Using GPS

The GNAT Programming Studio

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AdaCore

Table of Contents

1 Introduction

GPS is a complete integrated development environment that gives access to a wide range of tools and integrates them smoothly.

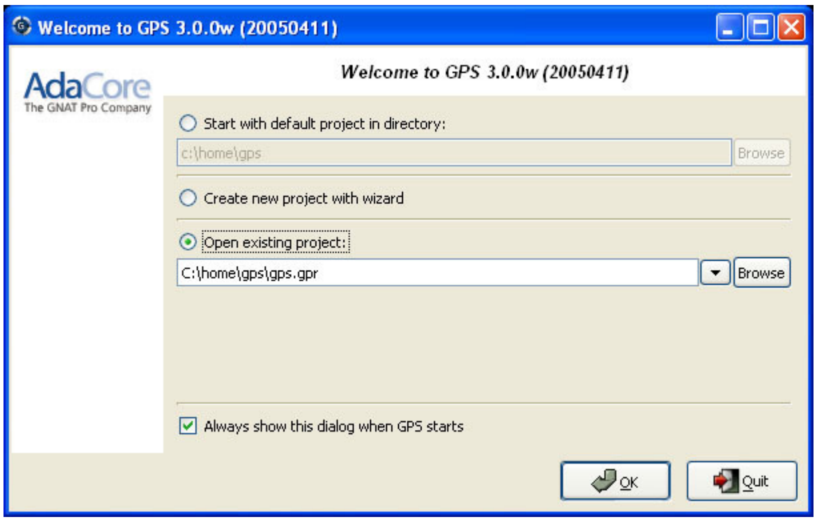
GPS gives access to built-in file editing; HTML based help system; complete compile/build/run cycle; intelligent source navigation; project management; general graph technology giving access to many different browsers such as source dependency, project dependency, call graphs, entity view, etc. . . ; fully integrated visual debugger; generic version control system, providing access to CVS, Subversion, ClearCase, and any other via xml plug-ins; many other tools such as a visual comparison, automatic generation of files, source reformatting.

GPS is fully customizable, providing several levels of customizations: a first level, available through the preferences and key manager dialogs; a second level, which allows you to customize your menu items, tool bar and key bindings; a third level, which allows you to automate processing through scripts (via xml and python scripting). See Chapter 16 [Customizing and Extending GPS], page 165 for more details.

GPS also interacts with most versions of command-line tools such as gcc, gdb, gnatmake, etc. . . .

2 Description of the Main Windows

2.1 The Welcome Dialog


Welcome to GPS 3.0.0w (20050411)

AdaCore
The GNAT Pro Company

Welcome to GPS 3.0.0w (20050411)

○ Start with default project in directory:
c:\home\gps
Browse

○ Create new project with wizard

● Open existing project:
C:\home\gps\gps.gpr
Browse

☑ Always show this dialog when GPS starts

OK
Quit

When starting GPS, a welcome dialog is displayed by default, giving the following choices:

Start with default project in directory

If you select this option and click on the `OK` button, GPS will first look for a project called '`default.gpr`' in the current directory and load it if found. Otherwise, it will copy in the current directory the default project found under '`<prefix>/share/gps/default.gpr`' and load it. GPS will remove this copy when exiting or loading another project, if the copy has not been modified during the session.

If the current directory is not writable, GPS will instead load directly `<prefix>/share/gps/readonly.gpr`.

Create new project with wizard

Selecting this option and clicking on the `OK` button will start a wizard allowing you to specify most of the properties for a new project. Once the project is created, GPS will save it and load it automatically. See Section 7.8 [The Project Wizard], page 70 for more details on the project wizard.

Several kinds of wizard are available. Depending on the kind of project, you will get asked different type of information. In the end, GPS will create one or more project files, and automatically load them.

One of the wizard, `"From existing Ada sources"`, will try and import a set of sources and object files, and attempt to create one or more project files so that building your application through these project files will put the objects in the same directory they are currently in. If you have not compiled your application when launching this wizard, GPS will create a single project file and all object files will be put in the same object directory. This is the prefered method when importing sources with duplicate file names, since the latter is only authorized in a single project file, not across various project files.

Open existing project
You can select an existing project by clicking on the `Browse` button, or by using a previously loaded project listed in the combo box. When a project is selected, clicking on the `OK` button will load this project and open the main window.

Always show this dialog when GPS starts
If unset, the welcome dialog won't be shown in future sessions. In this case, GPS will behave as follows: it will first look for a `-P` switch on the command line, and load the corresponding project if present. Then, it will look for a project file in the current directory and will load the first project file found.

If no project file can be found in the current directory, GPS will start with the default project.

To reset this property, go to the menu `Edit->Preferences`. See Section 16.1 [The Preferences Dialog], page 165.

Quit If you click on this button, GPS will terminate immediately.

When you specify a -P switch on the command line, or if there is only one project file in the current directory, GPS will start immediately with the project file specified, instead of displaying the welcome dialog.

In addition, if you specify source files on the command line, GPS will also start immediately, using the default project if no project is specified.

By default, files specified on the command line are taken as is and can be absolute or relative pathnames. In addition, if you prepend a filename with the `=` character, then GPS will look for the file in the source search path of the project.

2.2 The Menu Bar

This is a standard menu bar that gives access to all the global functionalities of GPS. It is usually easier to access a given functionality using the various contextual menus provided throughout GPS: these menus give direct access to the most relevant actions given the current context (e.g. a project, a directory, a file, an entity, . . .). Contextual menus pop up when the right mouse button is clicked or when using the special ⟨open contextual menu⟩ key on most PC keyboards.

The menu bar gives access to the following items:

File	See [The File Menu], page 32.
Edit	See [The Edit Menu], page 36.
Navigate	See Section 6.2 [The Navigate Menu], page 53.
VCS	See Section 12.3 [The VCS Menu], page 139.
Project	See Section 7.7 [The Project Menu], page 68.
Build	See Section 9.1 [The Build Menu], page 93.
Debug	See Section 11.1 [The Debug Menu], page 107.
Tools	See Section 13.1 [The Tools Menu], page 147.
Window	See Chapter 4 [Multiple Document Interface], page 21.
Help	See Section 3.1 [The Help Menu], page 19.

2.3 The Tool Bar

The tool bar provides shortcuts via buttons to some typical actions: creating a new file, opening a file, saving the current file; undo/redo last editing; cut to clipboard, copy to clipboard, paste from clipboard; go to previous/next location; start/continue the debugging session, step/next execution, finish current procedure.

The icon on the far right of the tool bar will be animated to indicate that an action (e.g. a build or a search) is going on in the background.

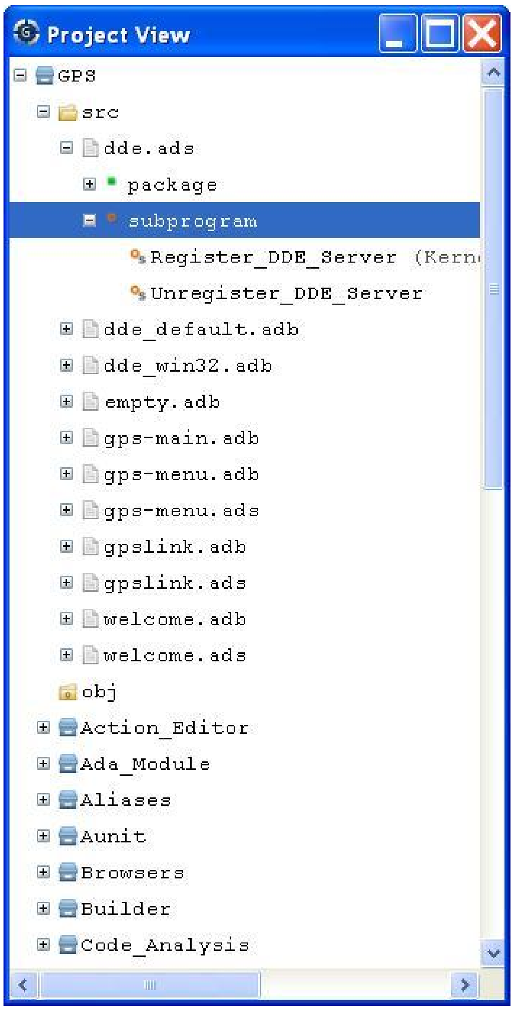
2.4 The Work Space

The whole work space is based on a multiple document interface, See Chapter 4 [Multiple Document Interface], page 21.

2.5 The Project View

The project view provides a representation of the various components of your project hierarchy, as listed below. It is displayed by default on the left side of the main window, and can be selected by using the `Project->Project View` or `Tools->Views->Project` menu items.

Under Windows, it is possible to drop files (coming e.g. from the Explorer) in the project view with the following behavior: a project file dropped will be loaded; any other file will be opened in a new source editor.



```
GPS
  src
    dde.ads
      package
      subprogram
        Register_DDE_Server  (Kern
        Unregister_DDE_Server
    dde_default.adb
    dde_win32.adb
    empty.adb
    gps-main.adb
    gps-menu.adb
    gps-menu.ads
    gpslink.adb
    gpslink.ads
    welcome.adb
    welcome.ads
  obj
  Action_Editor
  Ada_Module
  Aliases
  Aunit
  Browsers
  Builder
  Code_Analysis
```

The project view, as well as the file and outline view provide an interactive search capability allowing you to quickly search in the information currently displayed. The default key to start an interactive search is ⟨control-f⟩. This will open a small window at the bottom of the view where you can interactively type names. The first matching name in the tree will be selected while you type it.

You can then also use the ⟨up⟩ and ⟨down⟩ keys to navigate through all the items matching the current text.

The various components that are displayed are:

projects All the sources you are working with are put under control of projects. These projects are a way to store the switches to use for the various tools, as well as a number of other properties.

They can be organized into a project hierarchy, where a root project can import other projects, with their own set of sources.

Initially, a default project is created, that includes all the sources in the current directory.

The `Project View` displays this project hierarchy: the top node is the root project of your application (generally, this is where the source file that contains the main subprogram will be located). Then a node is displayed for each imported project, and recursively for their own imported projects.

A given project might appear multiple times in the `Project View`, if it is imported by several other projects.

There exists a second display for this project view, which lists all projects with no hierarchy: all projects appear only once in the view, at the top level. This display might be useful for deep project hierarchies, to make it easier to find projects in the project view.

This display is activated through the contextual menu entry `Show flat view`, which acts as a switch between the two displays.

A special icon with a pen mark is displayed if the project was modified, but not saved yet. You can choose to save it at any time by right-clicking on it. GPS will remind you to save it before any compilation, or save it automatically, if the corresponding preference is saved.

directories

The files inside a project can be organized into several physical directories on the disk. These directories are displayed under each project node in the `Project View`

You can chose whether you want to see the absolute path names for the directories or paths relative to the location of the project. This is done through the `Show absolute paths` contextual menu.

Special nodes are created for object and executables directories. No files are shown for these.

The contextual menu entry `Show hidden directories` can be used to filter the directories considered as hidden. This can be used to not display the version control directories like '`CVS`' or '`.svn`' for example.

files The source files themselves are stored in the directories, and displayed under the corresponding nodes. Note that only the source files that actually belong to the project (i.e. are written in a language supported by that project and follow its naming scheme) are actually visible. For more information on supported languages, See Section 7.2 [Supported Languages], page 62.

A given file might appear multiple times in the `Project View`, if the project it belongs to is imported by several other projects.

If you left click on a file and keep the button pressed, you can drop it anywhere in GPS to open an editor at that location.

entities If you open the node for a source file, the file is parsed by one of the fast parsers integrated in GPS so that all entities declared in the project can be shown. These entities are grouped into various categories, which depend on the language. Typical categories include subprograms, packages, types, variables, tasks, . . .

Double-clicking on a file, or simple clicking on any entity will open a source editor and display respectively the first line in this file or the line on which the entity is defined.

You can also drag a file anywhere into GPS. This will open a new editor if the file is not already edited, or move the existing editor otherwise. If you press ⟨shift⟩ at the same time, and the file is already edited, a new view of the existing editor is created instead.

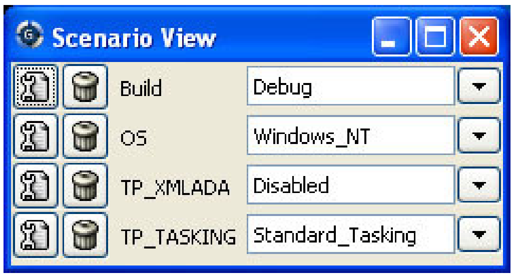
If you open the search dialog through the `Navigate->Find or Replace...` menu, you have the possibility to search for anything in the project view, either a file or an entity. Note that searching for an entity can be slow if you have lots of files, and/or big files.

A contextual menu, named `Locate in Project View`, is also provided when inside a source editor. This will automatically search for the first entry for this file in the project view. This contextual menu is also available in other modules, e.g. when selecting a file in the `Dependency Browser`.

2.5.1 The configuration variables

As described in the GNAT User's Guide, the project files can be configured through external variables (typically environment variables). This means that e.g. the exact list of source files, or the exact switches to use to compile the application can be changed when the value of these external variables is changed.

GPS provides a simple access to these variables, through a window called the `Scenario View`. These variables are called `Configuration Variables`, since they provide various scenarios for the same set of project files.



Build	Debug
OS	Windows_NT
TP_XMLADA	Disabled
TP_TASKING	Standard_Tasking

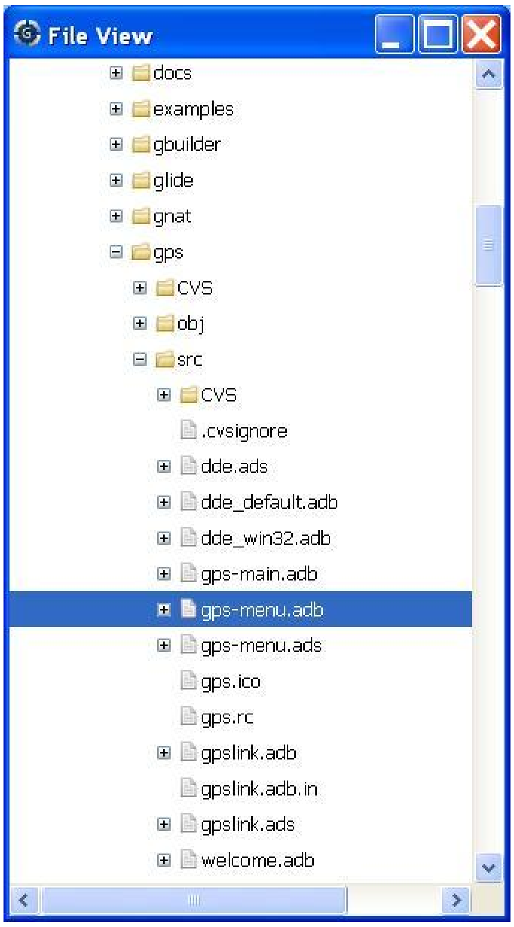
A combo box is displayed in this area for each environment variable the project depends on. The current value of the variable can be set simply by selecting it from the pop-down window that appears when you click on the arrow on the right of the variable name

New variables can be added through the contextual menu `Project->Add Configuration Variable` in the `Project View`. The list of possible values for a variable can be changed by clicking on the button on the left of the variable's name.

