simple SELECT * table will return 0 even if the table is full to bursting. 2] Implementation has an impact on performance [see below].

Execute_Update is not implemented correctly for SQLite: since, after calling Execute_Query, we call Affected_Rows, we end up with the same problem.

8.2.2 Suggested corrections

Correcting these inconsistencies is not difficult, but the result will range from transparent to very slow [depending on the type of query and/or the volume of data returned, since the entire recordset have to be iterated].

Number_Of_Rows: As the name don't suggests, returns the number of rows in the recordset, not in the table. Can be implemented with the above reservations by iterating through the entire recordset.

Affected_Rows: you'll need to remember the last query performed by Execute_Update [in the connection record, next to UTF8_String]. If this query contains INSERT, UPDATE or DELETE, we return the result unchanged; if it contains a SELECT *| Column_Name, we transform it into a SELECT COUNT[*|Column_Name]. If the query contains anything else, we execute a standard Query with the above reservations, since we have to iterate through the entire recordset.

8.2.3 Suggested implementations

Two possibilities:

- Either I implement it at Gnoga level, but Pascal [Gnoga's maintainer] has to agree. It's an imperfect hack, but it'll be better than this unusable existing one.
- Or I can implement this in v22 and ban the use of Execute_Query, Execute_Update, Number_Of_Rows in the docs in favor of functions with identical names but prefixed v22.Sql, which is pretty dirty and wouldn't solve the problem of these rogue functions in Gnoga.Server.Database.

8.3 Add-ons

8.3.1 Mycelite

<https://github.com/mycelial/mycelite>

8.3.2 Compile time options

<https://www.sqlite.org/compile.html>

8.4 Concurrent access

8.4.1 Activating WAL mode

```
PRAGMA journal_mode=WAL;  
sqlite3 github.db 'PRAGMA journal_mode=WAL';
```

8.4.2 Managing busy error

- Setting delay [internal control]

<<<TODO>>>

https://www.sqlite.org/pragma.html#pragma_busy_timeout

- Call back function in Ada [external control]

<<<TODO>>>

https://www.sqlite.org/c3ref/busy_handler.html

8.4.3 Experimental

<https://stackoverflow.com/questions/4060772/sqlite-concurrent-access>

8.4.4 Production

SQLite can handle concurrent access in WAL [Write Ahead Log] mode. In this case all writes are appended to a WAL temporary file which is periodically merged with the original database.

When SQLite is searching for something it would first check this temporary file and if nothing is found proceed with the main database file.

As a result, readers don't compete with writers and performance is much better compared to the traditional SQLite Rollback journaled mode.

<https://www.sqlite.org/walformat.html>

<https://fly.io/blog/sqlite-internals-wal> [How SQLite Scales Read Concurrency]

8.5 FAQ

8.5.1 Release history

<https://www.sqlite.org/draft/changes.html>

8.5.2 SQL virtual machine

<https://fly.io/blog/sqlite-virtual-machine>

8.5.3 Opening a new database connection

<https://www.sqlite.org/c3ref/open.html>

<https://www.sqlite.org/uri.html>

<https://stackoverflow.com/questions/56416437/confusion-about-uri-path-to-configure-sqlite-database>

8.5.4 UPSERT how to

- First pass [record does not exists]

Update on a non existent record

UPDATE System SET Value='0.0' WHERE Parameter='Shema_Version';

Success : 0 record(s) affected

Create ok because Changes[] = 0 [no change from the last operation]

INSERT INTO System [Parameter, Value] SELECT 'Shema_Version', '0.0' WHERE [Select Changes[] = 0];

Success : 1 record(s) affected

- Second pass [record already exists]

Update an existent record successfull

UPDATE System SET Value='0.1' WHERE Parameter='Shema_Version';

Success : 1 record(s) affected

No create since Changes[] = 1 [last operation has change something]

INSERT INTO System [Parameter, Value] SELECT 'Shema_Version', '0.1' WHERE [Select Changes[] = 0];

Success : 0 record(s) affected

8.5.5 File naming

Never have a filename with a part of it including reserved word.

v22.Gui.Connect is good but v22.Gui.Access is bad. This latter package will be silently ignored without apparent reason nor warning message.

8.6 Replication

8.6.1 Distributed SQLite

<https://fly.io/docs/litefs>
<https://fly.io/docs/litefs/how-it-works>
<https://fly.io/blog/litefs-cloud>
<https://fly.io/blog/introducing-litefs>
<https://news.ycombinator.com/item?id=36602970>

- Installing LiteFS without Docker

<https://github.com/superfly>
<https://github.com/superfly/litefs/releases>
<https://fly.io/docs/litefs/getting-started-fly>

8.6.2 Cr-SQLite

<https://github.com/vlcn-io/cr-sqlite>

8.6.3 LiteStream

<https://litestream.io>
<https://github.com/benbjohnson/litestream>
<https://fly.io/blog/all-in-on-sqlite-litestream>
<https://litestream.io/guides/systemd>

8.7 Utilities

8.7.1 Sqlite-utils

<https://sqlite-utils.datasette.io/en/stable/cli.html>

8.7.2 SQLCrush

<https://github.com/coffeeandscripts/sqlcrush>

8.7.3 Visidata

<https://www.visidata.org>

```
user@system: sudo apt install visidata
```

8.8 Why SQLite ?

<https://tailscale.com/blog/database-for-2022>
<https://simonwillison.net/2021/Jul/28/baked-data>

9 Encryption

9.1 Key expansion

A SHA256 could be used as key expansion routine [from 32 to 256 bits]

<https://ritul-patidar.medium.com/key-expansion-function-and-key-schedule-of-des-data-encryption-standard-algorithm-1bfc7476157>

https://www.researchgate.net/figure/Structure-of-RC4-key-scheduling-process_fig8_267858656

9.2 RC4

geta : RC4 minimum key length

<https://en.wikipedia.org/wiki/RC4>

https://en.wikipedia.org/wiki/Stream_cipher

https://www.researchgate.net/publication/337743183_Modernized_RC4_encryption_algorithm/link/5de7eb71a6fdc-c28370658dd/download

<https://iopscience.iop.org/article/10.1088/1757-899X/420/1/012131>

<https://iopscience.iop.org/article/10.1088/1757-899X/680/1/012025>

https://en.wikipedia.org/wiki/Variably_Modified_Permutation_Composition

<https://microchipdeveloper.com/harmony:middleware-crypto>

http://www.winpicprog.co.uk/pic_tutorial.htm

<https://github.com/cforler/Ada-Crypto-Library>

9.3 SHA-256

<https://emn178.github.io/online-tools/sha256.html> [interactive tool]

<https://en.wikipedia.org/wiki/SHA-2>

<https://rosettacode.org/wiki/SHA-256>

<https://github.com/oilulio/Microcontroller-hashes/blob/master/sha256.c>

<https://www.mdpi.com/2071-1050/13/8/4324>

10 List forward & backward

With LIMIT = 10

10.1 First display

```
SELECT Login FROM Sys_Users WHERE Login >= '' ORDER BY Login LIMIT 10
```

```
admin
admin2
admin3
alpha
bravo
charlie
delta
echo
foxtrot
golf
```

10.2 Forward



```
SELECT Login FROM Sys_Users WHERE Login >= 'golf' ORDER BY Login LIMIT 10
```

```
golf
hotel
india
juliet
kilo
lima
mike
november
oscar
papa < _Last
```



```
SELECT Login FROM Sys_Users WHERE Login >= 'papa' ORDER BY Login LIMIT 10
papa
quebec
romeo
sierra
tango
uniform
victor
whiskey
xray
yankee < _Last
```



```
SELECT Login FROM Sys_Users WHERE Login >= 'yankee' ORDER BY Login LIMIT 10
yankee
zoulou < _Last
```

```
if _Max < 10:
```

```
SELECT Login FROM Sys_Users WHERE Login <= 'zoulou' ORDER BY Login DESC LIMIT 10
zoulou
yankee
xray
whiskey
victor
uniform
tango
sierra
romeo
quebec < _Last
```

Then:

```
SELECT Login FROM Sys_Users WHERE Login >= 'quebec' ORDER BY Login LIMIT 10
quebec < _First
romeo
sierra
tango
uniform
victor
whiskey
xray
yankee
zoulou
```

10.3 Backward



```
SELECT Login FROM Sys_Users WHERE Login <= 'quebec' ORDER BY Login DESC LIMIT 10
quebec
```

```
papa  
oscar  
november  
mike  
lima  
kilo  
juliet  
india  
hotel < _Last
```

Then:

```
SELECT Login FROM Sys_Users WHERE Login >= 'hotel' ORDER BY Login LIMIT 10  
hotel < _First  
india  
juliet  
kilo  
lima  
mike  
november  
oscar  
papa  
quebec
```



```
SELECT Login FROM Sys_Users WHERE Login <= 'hotel' ORDER BY Login DESC LIMIT 10  
hotel  
golf  
foxtrot  
echo  
delta  
charlie  
bravo  
alpha  
admin3  
admin2 < _Last
```