Whenever you change the value of one of the variables, the project is automatically recomputed, and the list of source files or directories is changed dynamically to reflect the new status of the project. Starting a new compilation at that point will use the new switches, and all the aspects of GPS are immediately affected according to the new setup.

2.6 The File View

In addition to the `Project View`, GPS also provides a `File View` through the `Tools->Views->Files` menu.



In this view, directories are displayed exactly as they are organized physically on the disk (including Windows drives).

By default, the `File View` will display all the files that exist on the disk. Filters can be set through the contextual menu to only show the files and directories that belong to the project hierarchy by using the contextual menu `Show files from project only`.

Each source file can also be explored as described in Section 2.5 [The Project View], page 5. Drag and drop of files is also possible from the files view, to conveniently open a file.

The contextual menu also allow you to create, rename and delete files and directories. Some of those operations are also available from the Project View.

2.7 The Window View

The `Window View` displays the currently opened windows. It is opened through the `Tools->Views->Windows` menu.

It can display the opened windows in one of two ways:

- Sorted alphabetically
- Organized by notebooks, as in the GPS window itself. This latter view is mostly useful if you have lots of windows open

The mode is selected through the contextual menu.

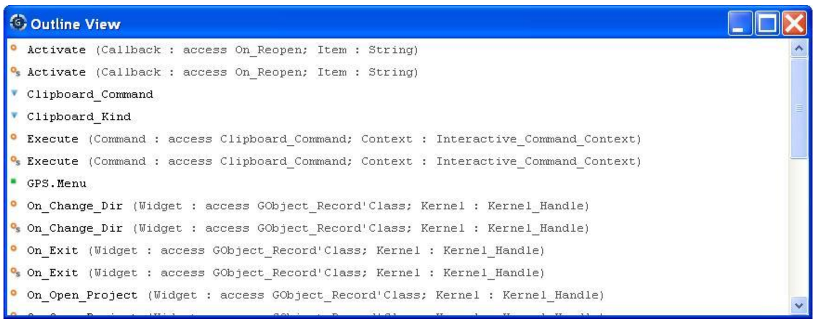
You can also choose, through this contextual menu, whether only the source editors should be visible, or whether all windows should be displayed.

This window allows you to quickly select and focus on a particular window, by clicking on the corresponding line with the left mouse button. If you click and leave the mouse button pressed, this starts a drag and drop operation so that you can also move the window to some other place in the desktop (see the description of the MDI earlier in this document).

Multiple windows can be selected by clicking with the mouse while pressing the control or shift keys. The Window view provides a contextual menu to easily close all selected windows at once, which is a very fast way to cleanup your desktop after you have finished working on a task.

2.8 The Outline View

The Outline View, which you can choose to activate through the `Tools->Views->Outline` menu, shows the contents of the current file.



```
Activate (Callback : access On_Reopen; Item : String)
Activate (Callback : access On_Reopen; Item : String)
Clipboard_Command
Clipboard_Kind
Execute (Command : access Clipboard_Command; Context : Interactive_Command_Context)
Execute (Command : access Clipboard_Command; Context : Interactive_Command_Context)
GPS.Menu
On_Change_Dir (Widget : access GObject_Record'Class; Kernel : Kernel_Handle)
On_Change_Dir (Widget : access GObject_Record'Class; Kernel : Kernel_Handle)
On_Exit (Widget : access GObject_Record'Class; Kernel : Kernel_Handle)
On_Exit (Widget : access GObject_Record'Class; Kernel : Kernel_Handle)
On_Open_Project (Widget : access GObject_Record'Class; Kernel : Kernel_Handle)
```

The exact meaning of this depends on the language you are seeing. For Ada, C and C++ files, this is the list of entities that are declared at the global level in your current file (Ada packages, C++ classes, subprograms, Ada types, . . .).

Clicking on any entity in this view will automatically jump to the right line in the file, including if your file has been slightly modified since the outline view was last refreshed.

To refresh the contents of the view, select the `Refresh` entry in the contextual menu (right-click anywhere in the outline view). Alternatively, you can switch temporarily to another window and come back to the same editor, and the outline view will be refreshed.

There are several preferences associated with the outline view, See [Outline Preferences], page 183.

2.9 The Clipboard View

GPS has an advanced mechanism for handling copy/paste operations.

When you select the menus `Edit->Copy` or `Edit->Cut`, GPS adds the current selection to the clipboard. As opposed to what lots of applications do, it doesn't discard the previous contents of the clipboard, but save it for future usage. It saves a number of entries this way, up to 10 by default. This value is configurable through the `Clipboard Size` preference.

When you select the menu `Edit->Paste`, GPS will paste the last entry made in the clipboard at the current location in the editor.

If you immediately select `Edit->Paste Previous`, this newly inserted text will be removed, and GPS will instead insert the second to last entry added to the clipboard. You can keep selecting the same menu to get access to older entries.

This is a very powerful mechanism, since it means you can copy several distinct lines from a place in an editor, move to an other editor and paste all these separate lines, without having to go back and forth between the two editors.

The `Clipboard View` provides a graphical mean of seeing what is currently stored in the clipboard. It appears as a list of lines, each of which is associated with one level of the clipboard. The text that shows in these lines is the first line of the selection at that level that contains non blank characters. Leading characters are discarded. `[...]` is prepended or appended in case the selection has been truncated.

If you bring the mouse over a line in the `Clipboard View`, a tooltip will pop up showing the entire selection corresponding to the line by opposition to the possibly truncated one.

In addition, one of the lines has an arrow on its left. This indicates the line that will be pasted when you select the menu `Edit->Paste`. If you select instead the menu `Edit->Paste Previous`, then the line below that one will be inserted instead.

If you double-click on any of these lines, GPS will insert the corresponding text in the current editor, and make the line you clicked on the current line, so that selecting `Edit->Paste` or the equivalent shortcut will now insert that line.

The contextual menu in the clipboard view provides one entry, which is `Append To Previous`. If you select this entry, the select line will be append to the one below, and removed from the clipboard. This means that selection `Edit->Paste` will in fact paste the two entries at the same time. This is in particular useful when you want to copy lines from separate places in the initial file, merge them, and then paste them together one or more times later on, through a single operation.

The Clipboard View content is preserved between GPS sessions. As an exception, huge entries are removed and replaced with an entry saying "[Big entry has been removed]".

2.10 The Callgraph View

The callgraph view plays a role similar the callgraph browser. They display the same information about entities, but in two different ways: the callgraph view displays the information in a tree, easily navigable and perhaps easier to manipulate when lots of entities are involved; the callgraph browser displays the information as graphical boxes that can be manipulated on the screen, and is best suited to generate a diagram that can be later exported to your own documents.

This callgraph view is used to display the information about what subprograms are called by a given entity, and, opposite, what entities are calling a given entity.

This view is automatically displayed when you select one of the contextual menus `... calls` and `... is called by`. Every time you select one of these menus, a new view is opened to display that entity.

Whenever you expand a node from the tree by clicking on the small expander arrow on the left of the line, further callgraph information is computed for the selected entity, which makes it very easy to get information for a full callgraph tree.

Closing and expanding a node again will recompute the callgraph for the entity.

On the right side of the main tree, a list displays the locations of calls for the selected entity. Clicking on entries in this list opens editors showing the corresponding location.

The Callgraph View supports keyboard navigation: `Up` and `Down` keys navigate between listed locations, `Left` collapses the current level, `Right` expands the current level, and `Return` jumps to the currently selected location.

All open callgraph views are automatically saved in the desktop, and restored the next time you restart GPS. However, the information displayed in these might no longer be accurate at this stage, since it shows the status of the callgraph during the last GPS session.

2.11 Bookmarks

Bookmarks are a convenient way to remember places in your code or in your environment so that you can go back to them at any point in the future. These bookmarks are saved automatically whenever they are modified, and restored when GPS is reloaded, so that they exist across GPS sessions.

Bookmarks will automatically remember the exact location in an editor, not in terms of line/column, but in terms of which word they point to. If you modify the file through GPS, the bookmark will be automatically updated to keep refering to the same place. Likewise if you close and reopen the file. However, when the file is modified outside of GPS, the bookmark will not be aware of that change, and will thus reference another place in the file.

The menu `Edit->Create Bookmark` allows you to create a bookmark at the current location (either in the editor, or the browser for instance).

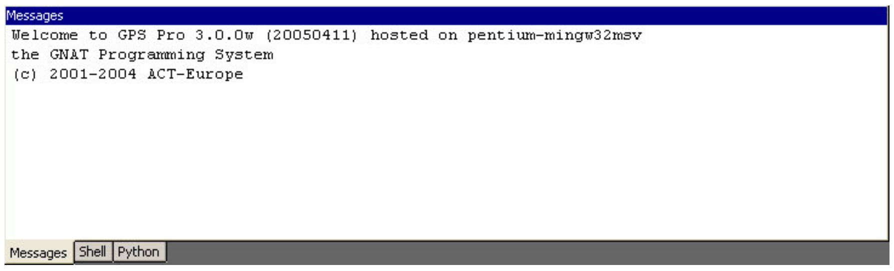
All the bookmarks you have created will be visible in the `Tools->Views->Bookmarks` window. Clicking on the small icon to the left side of each line will immediately jump to that bookmark.

You can rename a bookmark so that it is easier to remember what it refers to. To do so, open the Bookmarks window, and click twice on the line of the bookmark. This will change the way the name is displayed, so that you can edit it in place. Press ⟨enter⟩ when you are done modifying the name.

You can delete an existing bookmark by right clicking on the line, and select `Delete bookmark` in the contextual menu.

2.12 The Messages Window

The Messages window is used by GPS to display information and feedback about operations, such as build output, information about processes launched, error messages.



```
Welcome to GPS Pro 3.0.0w (20050411) hosted on pentium-mingw32msv
the GNAT Programming System
(c) 2001-2004 ACT-Europe
```

This is a read-only window, which means that only output is available, no input is possible.

For an input/output window, see Section 2.15 [The Execution Window], page 17 and also Section 2.13 [The Shell and Python Windows], page 15.

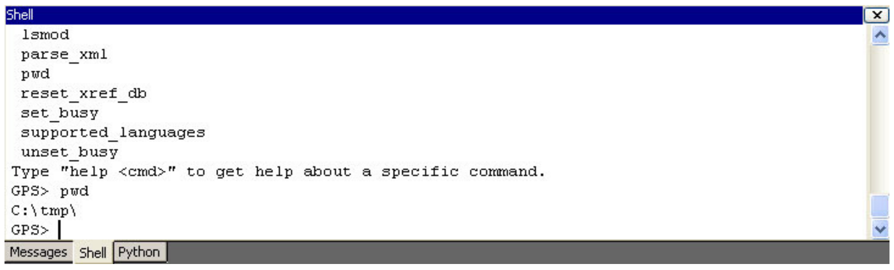
2.13 The Shell and Python Windows

These windows give access to the various scripting languages supported by GPS, and allow you to type commands such as editing a file or compiling without using the menu items or the mouse.

Some of these windows, especially the python window, might not be visible in your version of GPS, if GPS wasn't compiled with the support for that specific scripting language.

To show the shell consoles, select the menu `Tools`.

See Section 16.8 [Scripting GPS], page 254 for more information on using scripting languages within GPS.

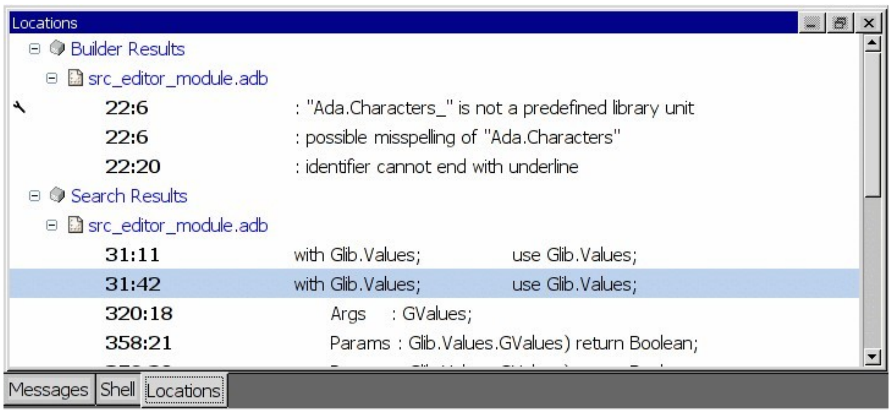


```
  lsmod
  parse_xml
  pwd
  reset_xref_db
  set_busy
  supported_languages
  unset_busy
Type "help <cmd>" to get help about a specific command.
GPS> pwd
C:\tmp\
GPS> 
```

You can use the ⟨up⟩ and ⟨down⟩ keys to navigate through the history of commands.

2.14 The Locations Tree

The Location Tree is filled whenever GPS needs to display a list of locations in the source files (typically, when performing a global search, compilation results, and so on).



```
Builder Results
  src_editor_module.adb
      22:6        : "Ada.Characters_" is not a predefined library unit
      22:6        : possible misspelling of "Ada.Characters"
      22:20       : identifier cannot end with underline
Search Results
  src_editor_module.adb
      31:11       with Glib.Values;        use Glib.Values;
      31:42       with Glib.Values;        use Glib.Values;
      320:18         Args   : GValues;
      358:21         Params : Glib.Values.GValues) return Boolean;
```

The Location Tree shows a hierarchy of categories, which contain files, which contain locations. Clicking on a location item will bring up a file editor at the requested place. Right-clicking on file or category items brings up a contextual menu allowing you to remove the corresponding node from the view.

Every time a new category is created, as a result of a compilation or a search operation for instance, the first entry of that category is automatically selected, and the corresponding editor opened. This behavior can be controlled through a preference `Jump To First Location`.

To navigate through the next and previous location (also called `Tag`), you can use the menu items `Navigate->Previous Tag` and `Navigate->Next Tag`, or the corresponding key bindings.

Left-clicking on a line in the Location Tree brings up a contextual menu with the following entries:

Sort by subcategory
Toggle the sorting of the entries by sub-categories. This is useful, for example, for separating the warnings from the errors in the build results.

Expand category
Expand all the files in the current categories.

Collapse all
Collapse all the categories in the Locations View

Jump to location
Open the location contained in the message, if any.

Clear Locations View
Remove all entries from the Locations View.

In some cases, a wrench icon will be associated on the left of a compilation message. See Section 13.3 [Code Fixing], page 150 for more information on how to make advantage of this icon.

2.15 The Execution Window

Each time a program is launched using the menu `Build->Run`, a new execution window is created to provide input and output for this program.

In order to allow post mortem analysis and copy/pasting, the execution windows are not destroyed when the application terminates.

To close an execution window, click on the cross icon on the top right corner of the window, or use the menu `File->Close`, or the menu `Window->Close` or the key binding ⟨Ctrl-W⟩.