Then:

```
SELECT Login FROM Sys_Users WHERE Login >= 'admin2' ORDER BY Login LIMIT 10  
admin2 < _First  
admin3  
alpha  
bravo  
charlie  
delta  
echo  
foxtrot  
golf  
hotel
```



```
SELECT Login FROM Sys_Users WHERE Login <= 'admin2' ORDER BY Login DESC LIMIT 10  
admin2  
admin < _Last
```

if _Max < 10:

```
SELECT Login FROM Sys_Users WHERE Login >= 'admin' ORDER BY Login LIMIT 10  
admin  
admin2  
admin3  
alpha  
bravo  
charlie
```

```
delta
echo
foxtrot
golf
```

11 Logs

11.1 Standard mode

```
20231031-101841 - INIT - MSG - v22 Framework - GUI test program
20231031-101841 - INIT - MSG - Copyright [C] Sowebio SARL 2020-2023, according to
                           GPLv3
20231031-101841 - INIT - MSG - testgui v0.2 - v22 v0.1 - build 2023-10-31 10:18:26
20231031-101841 - INIT - MSG - TestGui.Init.App > Configuration file testgui.cfg
                           loaded
20231031-101841 - INIT - MSG - TestGui.On_Connect > Starting Gnoga server
20231031-101841 - INIT - MSG - TestGui.SQL_Ping > Armed for 3600s cycles
20231031-101853 - INIT - MSG - TestGui.On_Connect > Login screen
20231031-101929 - INIT - MSG - Gui.User_Login > New user on logging screen
20231031-101929 - INIT - MSG - Gui.User_Login > User alpha connected
20231031-103450 - INIT - MSG - TestGui.On_Connect > Login screen
20231031-103502 - INIT - MSG - Gui.User_Login > New user on logging screen
20231031-103502 - INIT - MSG - Gui.User_Login > User alpha connected
20231031-112414 - INIT - MSG - TestGui.On_Connect > Login screen
20231031-125618 - INIT - MSG - TestGui.On_Connect > Login screen
20231031-125636 - INIT - MSG - Gui.User_Login > New user on logging screen
20231031-125636 - INIT - MSG - Gui.User_Login > User alpha connected
```

11.2 Debug mode

```
20231031-101357 - INIT - MSG - v22 Framework - GUI test program
20231031-101357 - INIT - MSG - Copyright [C] Sowebio SARL 2020-2023, according to
                           GPLv3
20231031-101357 - INIT - MSG - testgui v0.2 - v22 v0.1 - build 2023-10-31 10:13:41
20231031-101357 - INIT - MSG - TestGui.Init.App > Configuration file testgui.cfg
                           loaded
20231031-101357 - INIT - DBG - Load Database_Pragma: journal_mode=WAL
20231031-101357 - INIT - DBG - Load Database_Pragma: foreign_keys=ON
20231031-101357 - INIT - MSG - TestGui.On_Connect > Starting Gnoga server
20231031-101357 - INIT - MSG - TestGui.SQL_Ping > Armed for 3600s cycles
20231031-101433 - INIT - DBG - User > On_Mgt
20231031-101433 - INIT - MSG - TestGui.On_Connect > Login screen
20231031-101439 - INIT - DBG - Dispensers > Demo_Mode_1
20231031-101525 - INIT - DBG - Dispensers > Demo_Complex_Form_Create
20231031-101533 - INIT - DBG - User > On_Mgt
20231031-101551 - INIT - DBG - User > On_Mgt
20231031-101552 - INIT - DBG - User > On_Adm
20231031-101553 - INIT - DBG - Users > Main_Menu
20231031-101553 - INIT - DBG - Gui.List > Start
20231031-101554 - INIT - DBG - Key/Value: Users_List_1/alpha
20231031-101554 - INIT - DBG - Key/First: Users_List_First/alpha
20231031-101554 - INIT - DBG - Key/Value: Users_List_2/bravo
20231031-101554 - INIT - DBG - Key/Value: Users_List_3/charlie
20231031-101554 - INIT - DBG - Key/Value: Users_List_4/delta2
20231031-101554 - INIT - DBG - Key/Value: Users_List_5/echo
20231031-101554 - INIT - DBG - Key/Value: Users_List_6/foxtrot
20231031-101554 - INIT - DBG - Key/Value: Users_List_7/golf
20231031-101554 - INIT - DBG - Key/Value: Users_List_8/hotel
20231031-101554 - INIT - DBG - Key/Value: Users_List_9/india
20231031-101554 - INIT - DBG - Key/Value: Users_List_10/juliet
20231031-101554 - INIT - DBG - Key/Last: Users_List_Last/juliet
```

```
^C
20231031-101837 - INIT      - MSG - testgui > Ctrl-C detected, finalize application
20231031-101837 - INIT      - MSG - Total execution time: 0h0 4m 40s
20231031-101837 - INIT      - MSG - Closing SQLITE database: testgui
```