If you close the execution window while the application is still running, a dialog window is displayed, asking whether you want to kill the application, or to cancel the close operation.

2.16 The Status Line

The status line is composed of two areas: on the left a status bar and on the right one or several progress bars.

The status bar is used to display temporary information about GPS operations. Note that most of the information GPS displays can be found in the `Messages` window.

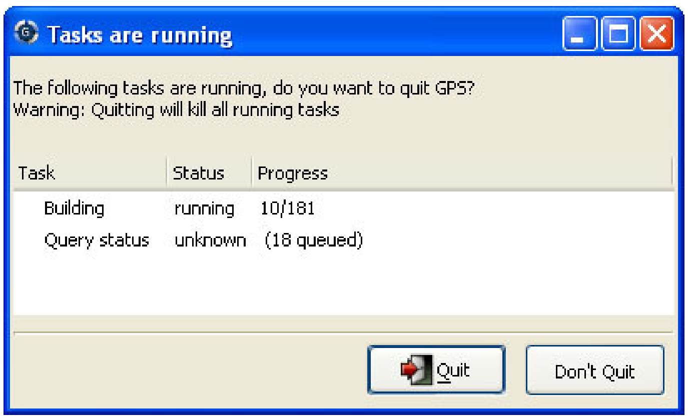
The progress bars are used to display information about on going operations such as builds, searches, or VCS commands. These tasks operate in the background, and can be paused/resumed via a contextual menu. This contextual menu is available by right-clicking on the progress bars themselves or on the corresponding lines in the Task Manager. See Section 2.17 [The Task Manager], page 17

2.17 The Task Manager

The Task Manager window lists all the currently running GPS operations that run in the background, such as builds, searches or VCS commands.

For each of these tasks, the Task Manager shows the status of the task, and the current progress. The execution of theses tasks can be suspended using a contextual menu, brought up by right-clicking on a line.

When exiting GPS, if there are tasks running in the Task Manager, a window will display those tasks. You can also bring up a contextual menu on the items in this window. You can force the exit at any time by pressing the confirmation button, which will kill all remaining tasks, or continue working in GPS by pressing the Cancel button.



The following tasks are running, do you want to quit GPS?
Warning: Quitting will kill all running tasks

Task	Status	Progress
Building	running	10/181
Query status	unknown	(18 queued)

3 Online Help

By default when you start GPS, the working area contains a welcome page giving a few starting points in the online help.

Online help for the GNAT tools is available from the `Help` menu item. GPS launches an external html browser to view these pages. (See Section 16.1 [The Preferences Dialog], page 165 on how to configure this under Unix. Under Windows systems, the default HTML browser is used.)

3.1 The Help Menu

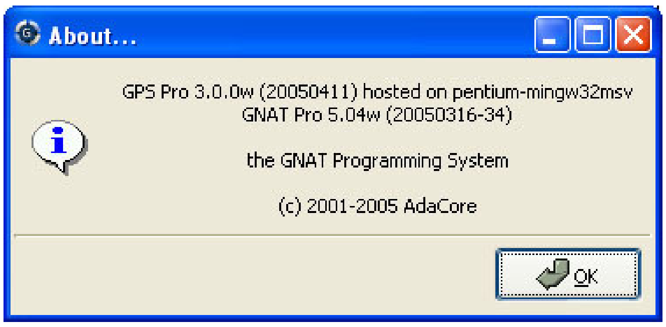
The Help menu item provides the following entries:

Welcome Open the GPS Welcome page.

Open HTML file...
Open a file selection dialog to load an HTML file.

Contents
Open a special HTML file that contains links for all the documentation files currently registered in GPS, See Section 3.2 [Adding New Help Files], page 20.

About Display a dialog giving information about the versions of GPS and GNAT used:



GPS Pro 3.0.0w (20050411) hosted on pentium-mingw32msv
GNAT Pro 5.04w (20050316-34)

the GNAT Programming System

(c) 2001-2005 AdaCore

This menu contains a number of additional entries, depending on what documentation packages were installed on your system. See the next section to see how to add new help files.

3.2 Adding New Help Files

GPS will search for the help files in the list of directories set in the environment variable `GPS_DOC_PATH` (a colon-separated list of directories on Unix systems, or semicolon-separated list of directories on Windows systems). In addition, the default directory `<prefix>/share/doc/gps/html` is also searched. If the file cannot be found in any of these directories, the corresponding menu item will be disabled.

The environment variable `GPS_DOC_PATH` can either be set by each user in his own environment, or can be set system-wide by modifying the small wrapper script '`gps`' itself on Unix systems.

It can also be set programmatically through the GPS shell or any of the scripting languages. This is done with

```
GPS.add_doc_directory ("/home/foo")
```

The specific list of files shown in the menus is set by reading the index files in each of the directories in `GPS_DOC_PATH`. These index files must be called '`gps_index.xml`'.

The format of these index files is specified in see Section 16.5.17 [Adding documentation], page 231.

4 Multiple Document Interface

All the windows that are part of the GPS environment are under control of what is commonly called a multiple document interface (MDI for short). This is a common paradigm on windowing systems, where related windows are put into a bigger window which is itself under control of the system or the windows manager.

This means that, by default, no matter how many editors, browsers, views, . . . windows you have opened, your system will still see only one window (On Windows systems, the task bar shows only one icon). However, you can organize the GPS windows exactly the way you want, all inside the GPS main window.

This section will show the various capacities that GPS provides to help you organize your workspace.

4.1 Selecting Windows

At any time, there is only one selected window in GPS (the **active window**). You can select a window either by clicking in its title bar, which will then get a different color, or by selecting its name in the menu `Window`.

Alternatively, windows can be selected with the keyboard. By default, the selection key is ⟨Alt-Tab⟩. When you press it, a temporary dialog is popped-up on the screen, with the name of the window that will be selected when the key is released. If you press the selection key multiple times, this will iterate over all the windows currently open in GPS.

This interactive selection dialog is associated with a filter, displayed below the name of the selected window. If you maintain ⟨Alt⟩ pressed while pressing other keys than ⟨Tab⟩, this will modify the current filter. From then on, pressing ⟨Alt-Tab⟩ will only iterate through those windows that match the filter.

The filter is matched by any window whose name contains the letter you have typed. For instance, if you are currently editing the files '`unit1.adb`' and '`file.adb`', pressing ⟨t⟩ will only leave '`unit1.adb`' selectable.

4.2 Closing Windows

Wherever the windows are displayed, they are always closed in the same manner. In the right side of the title bar of the window, one small button is displayed, looking like a cross. Clicking on this button will close the window.

An alternative way to close the window is to double-click on the icon to the left of the title bar of the window. Not all windows have such an icon, but editors do for instance.

When a window is closed, the focus is given to the window of the same part of the MDI (each of the docks or the middle area) that previously had the focus.

Therefore, if you simply open an editor as a result of a cross-reference query, you can simply close that editor to go back to where you were before.

Alternatively, you can also select the window by clicking anywhere in its title bar, and then select the menu `Window->Close`

4.3 Splitting Windows

The window in the central area of the MDI can be split at will, through any combination of horizontal and vertical splits. This feature requires at least two windows (text editors, browsers, . . .) to be superimposed in the central area. Selecting either the `Window->Split Horizontally` or `Window->Split Vertically` menus will then split the selected window in two. In the left (resp. top) pane, the currently selected window will be left on its own. The rest of the previously superimposed windows will be put in the right (resp. bottom) pane. You can then in turn split these remaining windows to achieve any layout you want.

All split windows can be resized interactively by dragging the handles that separate them. A preference (menu `Edit->Preferences`) controls whether this resizing is done in opaque mode or border mode. In the latter case, only the new handle position will be displayed while the mouse is dragged.

You may want to bind the key shortcuts to the menus `Window->Split Horizontally` as well as `Window->Split Vertically` using the key manager. In addition, if you want to achieve an effect similar to e.g. the standard Emacs behavior (where ⟨control-x 2⟩ splits a window horizontally, and ⟨control-x 3⟩ splits a window vertically), you can use the key manager (see Section 16.3 [The Key Manager Dialog], page 184).

Several editors or browsers can be put in the same area of the MDI. In such a case, they will be grouped together in a notebook widget, and you can select any of them by clicking on the corresponding tab. Note that if there are lots of windows, two small arrows will appear on the right of the tabs. Clicking on these arrows will show the remaining tabs.

In some cases GPS will change the color and size of the title (name) of a window in the notebook tab. This indicates that the window content has been updated, but the window wasn't visible. Typically, this is used to indicate that new messages have been written in the messages or console window.

4.4 Floating Windows

Although the MDI, as described so far, is already extremely flexible, it is possible that you prefer to have several top-level windows under direct control of your system or window manager. This would be the case for instance if you want to benefit from some extra possibilities that your system might provide (virtual desktops, different window decoration depending on the window's type, transparent windows, . . .).

GPS is fully compatible with this behavior, since windows can also be **floating windows**. Any window that is currently embedded in the MDI can be made floating at any time, simply by selecting the window and then selecting the menu `Window->Floating`. The window will then be detached, and can be moved anywhere on your screen, even outside of GPS's main window.

There are two ways to put a floating window back under control of GPS. The more general method is to select the window through its title in the menu `Window`, and then unselect `Window->Floating`.

The second method assumes that the preference **Destroy Floats** in the menu `Edit->Preferences` has been set to false. Then, you can simply close the floating window by clicking in the appropriate title bar button, and the window will be put back in GPS. If you actually want to close it, you need to click once again on the cross button in its title bar.

A special mode is also available in GPS, where all windows are floating. The MDI area in the main window becomes invisible. This can be useful if you rely on windows handling facilities supported by your system or window manager but not available in GPS. This might also be useful if you want to have windows on various virtual desktops, should your window manager support this.

This special mode is activated through a preference (menu `Edit->Preferences`). This preference is entitled **All Floating**.

4.5 Moving Windows

As we have seen, the organization of windows can be changed at any time by selecting a notebook containing several editors or browsers, and selecting one of the Split menus in the `Window` menu.

A more intuitive method is also provided, based on the drag-and-drop paradigm. The idea is simply to select a window, wherever it is, and then, by clicking on it and moving the mouse while keeping the left button pressed, drop it anywhere else inside GPS.

Selecting an item so that it can be dragged is done simply by clicking with the left mouse button in its title bar, and keep the button pressed while moving the mouse.

If the window is inside a notebook, you can also choose to select the notebook tab to start dragging the window around. In such a case, the windows within the notebook can also be reordered: select the tab, then start moving left or right to the new position the window should have. Note that your mouse must remain within the tab area, since otherwise GPS will enter in the mode where the window can be put in other notebooks.

While you keep the mouse button pressed, and move the mouse around, the selected drop area is highlighted with a dashed border. This shows precisely where the window would be put if you were to release the mouse button at that point.

Here are the various places where a window can be dropped:

Inside the MDI
: The location of the current window is indicated by a dashed rectangle, and the window you are dragging will be positioned at the same location as that rectangle: either on top of the window on which you dropped it (therefore they will both be put inside a notebook), or to one of the sides of that window, splitting as needed.

System window
: If you drop a window outside of GPS (for instance, on the background of your screen), the window will be floated.

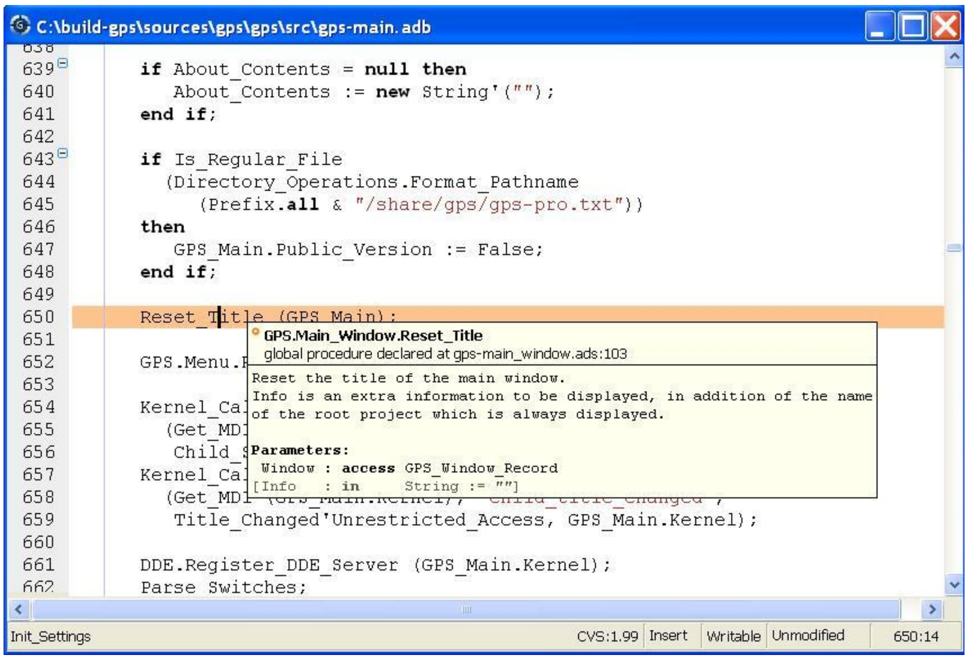
If you maintain the ⟨shift⟩ key pressed while dropping the window, this might result in a copy operation instead of a simple move. For instance, if you are dropping an editor, a new view of the same editor will be created, resulting in two views present in GPS: the original one is left at its initial location, and a second view is created at the new location.

If you maintain the ⟨control⟩ key pressed while dropping the window, all the windows that were in the same notebook are moved, instead of the single one you selected. This is the fastest way to move a group of windows to a new location, instead of moving them one by one.

5 Editing Files

5.1 General Information

Source editing is one of the central parts of GPS, giving in turn access to many other functionalities, including extended source navigation and source analyzing tools.



```
      if About_Contents = null then
         About_Contents := new String'("");
      end if;

      if Is_Regular_File
        (Directory_Operations.Format_Pathname
           (Prefix.all & "/share/gps/gps-pro.txt"))
      then
         GPS_Main.Public_Version := False;
      end if;

      Reset_Title (GPS_Main);

      GPS.Menu.F

      Kernel_Ca
        (Get_MD
         Child_
      Kernel_Ca
        (Get_MD
         Title_Changed'Unrestricted_Access, GPS_Main.Kernel);

      DDE.Register_DDE_Server (GPS_Main.Kernel);
      Parse_Switches;
```

```
GPS.Main_Window.Reset_Title
global procedure declared at gps-main_window.ads:103
Reset the title of the main window.
Info is an extra information to be displayed, in addition of the name
of the root project which is always displayed.

Parameters:
 Window : access GPS_Window_Record
[Info   : in     String := ""]
```

The integrated source editor provides all the usual capabilities found in integrated environments, including:

A title bar
Showing the full name of the file including path information.

Line number information
This is the left area of the source editor. Line numbers can be disabled from the preferences. See Section 16.1 [The Preferences Dialog], page 165. Note that this area can also display additional information, such as the current line of execution when debugging, or cvs annotations.