12 TCP/IP

<https://stackoverflow.com/questions/58361758/tcp-ip-using-ada-sockets-how-to-correctly-finish-a-packet>

<https://comp.lang.ada.narkive.com/V7LjubmR/tcp-ip-sockets-with-gnat-sockets>

13 Unicode

13.1 Introduction

<https://mcilloni.ovh/2023/07/23/unicode-is-hard>

13.2 Glossary

Paragraphs are from theses Wikipedia links:

- [https://en.wikipedia.org/wiki/Plane_\(Unicode\)](https://en.wikipedia.org/wiki/Plane_(Unicode))
- https://en.wikipedia.org/wiki/Byte_order_mark
- <https://en.wikipedia.org/wiki/Unicode>
- <https://en.wikipedia.org/wiki/UTF-8>
- <https://en.wikipedia.org/wiki/UTF-16>

13.2.1 BMP

In the Unicode standard, a plane is a continuous group of 65,536 [2¹⁶] code points. There are 17 planes, identified by the numbers 0 to 16, which corresponds with the possible values 00–1016 of the first two positions in six position hexadecimal format [U+hhhhhh].

Plane 0 is the Basic Multilingual Plane [BMP], which contains most commonly used characters.

13.2.2 BOM

BOM stands for Byte Order Mark. The BOM character is, simply, the Unicode code-point U+FEFF ZERO WIDTH NO-BREAK SPACE, encoded in the current encoding.

The encoded representation of the BOM depends of the representation. A text beginning with the sequence EF BB BF suggests an UTF-8 encoding.

| | |
|-------------|----------|
| UTF-8 | EF BB BF |
| UTF-16 [BE] | FE FF |
| UTF-16 [LE] | FF FE |

A BOM can signal several things to a program reading the text:

- The byte order, or endianness, of the text stream in the cases of 16-bit and 32-bit encodings;
- The fact that the text stream's encoding is Unicode, to a high level of confidence;

- Which Unicode character encoding is used.

BOM use is optional. Its presence interferes with the use of UTF-8 by software that does not expect non-ASCII bytes at the start of a file but that could otherwise handle the text stream.

⇒ According to the Unicode standard, the BOM for UTF-8 files is not recommended.

13.2.3 Unicode

Unicode, formally The Unicode Standard is an information technology standard for the consistent encoding, representation, and handling of text expressed in most of the world's writing systems.

Unicode can be stored using several different encodings, which translate the character codes into sequences of bytes. The Unicode Standard defines three encodings but several others exist, mostly variable-length encodings. The most common encodings are the ASCII-compatible UTF-8 and the ASCII-incompatible UTF-16, itself compatible with the obsolete UCS-2.

13.2.4 UTF-8

UTF-8 is a variable-length character encoding standard used for electronic communication. Defined by the Unicode Standard, the name is derived from Unicode [or Universal Coded Character Set] Transformation Format – 8-bit.

13.2.5 UTF-16

UTF-16 is a variable-length character encoding capable of encoding all 1,112,064 valid code points of Unicode [in fact this number of code points is dictated by the design of UTF-16]. The encoding is variable-length, as code points are encoded with one or two 16-bit code units. UTF-16 arose from an earlier obsolete fixed-width 16-bit encoding, now known as UCS-2 [for 2-byte Universal Character Set], once it became clear that more than 216 [65,536] code points were needed.

UTF-16 is used by systems such as the Microsoft Windows API, the Java programming language and JavaScript/ECMAScript. It is used by SMS [the SMS standard specifies UCS-2, but almost all users actually implement UTF-16 so that emojis work].

UTF-16 is the only web-encoding that is incompatible with ASCII and never gained popularity on the web. The Web Hypertext Application Technology Working Group [WHATWG] considers UTF-8 "the mandatory encoding for all [text]" and that for security reasons browser applications should not use UTF-16.

UTF-16 BE stands for Big Endian and UTF-16 LE for Little Endian.

13.3 UXString

Paragraphs below are from the UXString author:

- <https://github.com/Blady-Com/UXStrings>
- compl.land.ada [ANN] Release of UXStrings 0.5.0 – 230505 at 05:23

13.3.1 Introduction

v22 adopts UXString v3 implementation using Unbounded_Wide_Wide_Strings for internal representation. With this latter implementation, the characters are stored in

Unicode form and the management of dynamic size uses the standard Wide_Wide_Unbounded strings library.

Performance with Gnoga is better. UXStrings2 already brought better performance in the case of strings only made up of ASCII characters [improvement by a factor 2 to 3 compared to UXStrings1]. With UXStrings3 performance in the latter case is still improved [factor 6 to 7 compared to UXStrings1] moreover in the case of strings accentuated in French and strings containing emojis the process times are also improved [factor 7 to 8 by compared to UXStrings1 or even more in the case of emojis]. For all cases, the global memory occupation of the Gnoga application is generally similar.

13.3.2 Motivation

My first motivation was to avoid the user of the Ada language from having to make a choice in the representation of character strings. With the current Ada 2012 standard, the choice must be made according to the nature of the characters handled [Character, Wide_Character or Wide_Wide_Character] and the adaptation of the string size according to the operations carried out. Moreover, depending on the libraries used, making a single choice is generally not possible, which leads to continuous conversions.

Ada GUI library Gnoga internal character strings implementation is based on both Ada types String and Unbounded_String. The native Ada String encoding is Latin-1 whereas transactions with the Javascript part are in UTF-8 encoding.

Some drawbacks come up, for instance, with internationalization of programs [see Localize Gnoga demo]:

- Several conversions between String and Unbounded_String objects it isn't usable out of Latin-1 character set, characters out of Latin-1 set are blanked;
- Continuous conversions between Latin-1 and UTF-8, each sent and received transaction between Ada and Javascript parts.

Two ways of possible improvement for native Ada String: dynamic length handling and Unicode support.

13.3.3 Definitions

Supported encoding schemes

```
type Encoding_Scheme is [ASCII_7, Latin_1, UTF_8, UTF_16BE, UTF_16LE];
```

Supported UTF-16 encoding schemes

```
subtype UTF_16_Encoding_Scheme is Encoding_Scheme range UTF_16BE .. UTF_16LE;
```

Characters in ISO/IEC 646

```
subtype ASCII_Character is Ada.Characters.Handling.ISO_646;
subtype ASCII_Character_Array is String with
    Dynamic_Predicate => [for all Item of ASCII_Character_Array => Item in ASCII_Character];
```

Characters in ISO/IEC 8859-1

```
subtype Latin_1_Character is Character;
subtype Latin_1_Character_Array is String;
```

Characters in Unicode Basic Multilingual Plane

```

subtype BMP_Character is Wide_Character;
subtype BMP_Character_Array is Wide_String;

Characters in Unicode planes

subtype Unicode_Character is Wide_Wide_Character;
subtype Unicode_Character_Array is Wide_Wide_String;

Array of 8 bits values representing UTF encodings [UTF-8, UTF-16BE, or UTF-16LE]

subtype UTF_8_Character_Array is Ada.Strings.UTF_Encoding.UTF_String;
subtype UTF_16_Character_Array is Ada.Strings.UTF_Encoding.UTF_String;

Container type of Unicode characters with dynamic size usually named string

type UXString is tagged private with
  Constant_Indexing => Element,
  Iterable => [First => First, Next => Next, Has_Element => Has_Element, Element => Element],
  String_Literal => From_Unicode;

```

13.3.4 Workarounds

First possibility is using UTF-8 as internal implementation in Unbounded_String objects. The simplest way but Gnoga uses many times character indexes to parse Javascript messages that is not easy to achieved with UTF-8 which may have several lengths to represent one character. String parsing will be time consuming. Some combinations may lead to incorrect UTF-8 representation.

Second possibility is to use Unbounded_Wide_String or Unbounded_Wide_Wide_String. Using Unbounded_Wide_String is quite being in the middle of the river might as well use Unbounded_Wide_Wide_String. In this latter case the memory penalty is heavy for only few accentuated character occurrences. So back to Unbounded_Wide_String but you'll miss the so essential emojis ;-)

Third possibility is to make no choice between Latin-1, Wide and Wide_Wide characters. The object shall adapt its inner implementation to the actual content. For instance with English language the most often use case will be Latin-1 inner implementation, for French language the most often will be Latin-1 with some exceptions with BMP [Unicode Basic Multilingual Plane] implementation such as in "œur", for Greek language the most often will be BMP implementation. The programmer won't make any representation choice when for example receiving UTF-8 messages:

```

S2 : UXString;
...
S2 := "Received: " & From_UTF_8 [Message];

```

Automatically S2 will adapt its inner representation to the received characters.
UXStrings packages

Package named UXStrings [Unicode Extended Strings] and its Text_IO child package are proposed to bring String enhancements using some Ada 2022 features.