A scrollbar

Located on the right of the editor, it allows you to scroll through the source file.

A Speed Column

This column, when visible, is located on the left of the editor. It allows you to view all the highlighted lines in a file, at a glance. For example, all the lines containing compilation errors are displayed in the Speed Column. See Section 16.1 [The Preferences Dialog], page 165 for information on how to customize the behavior of the Speed Column.

A status bar

Giving information about the file. It is divided in two sections, one on the left and one on the right of the window.

The left section

The first box on the left shows the current subprogram name for languages that support this capability. Currently `Ada`, `C` and `C++` have this ability. See Section 16.1 [The Preferences Dialog], page 165 to enable or disable this feature.

The right section

If the file is maintained under version control, and version control is supported and enabled in GPS, the first box on the left will show VCS information on the file: the VCS kind (e.g. *CVS*), followed by the revision number, and if available, the status of the file.

The second box shows the current editing mode. This is either *Insert* or *Overwrite* and can be changed using the insert keyboard keys by default.

The third box shows the writable state of the file. You can change this state by clicking on the label directly: this will switch between *Writable* and *Read Only*. Note that this will not change the permissions of the file on disk, it will only change the writable state of the source editor within GPS.

When trying to save a file which is read only on the disk, GPS will ask for confirmation, and if possible, will force saving of the file, keeping its read only state.

The fourth box shows whether the file has been modified since the last save. The three possible states are:

Unmodified
The file has not been modified since the file has been loaded or saved.

Modified The file has been modified since last load or save. Note that if you undo all the editing operations until the last save operation, this label will change to *Unmodified*.

Saved The file has been saved and not modified since.

The fifth box displays the position of the cursor in the file by a line and a column number.

A contextual menu
Displayed when you right-click on any area of the source editor. See in particular Section 6.3 [Contextual Menus for Source Navigation], page 54 for more details.

Syntax highlighting
Based on the programming language associated with the file, reserved words and languages constructs such as comments and strings are highlighted in different colors and fonts. See Section 16.1 [The Preferences Dialog], page 165 for a list of settings that can be customized.

By default, GPS knows about many languages. You can also easily add support for other languages through XML files. Most languages supported by GPS will provide syntax highlighting in the editor.

Automatic indentation
When enabled, lines are automatically indented each time you press the ⟨Enter⟩ key, or by pressing the indentation key. The indentation key is ⟨Ctrl-Tab⟩ by default, and can be changed in the key manager dialog, See Section 16.3 [The Key Manager Dialog], page 184.

If a set of lines is selected when you press the indentation key, this whole set of lines will be indented.

Tooltips When you leave the mouse over a word in the source editor, a small window will automatically pop up if there are relevant contextual information to display about the word.

The type of information displayed depends on the current state of GPS.

In normal mode, the entity kind and the location of declaration is displayed when this information is available. That is, when the cross-reference information about the current file has been generated. If there is no relevant information, no tooltip is displayed. See Section 6.1 [Support for Cross-References], page 51 for more information.

In addition, the documentation for the entity is displayed. This is the block of comments just before or just after the entity's declaration of body. There mustn't be any blank line between the two. For instance, the following are valid documentation for Ada and C:

```
--  A comment for A
A : Integer;

B : Integer;
--  A comment for B

C : Integer;

--  Not a comment for C, there is a blank linke
```

In debugging mode, the value of the variable under the mouse is displayed in the pop up window if the variable is known to the debugger. Otherwise, the normal mode information is displayed.

You can disable the automatic pop up of tool tips in the Editor section of the preferences dialog. See Section 16.1 [The Preferences Dialog], page 165.

Code completion

GPS provides two kinds of code completion: a smart code completion based on semantic information (see [Smart Completion], page 36), and a text completion.

It is useful when editing a file and using often the same words to get automatic word completion. This is possible by typing the ⟨Ctrl-/⟩ key combination (customizable through the key manager dialog) after a partial word: the next possible completion will be inserted in the editor. Typing this key again will cycle through the list of possible completions.

Text completions are searched in all currently open source files, by first looking at the closest words and then looking further in the source as needed.

Delimiter highlighting

When the cursor is moved before an opening delimiter or after a closing delimiter, then both delimiters will be highlighted. The following characters are considered delimiters: ()[]{}. You can disable highlighting of delimiters in the preferences.

You can also jump to a corresponding delimiter by using the ⟨Ctrl-'⟩ key, that can be configured in the preferences. Typing twice on this key will move the cursor back to its original position.

Current line highlighting
You can configure the editor to highlight the current line with a certain color. See Section 16.1 [The Preferences Dialog], page 165.

Current block highlighting
If this preference is enabled, the editor will highlight the current block of code, e.g. the current `begin...end` block, or loop statement, etc...

The block highlighting will also take into account the changes made in your source code, and will recompute automatically the current block when needed.

This capability is currently implemented for Ada, C and C++ languages.

Block folding
When enabled, the editor will display - icons on the left side, corresponding to the beginning of subprograms. If you click on one of these icons, all the lines corresponding to this subprogram are hidden, except the first one. As for the block highlighting, these icons are recomputed automatically when you modify your sources and are always kept up to date.

This capability is currently implemented for Ada, C and C++ languages.

Auto save
You can configure the editor to periodically save modified files. See [autosave delay], page 169 for a full description of this capability.

GPS also integrates with existing third party editors such as `Emacs` or `vi`. See Section 5.9 [Using an External Editor], page 45.

5.2 Editing Sources

5.2.1 Key bindings

In addition to the standard keys used to navigate in the editor (up, down, right, left, page up, page down), the integrated editor provides a number of key bindings allowing easy navigation in the file.

In addition, there are several ways to define new key bindings, see Section 16.5.13 [Defining text aliases], page 219 and Section 16.5.8 [Binding actions to keys], page 208.

⟨Ctrl-Shift-u⟩ Pressing these three keys and then holding Ctrl-Shift allow you to enter characters using their hexadecimal value. For example, pressing ⟨Ctrl-Shift-u-2-0⟩ will insert a space character (ASCII 32, which is 20 in hexadecimal).

⟨Ctrl-x / Shift-delete⟩
Cut to clipboard

⟨Ctrl-c / Ctrl-insert⟩
Copy to clipboard

⟨Ctrl-v / Shift-insert⟩
Paste from clipboard

⟨Ctrl-s⟩ Save file to disk

⟨Ctrl-z⟩ Undo previous insertion/deletion

⟨Ctrl-r⟩ Redo previous insertion/deletion

⟨Insert⟩ Toggle overwrite mode

⟨Ctrl-a⟩ Select the whole file

⟨Home / Ctrl-Pgup⟩
Go to the beginning of the line

⟨End / Ctrl-Pgdown⟩
Go to the end of the line

⟨Ctrl-Home⟩ Go to the beginning of the file

⟨Ctrl-End⟩ Go to the end of the file

⟨Ctrl-up⟩ Go to the beginning of the line, or to the previous line if already at the beginning of the line.

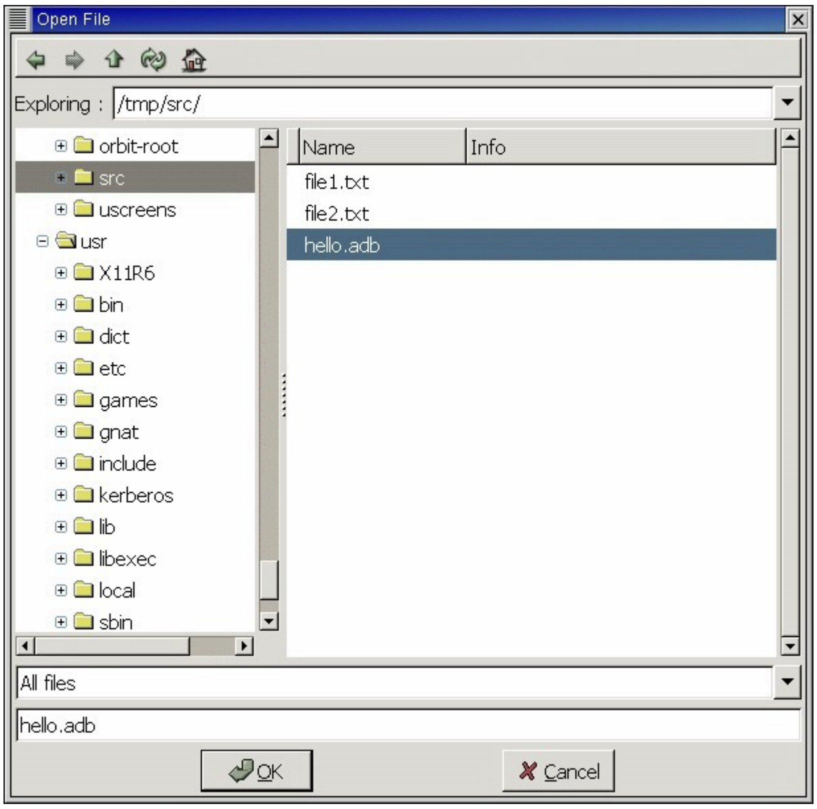
⟨Ctrl-down⟩ Go to the end of the line, or to the beginning of the next line if already at the end of the line.

⟨Ctrl-delete⟩ Delete end of the current word.

⟨Ctrl-backspace⟩
Delete beginning of the current word.

5.3 The File Selector

The file selector is a dialog used to select a file. Under Windows, the default is to use the standard file selection widget. Under other platforms, the file selector is a built-in dialog:



This dialog provides the following areas and capabilities:

- A tool bar on the top composed of five buttons giving access to common navigation features:

  left arrow
  : go back in the list of directories visited

  right arrow
  : go forward

  up arrow
  : go to parent directory

refresh	refresh the contents of the directory
home	go to home directory (value of the HOME environment variable, or `/` if not defined)

- A list with the current directory and the last directories explored. You can modify the current directory by modifying the text entry and hitting ⟨Enter⟩, or by clicking on the right arrow and choose a previous directory in the pop down list displayed.
- A directory tree. You can open or close directories by clicking on the `+` and `-` icons on the left of the directories, or navigate using the keyboard keys: ⟨up⟩ and ⟨down⟩ to select the previous or the next directory, ⟨+⟩ and ⟨-⟩ to expand and collapse the current directory, and ⟨backspace⟩ to select the parent directory.
- A file list. This area lists the files contained in the selected directory. If a filter is selected in the filter area, only the relevant files for the given filter are displayed. Depending on the context, the list of files may include additional information about the files, e.g. the kind of a file, its size, etc...
- A filter area. Depending on the context, one or several filters are available to select only a subset of files to display. The filter *All files* which is always available will display all files in the directory selected.
- A file name area. This area will display the name of the current file selected, if any. You can also type a file or directory name directly, and complete the name automatically by using the ⟨Tab⟩ key.
- A button bar with the `OK` and `Cancel` buttons. When you have selected the right file, clock on `OK` to confirm, or click on `Cancel` at any time to cancel and close the file selection.

5.4 Menu Items

The main menus that give access to extended functionalities related to source editing are described in this section.

5.4.1 The File Menu

New Open a new untitled source editor. No syntax highlighting is performed until the file is saved, since GPS needs to know the file name in order to choose the programming language associated with a file.

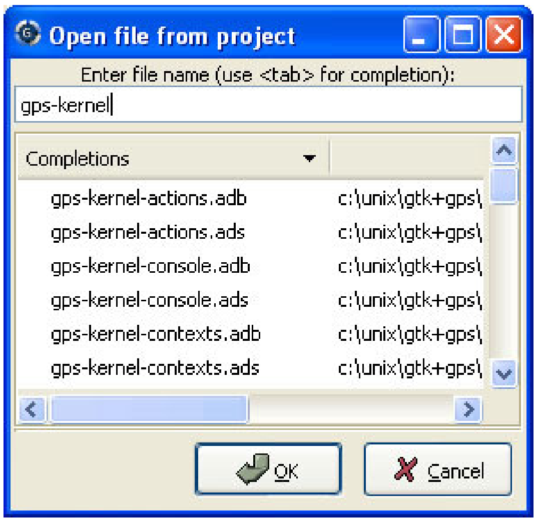
When you save a new file for the first time, GPS will ask you to enter the name of the file. In case you have started typing Ada code, GPS will try to guess based on the first main entity in the editor and on the current naming scheme, what should be the default name of this new file.

New View
Create a new view of the current editor. The new view shares the same contents: if you modify one of the source views, the other view is updated at the same time. This is particularly useful when you want to display two separate parts of the same file, for example a function spec and its body.

A new view can also be created by keeping the ⟨shift⟩ key pressed while drag-and-dropping the editor (see Section 4.5 [Moving Windows], page 23). This second method is preferred, since you can then specify directly where you want to put the new view. The default when using the menu is that the new view is put on top of the editor itself.

Open... Open a file selection dialog where you can select a file to edit. Under Windows, this is the standard file selector. Under other platforms, this is a built-in file selector described in Section 5.3 [The File Selector], page 31.

Open From Project...
Open a dialog where you can easily and rapidly select a source file from your project.



```
gps-kernel

gps-kernel-actions.adb     c:\unix\gtk+gps\
gps-kernel-actions.ads     c:\unix\gtk+gps\
gps-kernel-console.adb     c:\unix\gtk+gps\
gps-kernel-console.ads     c:\unix\gtk+gps\
gps-kernel-contexts.adb    c:\unix\gtk+gps\
gps-kernel-contexts.ads    c:\unix\gtk+gps\
```

The first text area allows you to type a file name. You can start the beginning of a file name, and use the ⟨Tab⟩ key to complete the file name. If there are several possible completions, the common prefix will be displayed, and a list of all possible completions will be displayed in the second text area.

You can then either complete the name by typing it, or continue hitting the ⟨Tab⟩ key to cycle through the possible completions, or click on one of the completions in the list displayed.

If you press the down arrow key, the focus will move to the list of completions, so that you can select a file from this list without using the mouse.

Once you have made your choice, click on the `OK` button to validate. Clicking on `Cancel` or hitting the ⟨Esc⟩ key will cancel the operation and close the dialog.

This dialog will only show each file once. If you have extended projects in your hierarchy, some files may be redefined in some extending project. In this case, only the files from the extending project are shown, and you cannot have access through this dialog to the overridden files of the extended project. Of course, you can still use the project view or the standard `File->Open` menu to open these files.

Recent Open a sub menu containing a list of the ten most recent files opened in GPS, so that you can reopen them easily.

Save Save the current source editor if needed.

Save As...
Same current file under a different name, using the file selector dialog. See Section 5.3 [The File Selector], page 31.

Save More
Give access to extra save capabilities.

All Save all items, including projects, etc. . .

Desktop Save the desktop to a file. The desktop includes information about files, graphs, . . . and their window size and position in GPS. The desktop is saved per top level project, so that if you reload the same project you get back to the same situation you were in when you left GPS. Instead, if you load a different project another desktop will be loaded (or the default desktop).

Default Desktop
Save the current desktop as the default desktop. The next time you start GPS, if there is no saved desktop associated with the chosen project, then this desktop will be used. If you haven't saved explicitely a default desktop, GPS will use its own default desktop from

'`prefix/share/gps/desktop.xml`' in its installation directory.

This default desktop is never overidden automatically by GPS.

Change Directory...
Open a directory selection dialog that lets you change the current working directory.

Messages
This sub menu gives access to functionalities related to the Messages window. See Section 2.12 [The Messages Window], page 14.

Clear Clear the contents of the Messages window.

Save As... Save the contents of the Messages window to a file. A file selector is displayed to choose the name and location of the file.

Load Contents...
Open a file selector to load the contents of a file in the Messages window. Source locations are identified and loaded in the Locations Tree. See Section 2.14 [The Locations Tree], page 16.

Close Close the current window. This applies to all GPS windows, not only source editors.

Print Print the current window contents, optionally saving it interactively if it has been modified. The Print Command specified in the preferences is used if it is defined. On Unix this command is required; on Windows it is optional.

On Windows, if no command is specified in the preferences the standard Windows print dialog box is displayed. This dialog box allows the user to specify the target printer, the properties of the printer, which pages to print (all, or a specific range of pages), the number of copies to print, and, when more than one copy is specified, whether the pages should be collated. Pressing the Cancel button on the dialog box returns to GPS without printing the window contents; otherwise the specified pages and copies are printed on the selected printer. Each page is printed with a header containing the name of the file (if the window has ever been saved). The page number is printed on the bottom of each page. See [Print Command], page 178.

Exit Exit GPS after confirmation and if needed, confirmation about saving modified windows and editors.

5.4.2 The Edit Menu

Undo Undo previous insertion/deletion in the current editor.

Redo Redo previous insertion/deletion in the current editor.

Cut Cut the current selection and store it in the clipboard.

Copy Copy the current selection to the clipboard.

Paste Paste the contents of the clipboard to the current cursor position.

Paste Previous

GPS stores a list of all the text that was previously copied into the clipboard through the use of Copy or Cut.

By default, if you press Paste, the newest text will be copied at the current position. But if you select Paste Previous immediately after (one or more times) you can instead paste text that was copied previously in the clipboard.

For instance, if you copy through `Edit->Copy` the text "First", then copy the text "Second", you can then select `Edit->Paste` to insert "Second" at the current location. If you then select `Edit->Paste Previous`, "Second" will be replaced by "First".

Selecting this menu several times will replace the text previously pasted by the previous one in the list saved in the clipboard. When reaching the end of this list, GPS will started from the beginning, and insert again the last text copied into the clipboard.

The size of this list is controlled by the `Clipboard Size` preference.

For more information, See Section 2.9 [The Clipboard View], page 12.

Select All

Select the whole contents of the current source editor.

Insert File...

Open a file selection dialog and insert the contents of this file in the current source editor, at the current cursor location.

Format Selection

Indent and format the selection or the current line. See Section 16.1 [The Preferences Dialog], page 165, for preferences related to source formatting.

Smart Completion

Complete the identifier prefix under the cursor, and list the results in a pop-up list. This command can take advantage of and entity database and offers completions from the entire project, along with documentation extracted from comments surrounding declarations.

To take full advantage of this feature, the smart completion preference must be enabled, which will imply the load of the entity database at GPS startup. The first time you use this feature, GPS will ask you wether you want this enabled or not.

In order to use this feature, open any Ada file, and begin to type an identifier. It has to be an identifier declared either in the current file (and accessible from the cursor location) or in one of the packages of the project loaded. Move the cursor right after the last character of the incomplete identifier and hit the completion key (which is ⟨ctrl+space⟩ by default). GPS will open a popup displaying all the known identifiers beginning with the prefix you typed. You can then browse among the various proposals by clicking on the ⟨up⟩ and ⟨down⟩ keys, or using the left scrollbar. For each entity, a documentation box is filled. If the location of the entity is known, it's displayed as an hyperlink, and you can jump directly to its declaration by clicking on it.

Typing new letters will reduce the range of proposal, as long as there remain solutions. Once you've selected the expected completion, you can validate by pressing ⟨Enter⟩.

Typing control characters (ie, characters which cannot be used in identifiers) will also validate the current selection.

GPS is also able to complete automatically subprogram parameter or dotted notations. For example, if you type

```
with Ada.
```

the smart completion window will appear automatically, listing all the child and nested packages of Ada. You can configure the time interval after which the completion window appears (see Section 16.1 [The Preferences Dialog], page 165).

You can also write the beginning of the package, e.g.:

```
with Ada.Text
```

pressing the completion key will offer you Text_IO.

If you are in a code section, you will be able to complete the fields of a record, or the contents of a package, e.g.:

```
     type R is record
        Field1 : Integer;
        Field2 : Integer;
     end record;

     V : R;

begin
```

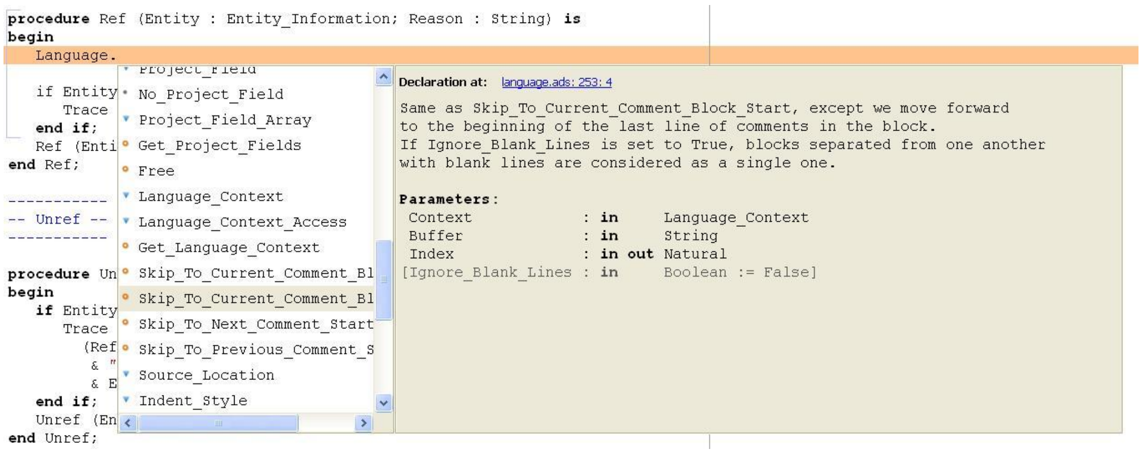
```
V.
```

Completing V. will propose Field1 and Field2.

The smart completion can also give you the possible parameters of a call you're currently making. For example, in the following code:

```
    procedure Proc (A, B, C : Integer);

begin

    Proc (1,
```

If you hit the completion key after the comma, the smart completion engine will propose you to complete with the named parameters "B =>", "C =>" or directly to complete with all the remaining parameters, which in this case will be "B =>, C =>)".



```
procedure Ref (Entity : Entity_Information; Reason : String) is
begin
   Language.
```

```
Project_Field
No_Project_Field
Project_Field_Array
Get_Project_Fields
Free
Language_Context
Language_Context_Access
Get_Language_Context
Skip_To_Current_Comment_Bl
Skip_To_Current_Comment_Bl
Skip_To_Next_Comment_Start
Skip_To_Previous_Comment_S
Source_Location
Indent_Style
```

Declaration at: language.ads: 253: 4

```
Same as Skip_To_Current_Comment_Block_Start, except we move forward
to the beginning of the last line of comments in the block.
If Ignore_Blank_Lines is set to True, blocks separated from one another
with blank lines are considered as a single one.

Parameters:
 Context             : in     Language_Context
 Buffer              : in     String
 Index               : in out Natural
[Ignore_Blank_Lines : in     Boolean := False]
```

Limitations:

- Completion does not work with generics.
- This feature is currently only available for Ada.

  Using the smart completion on non Ada files behaves as the identifier completion does. See [Complete Identifier], page 39.

More Completion

This submenu contains more ways to automatically complete code

- Expand Alias

  Consider the current word as an alias and expand according to aliases defined in Section 16.5.13 [Defining text aliases], page 219.

- Complete Identifier
  Complete the identifier prefix under the cursor. This command will cycle through all identifiers starting with the given prefix.
- Complete Block
  Close the current statement (if, case, loop) or unit (procedure, function, package). This action works only on an Ada buffer.

Selection

- Comment Lines
  Comment the current selection or line based on the current programming language syntax.
- Uncomment Lines
  Remove the comment delimiters from the current selection or line.
- Refill
  Refill text on the selection or current line according to the right margin as defined by the right margin preference (see Section 16.1 [The Preferences Dialog], page 165).
- Refill with fmt
  Refill text on the selection or current line using the external utility `fmt`. If `fmt` is not found on your system, this menu will not be displayed.
- Sort
  Sort the selected lines alphabetically. This is particularly useful when editing non source code, or for specific parts of the code, like with clauses in Ada.
- Sort Reverse
  Sort the selected lines in reverse alphabetical order
- Pipe in external program...
  Open an input window at the bottom of the GPS window where you can specify any external command, which will take the current selection as input. The output of the command will replace the contents of the selection on success.

Fold all blocks
Collapse all the blocks in the current file.

Unfold all blocks
Uncollapse all the blocks in the current file.

Create Bookmark
Creates a new Bookmark at cursor position. For more information, See Section 2.11 [Bookmarks], page 14.

Pretty Print
Pretty print the current source editor by calling the external tool `gnatpp`. It is possible to specify `gnatpp` switches in the switch editor. See Section 7.11 [The Switches Editor], page 81.

Generate Body
Generate Ada body stub for the current source editor by calling the external tool `gnatstub`.

Unit Testing
This sub menu gives access to dialogs that make it easy to generate AUnit stubs. AUnit is an Ada unit testing framework.

New Test Case...
Create a new test case. See AUnit documentation for more details.

New Test Suite...
Create a new test suite. See AUnit documentation for more details.

New Test Harness...
Create a new test harness. See AUnit documentation for more details.

Aliases Display the Aliases editor. See Section 16.5.13 [Defining text aliases], page 219.

Key shortcuts
Give access to the key manager dialog, to associate commands with special keys. See Section 16.3 [The Key Manager Dialog], page 184.

Preferences
Give access to the preferences dialog. See Section 16.1 [The Preferences Dialog], page 165.

5.5 Recording and replaying macros

It is often convenient to be able to repeat a given key sequence a number of times.

GPS supports this with several different methods:

- Repeat the next action

  If there is a single key press that you wish to repeat a number of times, you should first use the GPS action `"Repeat Next"` (bound by default to ⟨control-u⟩, but this can be changed as usual through the `/Edit/Key Shortcuts` menu), then entering the number of times you wish to repeat, and finally pressing the key you want.

For instance, the following sequence ⟨control-u 79 -⟩ will insert 79 characters '-' in the current editor. This proves often useful to insert separators.

If you are using the emacs mode (see `/Tools/Plug-ins` menu), you can also use the sequence ⟨control-u 30 control-k⟩ to delete 30 lines.

- Recording macros

  If you wish to repeat a sequence of more than 1 key, you should record this sequence as a macro. All macro-related menus are found in `/Tools/Macros`, although it is often more convenient to use these through key bindings, which you can of course override.

  You must indicate to GPS that it should start recording the keys you are pressing. This is done through the `/Tools/Macros/Start Keyboard Macro` menu. As its name indicates, this only records keyboard events, not mouse events. Until you select `/Tools/Macros/Stop Macro`, GPS will keep recording the events.

  In Emacs mode, the macro actions are bound to ⟨control-x (⟩, ⟨control-x)⟩ and ⟨control-x e⟩ key shortcuts. For instance, you can execute the following to create a very simple macro that deletes the current line, wherever your cursor initially is on that line:

```
⟨control-x (⟩      # start recording
⟨control-a⟩         # go to beginning of line
⟨control-k⟩         # delete line
⟨control-x )⟩      # stop recording
```

5.6 Contextual Menus for Editing Files

Whenever you ask for a contextual menu (using e.g. the third button on your mouse) on a source file, you will get access to a number of entries, displayed or not depending on the current context.

Menu entries include the following categories:

Source Navigation
See Section 6.3 [Contextual Menus for Source Navigation], page 54.

Edit with external editor
See Section 5.9 [Using an External Editor], page 45.

Dependencies
See Section 10.3 [Dependency Browser], page 101.

Entity browsing
See Section 10.4 [Entity Browser], page 104.

Project view
See Section 2.5 [The Project View], page 5.

Version control
See Section 12.4 [The Version Control Contextual Menu], page 140.

Debugger
See Section 11.6 [Using the Source Editor when Debugging], page 121.

Case exceptions
See Section 5.7 [Handling of case exceptions], page 42.

Refactoring
See Section 5.8 [Refactoring], page 43.

In addition, an entry `Properties...` is always visible in this contextual menu. When you select it, a dialog pops up that allows you to override the language used for the file, or the character set.

This can be used for instance if you want to open a file that does not belong to the current project, but where you want to benefit from the syntax highlighting that GPS knows how to.

It is not recommended to override the language for source files that belong to the project. Instead, you should use the `Project Properties` dialog and change the naming scheme if appropriate. This will ensure better consistency between GPS and the compiler in the way they manipulate the file.

5.7 Handling of case exceptions

GPS keeps a set of case exceptions that is used by all case insensitive languages. When editing or reformatting a buffer for such a language the case exception dictionary will be checked first. If an exception is found for this word or a substring of the word, it will be used; otherwise the specified casing for keywords or identifiers is used. A substring is defined as a part of the word separated by underscores.

Note that this feature is not activated for entities (keywords or identifiers) for which the casing is set to `Unchanged`. See see Section 16.1 [The Preferences Dialog], page 165.

A contextual menu named **Casing** has the following entries:

Lower *entity*
Set the selected entity in lower case.

Upper *entity*
Set the selected entity in upper case.

Mixed *entity*
: Set the selected entity in mixed case (set the first letter and letters before an underscore in upper case, all other letters are set to lower case).

Smart Mixed *entity*
: Set the selected entity in smart mixed case. Idem as above except that upper case letters are kept unchanged.

Add exception for *entity*
: Add the current entity into the case exception dictionary.

Remove exception for *entity*
: Remove the current entity from the case exception dictionary.

To add or remove a substring exception into/from the dictionary you need to first select the substring on the editor. In this case the last two contextual menu entries will be:

Add substring exception for *str*
: Add the selected substring into the case substring exception dictionary.

Remove substring exception for *str*
: Remove the selected substring from the case substring exception dictionary.

5.8 Refactoring

GPS includes basic facilities for refactoring your code. Refactoring is the standard term used to describe manipulation of the source code that do not affect the behavior of the application, but help reorganize the source code to make it more readable, more extendable, ...

Refactoring technics are generally things that programmers are used to do by hand, but which are faster and more secure to do automatically through a tool.

One of the basic recommendations when you refactor your code is to recompile and test your application very regularly, to make sure that each of the small modifications you made to it didn't break the behavior of your application. This is particularly true with GPS, since it relies on the cross-references information that is generated by the compilar. If some of the source files have not been recompiled recently, GPS will print warning messages indicating that the renaming operation might be dangerous and/or only partial.