The first part of UXStrings package contains renaming statements of current Ada types. Ada current String type is structurally an array of Latin-1 characters thus is renamed as Latin_1_Character_Array. And so on.

The second part defines the USXString type as a tagged private type which has got aspects such as Constant_Indexing, Variable_Indexing, Iterable and String_Literal, so we can write:

```
S1, S2, S3 : UXString;
C           : Character;
WC          : Wide_Character;
WWC         : Wide_Wide_Character;
...
S1 := "étais blah blah";
C := S1 [3];
WC := S1 [2];
WWC := S1 [1];
S1 [3] := WWC;
S1 [2] := WC;
S1 [1] := C;
S3 := "une soirée passée à étudier les mathématiques NC&K... ";
for I in S3 loop
    C := S3 [I];
    WC := S3 [I];
    WWC := S3 [I];
    Put_Line (Character' pos [C]' img & Wide_Character' pos [WC]' img & Wide_Wide_Character' pos [WWC]' img);
end loop;
```

The third part defines conversion functions between UXString and various encoding such as Latin-1, BMP [USC-2], Unicode [USC-4], UTF-8 or UTF-16, so we can write:

```
S1 := From_Latin_1 ("blah blah");
S2 := From_BMP ("une soirée passée à étudier la physique ω=Δθ/Δt... ");
S3 := From_Unicode ("une soirée passée à étudier les mathématiques NC&K... ");
Send [To_UTF_8 [S1] & To_UTF_8 [S3]];
```

The fourth part defines various API coming from Unbounded_String such as Append, "&", Slice, "=", Index and so on.

Note: Iterable is a GNAT specific aspect.

13.3.5 Some thoughts

I've preferred that the API of legacy Ada "string" types to be closed to those of Ada library so that the adaptation would be easy. Note that I've renamed them as character arrays rather than strings in order to accentuate the semantic difference.

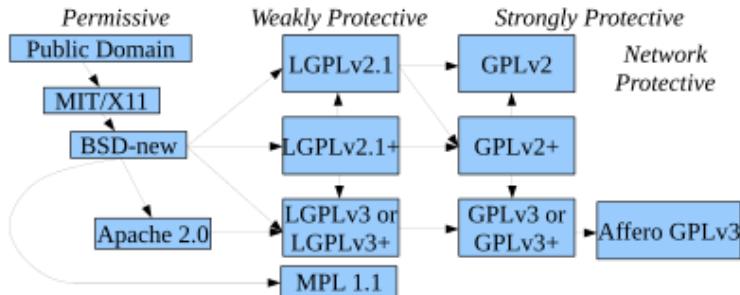
Apart from complex implementations, if you want to access a specific position you have to parse from the beginning of the UTF-8 data as UXStrings1 does. UXStrings2 always computes if the resulting data are all ASCII, so the access is then direct. UXStrings3 is internally like an Unicode array, so the access is direct.

Appendices

1 Copyrights & credits

1.1 Library Licence

v22 is copyright Sowebio under GPL v3 license.



1.1.1 GPL v3 compatibility with others licenses

https://en.wikipedia.org/wiki/License_compatibility: MIT licence is compatible with GPL and can be re-licensed as GPL. European Union Public Licence [EUPL] is *explicitly compatible* with GPL v2 v3, OSL v2.1 v 3, CPL v1, EPL v1, CeCILL v2 v2.1, MPL v2, LGPL v2.1 v3, LiLIQ R R+ AGPL v3.

1.2 Manual license

This manual is intended for v22, a KISS library for Ada command line programs. Copyright © 2004, 2005, 2020, 2021, 2022, 2023 Stéphane Rivière. This document may be copied, in whole or in part, in any form or by any means, as is or with alterations, provided that alterations are clearly marked as alterations and this copyright notice is included unmodified in any copy.

1.3 v22 Packages copyrights, credits and licences

Andreas Almroth: <https://web.archive.org/web/20070403105909/http://www.almroth.com/adacurl> [Curl binding, LGPL v2]

David Botton: <https://www.linkedin.com/in/david-botton-3741b210> [Gnoga, LGPL v3]

Dmitry A. Kazakov: <http://www.dmitry-kazakov.de/ada/components.htm> [Simple Components, GPLv2]

Jeffrey R. Carter: <https://github.com/jrcarter/PragmARC> [PragmAda Reusable Components, 3 Clause BSD]

Michael Rohan: <https://sourceforge.net/projects/zanyblue> [Internationalization, 3 Clause BSD]

Pascal Pignard: <https://github.com/Blady-Com> [UXStrings, CECILL-C v2.1]

2 To-do list

2.1 New features

2.1.1 v22.Api

20231102 - API OVH with provisions for other providers.

2.1.2 v22.Gui

20231102 - Add double clic to an item list to open record view.

20231102 - Add automatic keyboard short-cut to Module_Menu and User_Menu.

20231108 - The user list does not indicate whether it extends over several pages.

2.1.3 v22.Net

Mail and SMS sending.

2.1.4 v22.Pie

Print, import and export module.

2.1.5 v22.Tio

20231102 - Add procedures Tio.Cursor_On and Cursor_Off using "tput civis" cursor invisible and "tput cnorm" cursor visible] or To hide the cursor: ESC + "?25l" and to To re-enable the cursor: ESC + "?25h" see <https://gist.github.com/fnky/458719343aab01cfb17a3a4f7296797>

20231102 - Add functions "tput lines" and "tput cols" to get current console lines and columns values or the oneliner echo -e "lines\ncols"\tput -S or use <https://stackoverflow.com/questions/27902721/ioctl-tiocgwinsz-in-gnat-ada-returns-errno-25-but-c-program-work-fine> [should be better] and https://www.pegasoft.ca/resources/boblap/99_e.html

Tput overview : <https://stackoverflow.com/questions/5947742/how-to-change-the-output-color-of-echo-in-linux/20983251#20983251>

Add ANSI full color control including this work <https://github.com/moste0/ansi-ada> https://en.wikipedia.org/wiki/ANSI_escape_code#CSI_sequences

20231102 - Add function [enter] or [quit]

20231102 - Add function [Yes] or [no] with Yes/No default choice

2.2 Other changes

<<<TODO>>>

2.3 Bugs correction

2.3.1 v22.Gui

20231108 - The 'Enter' key causes a disconnection when searching for in a CRUD.

20231108 - The 'Enter' key is not active when entering login + password.

2.4 Doc

2.4.1 The never-ending task

Hunt <<<TODO>>> tags :]

3 Quality control

Check list

<<< TODO>>>

4 Release check list

Things to do to release to github

<<< TODO>>>

5 History

5.1 Phase 1

2022 – 7 weeks: Théodore Gigault, first-year EINSERB intern.

v22.Gui: Gnoga study, extensive documentation and early developments, including breadcrumb.

5.2 Phase 2

2023 – 7 weeks: Arthur Le Floch, first-year EINSERB intern.

v22.Gui: Completion of the first release, as the web brick that justifies the v22 framework in its own right.

5.3 Phase 3

2023 – 4 weeks : Stéphane Rivière, Sowebio CTO.

v22: Porting the v20 library to the v22 framework.

v22.Uxs: Add UXStrings and delete v20.Vst.

v22.Sql: Removing Dmiti Kazakov's SQLite bind and replacing it with David Botton's MySQL and SQLite bind and upgrading v22.Sql functions as the two binds have a different approach. Debugging of the Gnoga.Database.Server binding and work on v22.Sql to make the MySQL and SQLite interface perfectly normalized.

v22.Sql: This work shows that v22.Sql is far superior to v20.Sql. N databases can now be opened simultaneously [interesting for gateways], integrated data dictionaries are more elaborate, an exception automatically closes all database connections, etc.

5.4 Phase 4

2023 – 6 weeks : Stéphane Rivière, Sowebio CTO.

v22 : Source width increased to 131 columns.

v22 : Generalization of .adb chaptering with API & Private as in v22.Gui.

v22.Gui : Source reformatting: v22 standardization.