GPS currently provides the following refactoring capabilities:

- Rename entity

  Clicking on an entity in a source file and selecting the `Refactoring/Rename` menu will open a dialog asking for the new name of the entity. GPS will rename all instances of the entity in your application. This includes the definition of the entity, its body, all calls to it, etc. . . Of course, no comment is updated, and you should probably check manually that the comment for the entity still applies.

  GPS will handle primitive operations by also renaming the operations it overrides or that overrides it. This means that any dispatching call to that operation will also be renamed, and the application should still work as before.

- Name parameters

  If you are editing Ada code and click on a call to a subprogram, GPS will display a contextual menu `Refactoring/Name parameters`, which will replace all unnamed parameters by named parameters, as in:

```
   Call (1, 2)
=>
   Call (Param1 => 1, Param2 => 2);
```

- Extract Method

  This refactoring is used to move some code from one place to a separate subprogram. The goal is to simplify the original subprogram, by moving part of its code elsewhere. GPS takes care of finding which parameters the new subprogram should have, whether they should be "in", "in out" or "out" parameters, and whether the new subprogram should be a procedure or a function. It also replaces the code in the original subprogram by a call to the new subprogram.

```
   procedure Proc (Param1 : Integer) is
      Local1 : Integer;
   begin
      Local1 := Param1;         --  line 4
      Local1 := Local1 + 1;     --  line 5
      Local1 := Local1 + 4;
   end Proc;

When lines 4 and 5 are extracted, we get:
   function New_Method (Param1 : Integer) return Integer is
      Local1 : Integer;
   begin
      Local1 := Param1;         --  line 4
      Local1 := Local1 + 1;     --  line 5
      return Local1;
   end New_Method;
```

```
procedure Proc (Param1 : Integer) is
   Local1 : Integer;
begin
   Local1 := New_Method (Param1);
   Local1 := Local1 + 4;
end Proc;
```

The above example, albeit trivial, shows in particular that GPS knows how to find which parameters should be transfered to the new subprogram.

GPS will use, for the parameters, the same name that was used for the local variable. Very often, it will make sense to recompile the new version of the source, and then apply the `Rename Entity` refactoring to have more specific names for the parameters, or the `Name Parameters` refactoring so that the call to the new method uses named parameters to further clarify the code.

This refactoring is only available if you have selected at least a full line of text, not a partial selection in a line of text.

5.9 Using an External Editor

GPS is fully integrated with a number of external editors, in particular `Emacs` and `vi`. The choice of the default external editor is done in the preferences. See Section 16.1 [The Preferences Dialog], page 165. The following values are recognized:

`gnuclient`

This is the recommended client. It is based on Emacs, but needs an extra package to be installed. This is the only client that provides a full integration in GPS, since any extended lisp command can be sent to the Emacs server.

By default, gnuclient will open a new Emacs frame for every file that is opened. You might want to add the following code to your '`.emacs`' file (create one if needed) so that the same Emacs frame is reused every time:

```
(setq gnuserv-frame (car (frame-list)))
```

See http://www.hpl.hp.com/people/ange/gnuserv/home.html for more information.

`emacsclient`

This is a program that is always available if you have installed Emacs. As opposed to starting a new Emacs every time, it will reuse an existing Emacs session. It is then extremely fast to open a file.

`emacs` This client will start a new Emacs session every time a file needs to be opened. You should use `emacsclient` instead, since it is much faster, and makes it easier to copy and paste between multiple files. Basically, the only reason to use this external editor is if your system doesn't support `emacsclient`.

`vim` `Vim` is a vi-like editor that provides a number of enhancements, for instance syntax highlighting for all the languages supported by GPS. Selecting this external editor will start an xterm (or command window, depending on your system) with a running `vim` process editing the file.

Note that one limitation of this editor is that if GPS needs to open the same file a second time, it will open a new editor, instead of reusing the existing one.

To enable this capability, the xterm executable must be found in the PATH, and thus is not supported on Windows systems. Under Windows systems, you can use the `custom` editor instead.

`vi` This editor works exactly like vim, but uses the standard `vi` command instead of `vim`.

`custom` You can specify any external editor by choosing this item. The full command line used to call the editor can be specified in the preferences (see [custom editor command], page 170).

`none` No external editor is used, and the contextual menus simply won't appear.

In the cases that require an Emacs server, GPS will try several solutions if no already running server was found. It will first try to spawn the glide environment distributed with GNAT. If not found in the PATH, it will then start a standard Emacs. The project file currently used in GPS will be set appropriately the first time Emacs is spawned. This means that if you load a new project in GPS, or modify the paths of the current project, you should kill any running Emacs, so that a new one is spawned by GPS with the appropriate project.

Alternatively, you can reload explicitly the project from Emacs itself by using the menu `Project->Load`

In the preferences, there are three settings that allow you to select the external editor (if left to an empty string, GPS will automatically select the first editor available on your system), to specify the custom editor command, in case you've selector this item, and whether this editor should always be used every time you double-click on a file, or whether you need to explicitly select the contextual menu to open the external editor.

5.10 Using the Clipboard

This section concerns X-Window users who are used to cutting and pasting with the middle mouse button. In the GPS text editor, as in many recent X applications, the *GPS clipboard* is set by explicit cut/copy/paste actions, either through menu items or keyboard shortcuts, and the *primary clipboard* (i.e. the “middle button” clipboard) is set by the current selection.

Therefore, copy/paste between GPS and other X applications using the *primary clipboard* will still work, provided that there is some text currently selected. The *GPS clipboard*, when set, will override the *primary clipboard*.

See `http://www.freedesktop.org/standards/clipboards.txt` for more information.

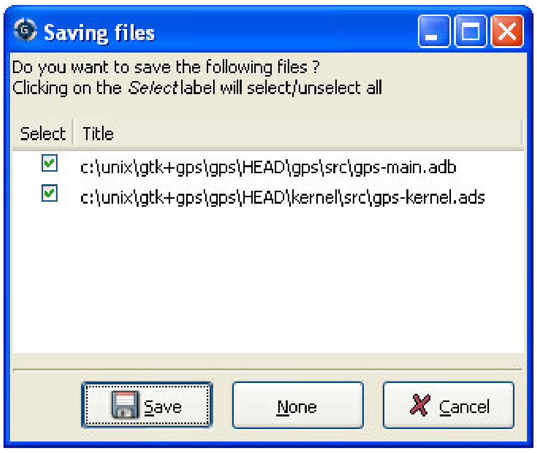
5.11 Saving Files

After you have finished modifying your files, you need to save them. The basic method to do that is to select the menu `File->Save`, which saves the currently selected file.

You can also use the menu `File->Save As...` if you want to save the file with another name, or in another directory.

If you have multiple files to save, another possibility is to use the menu `File->Save More->All`. This will open a dialog listing all the currently modified editors that need saving. You can then select individually which one should be saved, and click on `Save` to do the actual saving.

When calling external commands, such as compiling a file, if the `Auto save` preference is disabled, this same dialog is also used, to make sure that e.g. the compiler will take into account your local changes. If the preference is enabled, the saving is performed automatically.



Do you want to save the following files ?
Clicking on the *Select* label will select/unselect all

Select	Title
✓	c:\unix\gtk+gps\gps\HEAD\gps\src\gps-main.adb
✓	c:\unix\gtk+gps\gps\HEAD\kernel\src\gps-kernel.ads

You can conveniently select or unselect all the files at once by clicking on the title of the first column (labeled *Select*). This will toggle the selection status of the first line, and have the same status for all other editors.

If you press `Cancel` instead of `Save`, no saving will take place, and the action that displayed this dialog is also canceled. Such actions can be for instance starting a compilation command, a VCS operation, or quitting GPS with unsaved files.

5.12 Remote Files

GPS has a basic support for working with files on remote hosts. This includes a number of protocols, described below, which allow you to read a file from a remote host, edit it locally, and then save it transparently to the remote machine.

For now, the support for remote files is only available through the GPS shell window. You start editing a remote file by typing a line similar to

```
Editor.edit protocol://user@machine/full/path
```

where "protocol" should be replaced by the name of the protocol you want to use, "user" is the login name you wish to use on the remote "machine", and "/full/path" is the full path on the remote machine to access the file.

The user name is optional. If it is the same as on the local machine, you can omit the user name as well as the "`@`" sign.

Likewise, the machine name is optional, if you want to get a file from the local host. This can be used to access files belonging to another user. In this case, you need to specify the "`@`" sign, but do not insert a machine name right after it.

Remote files can also be used if you want to work with GPS, but the machine on which the files are found isn't supported by GPS.

The following protocols are supported:

ssh This protocol is based on the ssh command line tool, which must therefore be available in the path. It provides encrypted and secure connections to the remote host. Files are transfered in-line, that is the connection is established the first time you access the remote host, and kept open for all further access.

Although ssh can be setup not to require a password, GPS will automatically detect if a password is asked and open a dialog to query it.

The remote system must be a Unix-like system with support for standard Unix commands like `test`, `echo`, `rm` and `ls`.

In the sample shell command above, you would replace the word "protocol" with "ssh" to use this protocol.

rsh This protocol behaves like ssh, except that the connections are not encrypted. However, this protocol is generally available on all Unix machines by default.

It has the same requirements that the ssh protocol. To use it, substitute the word `"rsh"` to `"protocol"` in the example above.

telnet This protocol is based on the standard telnet protocol. It behaves much like the two protocols above, with an unencrypted connection.

To use it, substitute the word `"telnet"` to `"protocol"` in the example above.

scp This protocol is also based on one of the tools of the ssh suite. It provides encrypted connections, and uses a mixture of ssh and scp connections. Various commands like querying the time stamp of a file are executed through a permanent ssh connection, whereas files are downloaded and uploaded through a one-time scp command.

It basically has the same behavior as the ssh protocol, although it might be slightly slower since a new connection has to be established every time a file is fetched from, or written to the remote host. However, it might work better than ssh if the file contains 8 bit characters.

To use it, substitute the word `"scp"` to `"protocol"` in the example above.

rsync Just like scp is based on ssh, this protocol is based on rsh. It depends on the external tool rsync, and uses a mixture of a rsh connection for commands like querying the time stamp of a file, and one-time connections with rsync to transfer the files.

Rsync is specially optimized to transfer only the parts of a file that are different from the one already on the remote host. Therefore, it will generally provide the best performance when writing the file back to the remote host.

If you set up the environment variable RSYNC_RSH to ssh before starting gps, the connection will then be encrypted when transferring the files.

To use this protocol, substitute the word `"rsync"` to `"protocol"` in the example above.

ftp This protocol provides only limited capabilities, but can be used to retrieve or write a file back through an ftp connection, possibly even through an anonymous ftp connection.

To use this protocol, substitute the word `"ftp"` to `"protocol"` in the example above.

http This is the usual http protocol to download documents from the web. It is in particular useful for documentation

6 Source Navigation

6.1 Support for Cross-References

GPS provides cross-reference navigation for program entities, such as types, procedures, functions, variables, ..., defined in your application. The cross-reference support in GPS relies on language-specific tools as explained below.

Ada The GNAT compiler is used to generate the cross-references information needed by GPS. This means that you must compile your application before you browse through the cross-references or view various graphs in GPS. If sources have been modified, you should recompile the modified files.

If you need to navigate through sources that do not compile (e.g after modifications, or while porting an application), GNAT can still generate partial cross-reference information if you specify the `-gnatQ` compilation option. Along with the `-k` option of gnatmake, it is then possible to generate as much relevant information as possible for your non compilable sources.

There are a few special cases where GPS cannot find the external file (called '`ALI file`') that contains the cross-reference information. Most likely, this is either because you haven't compiled your sources yet, or because the source code has changed since the '`ALI file`' was generated.

It could also be that you haven't included in the project the object directories that contain the '`ALI files`'.

In addition, one special case cannot be handled automatically. This is for separate units, whose file names have been crunched through the `gnatkr` command. To handle this, you should force GPS to parse all the '`ALI files`' in the appropriate object directory. This is done by right-clicking on the object directory in the project view (left-side panel on the main window), and selecting the menu "Parse all xref information".

C/C++ To enable the navigation features for C and C++ source files, you need to first generate a database of symbol references, by going through the menu Build->Recompute C/C++ Xref info. Messages in the console window will indicate the state of the processing. Due to the nature of these languages, in order to provide accurate cross-references, GPS needs to generate the database in two phases: a first pass parses all the files that have been modified since the previous parsing, and a second pass generates global cross-references by analyzing the complete database. It is thus expected that for large projects, this phase can take a significant amount of CPU to proceed.

In some cases, GPS won't be able to determine the exact function involved in a cross-reference. This will typically occur for overloaded functions, or if multiple functions with the same name, but under different `#ifdef` sections, are defined. In this case, GPS will display a dialog listing the possible choices to resolve the ambiguity.

In addition, the C/C++ parser has the following limitations: namespaces are currently ignored (no specific processing is done for namespaces); minimal support for templates; no attempt is made to process the macros and other preprocessor defines. Macros are considered as special entities, so it is possible to navigate from a macro use to its definition, but the macro content is ignored, which means for example that function calls made through macros won't be detected.

6.1.1 Loading xref info in memory

The cross-reference information, as mentioned above, is generated either by the compiler when you recompile your sources, or explicitly when you select the menu `Build->Recompute C/C++ Xref info`.

This information will be loaded in memory automatically by GPS when it needs it, and as little as possible, to limit the memory footprint. However, this means that some operations, for instance searching for all the references to a global entity, will need to parse most, if not all, of the cross-reference information. This will slow done the search the first time (and then the information is in memory and the search is fast, unless the cross-reference information has been regenerated on the disk).

You can select the menu `Build->Load xref info in memory` to force GPS to load all the available information immediately in memory. This will speed up future queries.

This menu can also be used in some cases for C and C++. Since these languages have no notion of package, the declaration of a subprogram and its actual implementation can be in two different files with vastly different names. GPS in such case will not be able to display a `Goto body` contextual menu unless it has already parsed both files. A way to get fully accurate cross-reference information is thus to load all information into memory before attempting any navigation operation.

A special case has been put in place so that both '`file.h`' and '`file.cpp`' are loaded together in memory. This means that in the general case where an entity is defined in '`foo.h`' and implemented in '`foo.cpp`', nothing special needs to be done. The specific file extensions depend on the naming scheme specified in your project.

A preference can be set to have GPS load the cross-information automatically on startup, See Section 16.1 [The Preferences Dialog], page 165.

6.2 The Navigate Menu

Find or Replace...
: Open the find and replace dialog. See Chapter 8 [Searching and Replacing], page 87.

Find Next
: Find next occurrence of the current search. See Chapter 8 [Searching and Replacing], page 87.

Find Previous
: Find previous occurrence of the current search. See Chapter 8 [Searching and Replacing], page 87.

Find All References
: Find all the references to the current entity in the project. The search is based on the semantic information extracted from the sources, this is not a simple text search. The result of the search is displayed in the location window, see Section 2.14 [The Locations Tree], page 16.

Goto Declaration
: Go to the declaration/spec of the current entity. The current entity is determined by the word located around the cursor. This item is also accessible through the editor's contextual menu directly. This capability requires the availability of cross-reference information. See Section 6.1 [Support for Cross-References], page 51.

Goto Body
: Go to the body/implementation of the current entity. This item is also accessible through the editor's contextual menu directly. This capability requires the availability of cross-reference information. See Section 6.1 [Support for Cross-References], page 51.

Goto Matching Delimiter
: Go to the delimiter matching the one right before (for a closing delimiter) or right after (for an opening delimiter) the cursor if any.

Goto Line...
: Open a dialog where you can type a line number, in order to jump to a specific location in the current source editor.

Goto File Spec<->Body
Open the corresponding spec file if the current edited file is a body file, or body file otherwise. This option is only available for the Ada language. This item is also accessible through the editor's contextual menu

This capability requires support for cross-references. This item is also accessible through the editor's contextual menu

Start Of Statement
Move the cursor position to the start of the current statement, move to the start of the enclosing statement if the cursor position is already at the start of the statement.

End Of Statement
Move the current cursor position to the end of the statement, move to the end of the enclosing statement if the cursor position is already at the end of the statement.

Previous Subprogram
Move the current cursor position to the start of the previous procedure, function, task, protected record or entry.

Next Subprogram
Move the current cursor position to the start of the next procedure, function, task, protected record or entry.

Previous Tag
Go to previous tag/location. See Section 2.14 [The Locations Tree], page 16.

Next Tag Go to next tag/location. See Section 2.14 [The Locations Tree], page 16.

Back Go to previous location.

Forward Go to next location.

6.3 Contextual Menus for Source Navigation

This contextual menu is available from any source editor. If you right click over an entity, or first select text, the contextual menu will apply to this selection or entity.

Goto declaration of *entity*
Go to the declaration/spec of *entity*. The current entity is determined by the word located around the cursor or by the current selection if any. This capability requires support for cross-references.

Goto body of *entity*

Go to the body/implementation of *entity*. This capability requires support for cross-references.

Goto declarations of *entity*

This contextual menu appears when you are clicking on a subprogram call that is a dispatching call. In such a case, there is no possibility for GPS to know what subprogram will actually be called at run time, since that depends on dynamic information. It therefore gives you a list of all entities in the tagged type hierarchy, and let you choose which of the declarations you want to jump to. See also the '`methods.py`' plug-in (enabled by default) which, given an object, lists all its primitive operations in a contextual menu so that you can easily jump to them. See also the contextual menu '`References/Find References To...`' which allows you to find all calls to a subprogram or to one of its overriding subprograms.

Goto bodies of *entity*

This is similar to *Goto declarations of*, but applies to the bodies of the entities.

Goto file spec/body

Open the corresponding spec file if the current edited file is a body file, or body file otherwise. This option is only available for the Ada language.

Entity **calls**

Display a list of all subprograms called by *entity* in a tree view. This is generally more convenient than using the corresponding Browsers/ submenu if you expect lots of references, See Section 2.10 [The Callgraph View], page 13.

Entity **is called by**

Display a list of all subprograms calling *entity* in a tree view. This is generally more convenient than using the correponding Browsers/ submenu if you expect lots of references, See Section 2.10 [The Callgraph View], page 13.

References

This item gives access to different capabilities related to listing or displaying references to the current entity or selection.

`Find all references to` *entity*

Find all references to *entity* in all the files in the project, See [Find All References], page 53.

`Find all references...`

This menu is similar to the one above, except it is possible to select more precisely what kind of reference should be selected. It is also possible to indicate the scope of the search, and whether the context (or caller) at each reference should be displayed. Computing the caller information will take slightly longer though.

This dialog has an option `Include overriding and overriden operations`, which, when activated, will include references to overriden or overriding entities of the one you selected.

This is particularly useful when you are wondering whether you can easily modify the profile of a primitive operation, since you can then see what other entities will also be impacted. If you select only the `declaration` check box, you will see the list of all related primitive operations.

This dialog also allows you to find out which entities are imported from a given file/unit. Click on any entity from that file (for instance on the `with` line for Ada code), then select the `All entities imported from same file` toggle button. This will display in the location window the list of all entities imported from the same file as the entity selected.

In addition, if you have selected the `Show context` option, you will get a list of all the exact references to these entities within the file. Otherwise, you just get a pointer to the declaration of the imported entities.

`Find all local references to` *entity*

Find all references to *entity* in the current file (or in the current top level unit for Ada sources). See [Find All References], page 53 for more details.

`Variables used in` *entity*

Find all variables (local or global) used in *entity* and list each first reference in the locations window.

Methods of *entity*

This submenu is only visible if you have activated the plug-in '`methods.py`' (which is the case by default), and when you click on a tagged type or an instance of a tagged type. This menu lists all the primitive operations of that type, and you can therefore easily jump to the declaration of any of these operations.

Browsers

This item gives access to graph representations of callers and callees for subprograms.

Entity `calls`

Open or raise the call graph browser on the specified entity and display all the subprograms called by *entity*. See Section 10.2 [Call Graph], page 99.

Entity `is called by`

Open or raise the call graph browser on the specified entity and display all the subprograms calling *entity*. See Section 10.2 [Call Graph], page 99.

Note that this capability requires a global look up in the project cross-references, which may take a significant amount of time the first time. After a global look up, information is cached in memory, so that further global queries will be faster.

7 Project Handling

The section on the project view (Section 2.5 [The Project View], page 5) has already given a brief overview of what the projects are, and the information they contain.

This chapter provides more in-depth information, and describes how such projects can be created and maintained.

7.1 Description of the Projects

7.1.1 Project files and GNAT tools

This section describes what the projects are, and what information they contain.

The most important thing to note is that the projects used by GPS are the same as the ones used by GNAT. These are text files (using the extension '`.gpr`') which can be edited either manually, with any text editor, or through the more advanced GPS interface.

The exact syntax of the project files is fully described in the GNAT User's Guide (`gnat_ug.html`) and GNAT Reference Manual (`gnat_rm.html`). This is recommended reading if you want to use some of the more advanced capabilities of project files which are not yet supported by the graphical interface.

GPS can load any project file, even those that you have been edited manually. Furthermore, you can manually edit project files created by GPS.

Typically you will not need to edit project files manually, since several graphical tools such as the project wizard (Section 7.8 [The Project Wizard], page 70) and the properties editor(Section 7.10 [The Project Properties Editor], page 79) are provided.

GPS doesn't preserve the layout nor comments of manually created projects after you have edited them in GPS. For instance, multiple case statements in the project will be coalesced into a single case statement. This normalization is required for GPS to be able to preserve the previous semantic of the project in addition to the new settings.

All command-line GNAT tools are project aware, meaning that the notion of project goes well beyond GPS' user interface. Most capabilities of project files can be accessed without using GPS itself, making project files very attractive.

GPS uses the same mechanisms to locate project files as GNAT itself:

- absolute paths
- relative paths. These paths, when used in a with line as described below, are relative to the location of the project that does the with.

- ADA_PROJECT_PATH. If this environment variable is set, it contains a colon-separated (or semicolon under Windows) list of directories in which the project files are searched.
- predefined project path. The compiler itself defines a predefined project path, in which standard libraries can be installed, like XML/Ada for instance.

7.1.2 Contents of project files

Project files contain all the information that describe the organization of your source files, object files and executables.

A project file can contain comments, which have the same format as in Ada, that is they start by "--" and extend to the end of the line. You can add comments when you edit the project file manually. GPS will attempt to preserve them when you save the project through the menu, but this will not always be possible. It helps if the comments are put at the end of the line, as in

```
project Default is
    for Source_Dirs use ();  --  No source in this project
end Default;
```

Generally, one project file will not be enough to describe a complex organization. In this case, you will create and use a project hierarchy, with a root project importing other sub projects. Each of the projects and sub projects is responsible for its own set of sources (compiling them with the appropriate switches, put the resulting files in the right directories, . . .).

Each project contains the following information (see the GNAT user's guide for the full list)

- **List of imported projects**: When you are compiling sources from this project, the compiler (either through GNAT or the automatically generated Makefiles) will first make sure that all the imported projects have been correctly recompiled and are up-to-date. This way, dependencies between source files are properly handled.

  If one of the source files of project A depends on some source files from project B, then B must be imported by A. If this isn't the case, the compiler will complain that some of the source files cannot be found.

  One important rule is that each source file name must be unique in the project hierarchy (i.e. a file cannot be under control of two different projects). This ensures that the same file will be found no matter what project is managing the source file that uses
- **List of source directories**: All the sources managed by a project are found in one or more source directories. Each project can have multiple source directories, and a given source directory might be shared by multiple projects.

- **Object directory**: When the sources of the project are compiled, the resulting object files are put into this object directory. There exist exactly one object directory for each project. If you need to split the object files among multiple object directories, you need to create multiple projects importing one another as appropriate.

  When sources from imported sub-projects are recompiled, the resulting object files are put in the sub project's own object directory, and will never pollute the parent's object directory.
- **Exec directory**: When a set of object files is linked into an executable, this executable is put in the exec directory of the project file. If this attribute is unspecified, the object directory is used.
- **List of source files**: The project is responsible for managing a set of source files. These files can be written in any programming languages. Currently, the graphical interface supports Ada, C and C++.

  The default to find this set of source files is to take all the files in the source directories that follow the naming scheme (see below) for each language. In addition if you edit the project file manually, it is possible to provide an explicit list of source files.

  This attribute cannot be modified graphically yet.
- **List of main units**: The main units of a project (or main files in some languages) are the units that contain the main subprogram of the application, and that can be used to link the rest of the application.

  The name of the file is generally related to the name of the executable.

  A given project file hierarchy can be used to compile and link several executables. GPS will automatically update the Compile, Run and Debug menu with the list of executables, based on this list.
- **Naming schemes**: The naming scheme refers to the way files are named for each languages of the project. This is used by GPS to choose the language support to use when a source file is opened. This is also used to know what tools should be used to compile or otherwise work with a source file.
- **Embedded targets and cross environments**: GPS supports cross environment software development: GPS itself can run on a given host, such as GNU/Linux, while compilations, runs and debugging occur on a different remote host, such as Sun/Solaris.

  GPS also supports embedded targets (VxWorks, . . .) by specifying alternate names for the build and debug tools.

  The project file contains the information required to log on the remote host.
- **Tools**: Project files provide a simple way to specify the compiler and debugger commands to use.

- **Switches**: Each tool that is used by GPS (compiler, pretty-printer, debugger, . . .) has its own set of switches. Moreover, these switches may depend on the specific file being processed, and the programming language it is written in.

7.2 Supported Languages

Another information stored in the project is the list of languages that this project knows about. GPS support any number of language, with any name you choose. However, advanced support is only provided by default for some languages (Ada, C and C++), and you can specify other properties of the languages through customization files (see Section 16.5.12 [Adding support for new languages], page 214).

By default, the graphical interface will only give you a choice of languages among the ones that are known to GPS at that point, either through the default GPS support or your customization files. But you can also edit the project files by hand to add support for any language.

Languages are a very important part of the project definition. For each language, you should specify a naming scheme that allows GPS to associate files with that language. You would for instance specify that all '`.adb`' files are Ada, all '`.txt`' files are standard text files, and so on.

Only the files that have a known language associated with them are displayed in the `Project View`, or available for easy selection through the `File->Open From Project` menu. Similarly, only these files are shown in the Version Control System interface.

It is therefore important to properly setup your project to make these files available conveniently in GPS, although of course you can still open any file through the `File->Open` menu.

If your project includes some README files, or other text files, you should add `"txt"` as a language (or any other name you want), and make sure that these files are associated with that language in the `Project properties editor`.

By default, GPS provides support for a number of languages. In most cases, this support takes the form of syntax highlighting in the editor, and possibly the Outline View. Other languages have advanced cross-references available.

All the supported languages can be added to the project, but you can also add your own languages as you need (either by editing the project files by hand, or by creating XML files to add GPS support for these languages, which will then show in the project properties editor graphically).

7.3 Scenarios and Configuration Variables

The behavior of projects can be further tailored by the use of scenarios.

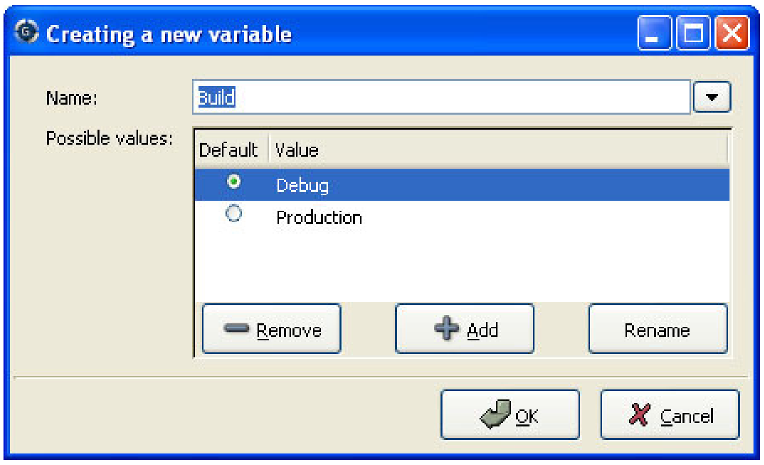
All the attributes of a project, except its list of imported projects, can be chosen based on the value of external variables, whose value is generally coming from the host computer environment, or directly set in GPS. The interface to manipulate these scenarios is the scenario view, which can be displayed by selecting the menu `Tools->Views->Scenario`. It can be convenient to drag this window with your mouse, and drop it above the project view, so that you can see both at the same time.

This area allows you to select new values for the scenario variables defined in your project, and thus change dynamically the view GPS has of your project and your source files.

This facility can for instance be used to compile all the sources either in debug mode (so that the executables can be run in the debugger), or in optimized mode (to reduce the space and increase the speed when delivering the software). In this configuration scenario, all the attributes (source directories, tools, . . .) remain the same, except for the compilation switches. It would be more difficult to maintain a completely separate hierarchy of project, and it is much more efficient to create a new configuration variable and edit the switches for the appropriate scenario (Section 7.10 [The Project Properties Editor], page 79).

7.3.1 Creating new configuration variables

Creating a new scenario variable is done through the contextual menu (right-click) in the Project View or the Scenario View itself. Select the menu `Project->Add Configuration Variable`. This opens the following dialog:



Name: Build

Possible values:

Default	Value
●	Debug
○	Production

There are two main areas in this dialog: in the top line, you specify the name of the variable. This name is used for two purposes:

- It is displayed in the scenario view
- This is the name of the environment variable from which the initial value is read. When GPS is started, all configuration variables are initialized from the host computer environment, although you can of course change its value later on inside GPS. Note that selecting a new value for the scenario variable does not change the actual value of the environment variable, which is only used to get the default initial value of the scenario variable.

  When you spawn external tools like gnatmake for instance, you can also specify the value they will use for the scenario variable by using a command line switch, typically `-X`.