v22.Gui : To_UXStrings replaced by v22.Uxs.To_String_Unsigned.
v22.Gui : Replacement of View, Base, Element, Common with package initials for v22 naming standardization.
v22.Gui : Rename CRUD with Main_Menu.
v22 : Parallel management of <application>.log and <application>-gnoga.log with setters to control them.
v22 : Automatic creation of configuration file <application>.cfg. handling of parameters read.
v22 : Correct management of the <application>.log file in the event of unexpected termination [the current buffer is correctly emptied in the file].
v22 : Ctrl-C interception for orderly application termination [file closing, SQL disconnection, etc.].
v22.Gui : Add host and port parameters to the connection function.
v22.Gui : Online help, HTML file display.
v22.Gui : Rename Set_Text>Title to Put_Text>Title.
v22 : Unification of v22 and Gnoga debug modes.
v22 : Adding On_Off getters.
v22 : General conversion of getters and setters from Boolean type [True/False] to On_Off type [On/Off].
v22 : On_Off type added for Msg.Std, Tio.Put, Tio.Put_Line and Uxs.To_String
v22 : Validation or inhibition of Ctrl-C.
v22.Gui : Installation of the free Overpass font [optimized for web reading] in regular, bold, italic and bolditalic.
v22.Gui : Preparing for application theming.
v22.Gui : Harmonization of v22 resource directories [icons, images] and Gnoga [use of Gnoga's standard /img directory].
v22.Gui : Main_Menu_Add_Element, add "event On_Click : GGB.Action_Event := null" parameter to extend Main_Menu caps.
v22.Gui : alpha reordering.
v22.Msg : Log procedures names refactoring.
v22 : Change all Line procedures to New_Line.
v22 : Handling of the default 8 hours connection timeout associated to the infamously unclear "MySQL Server Has Gone Away" error message with a task pinging the MySQL server every hour.
v22.Gui: Main_Menu mode 1 [direct mode] implementation in addition to mode 2 [sub menu mode].
v22.Gui: First [intermediate] version of user management, as a demonstration of a more elaborate future model [automatic generation from a data dictionary].
v22.Uxs : Remove routines now implemented in UXStrings with v22 refactoring.
v22 : Documentation update v34 to v66, 165 to 228 pages. Update UXStrings API.

6 Issues

6.1 Compiler bug reporting

Historic and still working report email: report@gnat.com

Since the beginning of the XXIth century: report@adacore.com

6.1.1 GNAT CE 2019 - Exception with Delete_Tree

Ada.Directories.Del_Tree crashes if a broken symbolic link in a directory of the tree to be deleted exists: raised ADA.IO_EXCEPTIONS.USE_ERROR: directory tree rooted at "/home/sr/opt/gnat-2019/lib/xmlada/xmlada_input.relocatable" could not be deleted.

- Demo

```
Ada.Directories.Delete_Tree > Is_Valid_Path_Name > Is_Directory Ada >
is_Directory C > adaint.c > __gnat_is_directory >
__gnat_reset_attributes > __gnat_is_directory_attr >
* __gnat_stat_to_attr* > __gnat_stat > GNAT_STAT

Around More_Entries > Fetch_Next_Entry > readdir_gnat > Match

Here a broken symbolic link libxmlada_input_sources.so which is declared "non existent" by File_Exists_Attr [C_Full_Name' Address, Attr' Access]; en 776 which is __gnat_file_exists_attr in 1668 of adaint.c with a reference to a structure in adaint.h:

-----
struct file_attributes {
    int          error;

/* Errno value returned by stat()/fstat(). If non-zero, other fields
should be considered as invalid. */

    unsigned char exists;
    unsigned char writable;
    unsigned char readable;
    unsigned char executable;

    unsigned char symbolic_link;
    unsigned char regular;
    unsigned char directory;
-----
Who calls *__gnat_stat_to_attr* and test a file descriptor at -1, [broken symbolic
link I guess]. Then __gnat_stat returns 2 to __gnat_stat_to_att with a test at line
1124 of adaint.c

    if [error == 0 || error == ENOENT]
        attr->error = 0;

In s-oscons.ads ENOENT: constant := 2; -- File not found !

<shadok> So if you can't find the file, there's no error. </shadok>
```

- Conclusion

The rest becomes clear... The broken symbolic link libxmlada_input_sources.so is declared to not exist, the routine exits of the current directory (which it is believed to be empty, to delete it, and then crashes when it tries to erase this directory, which is empty but isn't...).

- Solving

We could re-code this recursive function in a simpler way. However, the best thing to do would be to correct the anomaly which is probably in __gnat_stat, so that this func-

tion returns the correct value and doesn't confuse 'doesn't exist' [the file to which the symbolic link points] with 'doesn't exist' [the symbolic file].

Preliminary





Ada, « it's stronger than you ».
Tribute to Daniel Feneuille, a legendary french Ada teacher [and much more]⁷

The link below is kept here for future use...

<https://this-page-intentionally-left-blank.org>



⁷ <http://d.feneuille.free.fr>