If you click on the arrow on the right of this name area, GPS will display the list of all the environment variables that are currently defined. However, you don't need to pick the name of an existing variable, neither must the variable exist when GPS is started.

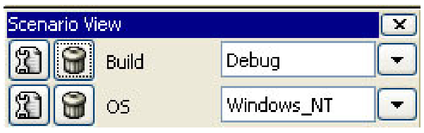
The second part of this dialog is the list of authorized value for this variable. Any other value will generate an error reported by GPS, and the project won't be loaded as a result.

One of these values is the default value (the one whose button in the Default column is selected). This means that if the environment variable doesn't exist when GPS is started, GPS will behave as if it did exist with this default value.

The list of possible values can be edited through the `Remove`, `Add` and `Rename` buttons, although you can also simply click on the value itself to change it.

7.3.2 Editing existing configuration variables

If at least one configuration variable is defined in your project, the scenario view will contain something similar to:



Build	Debug
OS	Windows_NT

This screen shot shows two configuration variables, named `Build` and `OS`, with their current value (resp. `Debug` and `Unix`).

You can easily change the current value of any of these variables by clicking on the arrow on the right of the value. This will display a pop-up window with the list of possible values, from which you select the one you wish to use.

As soon as a new value is selected, GPS will recompute the project view (in case source directories, object directories or list of source files have changed). A number of things will also be updated (like the list of executables in the `Compile`, `Run` and `Debug` menus).

Currently, GPS will not recompute the contents of the various browsers (call graph, dependencies, . . .) for this updated project. This would be too expensive to do every time the value changes, and therefore you need to explicitly request an update.

You can change the list of possible values for a configuration variable at any time by clicking on the button to the far left of the variable's name. This will pop up the same dialog that is used to create new variables. This dialog also allows you to change the name of the scenario variable. This name is the same as the environment variable that is used to set the initial value of the scenario variable.

Removing a variable is done by clicking on the button immediately to the left of the variable's name. GPS will then display a confirmation dialog.

If you confirm that you want to delete the variable, GPS will simply remove the variable, and from now on act as if the variable always had the value it had when it was deleted.

7.4 Extending Projects

7.4.1 Description of extending projects

The project files were designed to support big projects, with several hundreds or thousands of source files. In such contexts, one developer will generally work on a subset of the sources. It is also not rare for such a project to take several hours to fully compile. Most developers therefore do not need to have the full copy of the project compiled on their own machine or personal disk space.

However, it is still useful to be able to access other source files of the application, for instance to find out whether a subprogram can be changed and where it is currently called.

Such a setup can be achieved through extending projects. These are special types of projects that inherit most of their attributes and source files from another project, and can have, in their source directories, some source files that hide/replace those inherited from the original project.

When compiling such projects, the compiler will put the newly created project files in the extending project's directory, and will leave the original untouched. As a result, the original project can be shared read-only among several developers (for instance, it is usual for this original project to be the result of a nightly build of the application).

7.4.2 Creating extending projects

This project wizard allows you to easily create extending projects. You should select an empty directory (which will be created automatically if needed), as well as a list of source files you want to work on initially. New files can also be added later.

As a result, GPS will copy the selected source files to the new directory (if you so decided), and create a number of project files there. It will then load a new project, which has the same properties as the previous one, except that some files are found transparently in the new directory, and object files resulting from the compilation are create into that directory as opposed to the object directory of the original project.

7.4.3 Adding files to extending projects

Once you have loaded an extending project in GPS, things work mostly transparently. If you open a file through the `File->Open From Project` dialog, the files found in the local directory of your extending project will be picked up first.

The build actions will create object files in the extending project's directory, leaving the original project untouched.

It might happen that you want to start working on a source file that you had not added in the extending project when it was created. You can of course edit the file found in the original project, provided you have write access to it. However, it is generally better to edit it in the context of the extending project, so that the original project can be shared among developers.

This can be done by clicking on the file in the `Project View`, then selecting the menu `Add To Extending Project`. This will popup a dialog asking whether you want GPS to copy the file to the extending project's directory for you. GPS might also create some new project files in that directory if necessary, and automatically reload the project as needed. From then on, if you use the menu `File->Open From Project`, GPS will first see the file from the extending project.

Note that open editors will still be editing the same file they were before, so you should open the new file if needed.

7.5 The Project View

The project view, as mentioned in the general description of the GPS window, is one of the views found by default on the left of the window. It shows in a tree structure the project hierarchy, along with all the source files belonging to the project, and the entities declared in the source files.

It is worth noting that the project view provides a tree representation of the project hierarchy. If a project is imported by multiple other projects in the hierarchy, then this project will appear multiple times in the project view.

Likewise, if you have edited the project manually and have used the `limited with` construct to have cycles in the project dependencies, the cycle will expand infinitely. For instance, if project '`a`' imports project '`b`', which in turns imports project 'a' through a `limited with` clause, then expanding the node for 'a' will show 'b'. In turn, expanding the node for 'b' will show a node for 'a', and so on.

The contextual menu in this project view provides a number of items to modify the project hierarchy (what each project imports), as well as to visualize and modify the attributes for each projects (compilation switches, naming scheme, ...)

The following entries are available in the contextual menu:

`Show Projects Imported by...`
: This item will open a new window in GPS, the project browser, which displays graphically the relationships between each project in the hierarchy.

`Save The Project...`
: This item can be selected to save a single project in the hierarchy after it was modified. Modified but unsaved projects in the hierarchy have a special icon (a pen mark is drawn on top of the standard icon). If you would rather save all the modified projects in a single step, use the menu bar item `Project->Save All`.

`Project/Properties`
: This item will open a new dialog, and give access to all the attributes of the project: tool switches, naming schemes, source directories, ... See Section 7.10 [The Project Properties Editor], page 79.

`Project/Edit source file`
: This menu will load the project file into an editor, so that you can manually edit it. This should be used if you need to access some features of the project files that are not accessible graphically (renames statements, variables, ...)

`Project/Dependencies...`
: This opens the dependencies editor (see Section 7.9 [The Project Dependencies Editor], page 77).

`Add Configuration Variable`
: This menu item should be used to add new configuration variables, as described in Section 7.3 [Scenarios and Configuration Variables], page 62.

`Build`
: This menu offers the submenu `"Clean"` which remove all object files and other compilation artifacts associated to the current project.

Any time one or several projects are modified, the contents of the project view is automatically refreshed. No project is automatically saved. This provides a simple way to temporarily test new values for the project attributes. Unsaved modified projects are shown with a special icon in the project view, displaying a pen mark on top of the standard icon:

Note that in all tree views in GPS, you can use the + and - keys to expand and collapse nodes (e.g. projects and directories).

7.6 Disabling Project Edition Features

The project files should generally be considered as part of the sources, and thus be put under control of a version control system. As such, you might want to prevent accidental editing of the project files, either by you or some other person using the same GPS installation.

The main thing to do to prevent such accidental edition is to change the write permissions on the project files themselves. On Unix systems, you could also change the owner of the file. When GPS cannot write a project file, it will report an error to the user.

However, the above doesn't prevent a user from trying to do some modifications at the GUI level, since the error message only occurs when trying to save the project (this is by design, so that temporary modification can be done in memory).

You can disable all the project editing related menus in GPS by adding special startup switches. The recommended way is to create a small batch script that spawns GPS with these switches. You should use the following command line:

```
gps --traceoff=MODULE.PROJECT_VIEWER --traceoff=MODULE.PROJECT_PROPERTIES
```

What these do it prevent the loading of the two GPS modules that are responsible for project edition. However, this also has an impact on the python functions that are exported by GPS, and thus could break some plug-ins. Another solution which might apply in your case is simply to hide the corresponding project-editing menus and contextual menus. This could be done by creating a small python plugin for GPS (see Section 16.5 [Customizing through XML and Python files], page 187, which contains the following code:

```
import GPS
GPS.Menu.get  ("/Project/Edit Project Properties").hide()
GPS.Contextual ('Edit project properties').hide()
GPS.Contextual ('Save project').hide()
GPS.Contextual ('Add configuration variable').hide()
```

7.7 The Project Menu

The menu bar item `Project` contains several commands that generally act on the whole project hierarchy. If you only want to act on a single project, use the contextual menu in the project view.

Some of these menus apply to the currently selected project. This notion depends on what window is currently active in GPS: if it is the project view, the selected project is either the selected node (if it is a project), or its parent project (for a file, directory, . . .). If the currently active window is an editor, the selected project is the one that contains the file.

In all cases, if there is no currently selected project, the menu will apply to the root project of the hierarchy.

These commands are:

`New`
: This menu will open the project wizard (Section 7.8 [The Project Wizard], page 70), so that you can create new project. On exit, the wizard asks whether the newly created project should be loaded. If you select `Yes`, the new project will replace the currently loaded project hierarchy.

  You will get asked what information you would like to create the project from. In particular, you can create a set of project files from existing Ada sources.

`Open`
: This menu opens a file selection dialog, so that any existing project can be loaded into GPS. The newly loaded project replaces the currently loaded project hierarchy. GPS works on a single project hierarchy at a time.

`Recent`
: This menu can be used to easily switch between the last projects that were loaded in GPS.

`Edit Project Properties`
: This menu applies to the currently selected project, and will open the project properties dialog for this project.

`Save All`
: This will save all the modified projects in the hierarchy.

`Edit File Switches`
: This menu applies to the currently selected project. This will open a new window in GPS, listing all the source files for this project, along with the switches that will be used to compile them, See Section 7.11 [The Switches Editor], page 81.

`Reload Project`
: Reload the project from the disk, to take into account modifications done outside of GPS. In particular, it will take into account new

files added externally to the source directories. This isn't needed for modifications made through GPS.

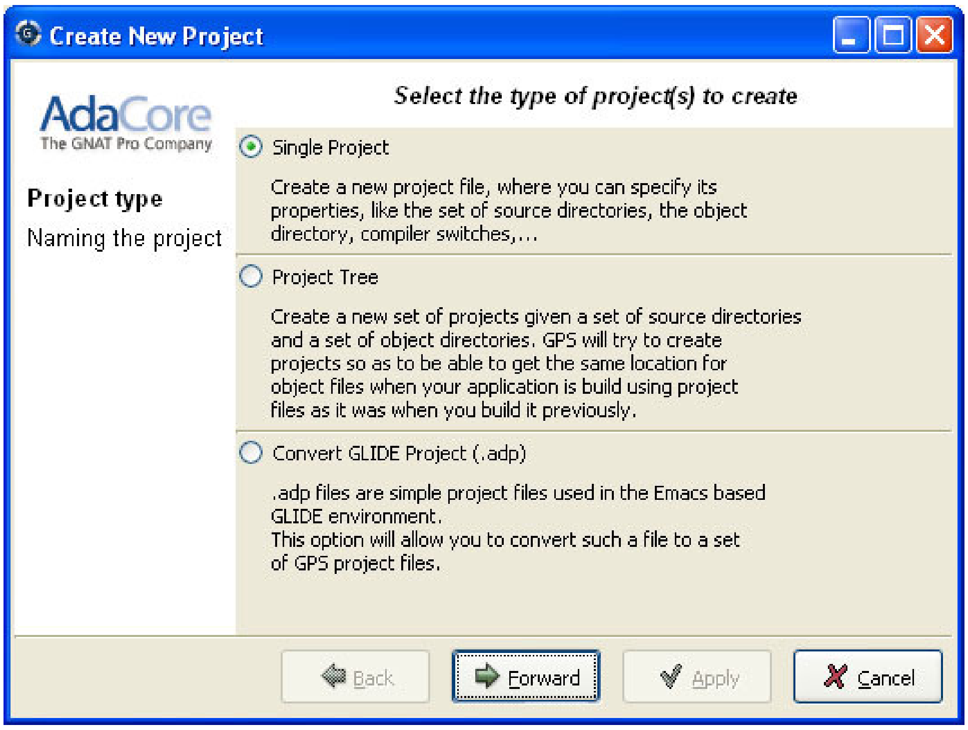
`Project View`
: Open (or raise if it is already open) the project view on the left side of the GPS window.

7.8 The Project Wizard

The project wizard allows you to create in a few steps a new project file. It has a number of pages, each dedicated to editing a specific set of attributes for the project.

The typical way to access this wizard is through the `Project->New...` menu.

The project wizard is also launched when a new dependency is created between two projects, through the contextual menu in the project view.



Select the type of project(s) to create

(●) Single Project

Create a new project file, where you can specify its properties, like the set of source directories, the object directory, compiler switches,...

( ) Project Tree

Create a new set of projects given a set of source directories and a set of object directories. GPS will try to create projects so as to be able to get the same location for object files when your application is build using project files as it was when you build it previously.

( ) Convert GLIDE Project (.adp)

.adp files are simple project files used in the Emacs based GLIDE environment.
This option will allow you to convert such a file to a set of GPS project files.

The wizard gives access to the following list of pages:

- Project type
- Project Naming

- Languages Selection
- Version Control System Selection
- Source Directories Selection
- Build Directory
- Main Units
- Library
- Naming Scheme
- Switches

7.8.1 Project Type

Several types of project wizards are provided in GPS. Depending on the information you have or your current setup, you will choose one or the other.

- Single Project

  This is likely the wizard you will use most often. It creates a project file from scratch, and asks you for the location of source directories, the object directory, . . .; The rest of this chapter describes this wizard in more details
- Project Tree

  This wizard will attempt to create a set of one or more project files to represent your current build environment. It will analyze what your sources are, where the corresponding object files are, and will try and find some possible setup for the project files (remember that a given '`.gpr`' project file can be associated with a single object directory.

  This wizard might not work in all cases, but is worth a try to get you started if you already have an existing set of sources
- Convert GLIDE Project (.adp)

  This wizard will help you convert a '`.adp`' project file that is used by the GLIDE environment. The same restrictions apply as above, except that the list of source directories, object directories and tool switches are read directly from that file.
- Library Project

  This specialized wizard is similar to the Single Project wizard, except it adds one extra page, the Library page. The output of the compilation of this project is a library (shared or static), as opposed to an executable in the case of `Single Project`.
- Extending Project

  This specialized wizard allows you to easily create extending projects (see Section 7.4 [Extending Projects], page 65).

7.8.2 Project Naming

This is the first page displayed by any of the wizard.

You must enter the name and location of the project to create. This name must be a valid Ada identifier (i.e. start with a letter, optionally followed by a series of digits, letters or underscores). Spaces are not allowed. Likewise, reserved Ada keywords must be avoided. If the name is invalid, GPS will display an error message when you press the `Forward` button.

Child projects can be created from this dialog. These are project whose name is of the form `Parent.Child`. GPS will automatically generate the dependency to the parent project so as to make the child project valid.

In this page, you should also select what languages the source files in this project are written in. Currently supported languages are `Ada`, `C` and `C++`. Multiple languages can be used for a single project.

The last part of this page is used to indicate how the path should be stored in the generated project file. Most of the time, this setting will have no impact on your work. However, if you wish to edit the project files by hand, or be able to duplicate a project hierarchy to another location on your disk, it might be useful to indicate that paths should be stored as relative paths (they will be relative to the location of the project file).

7.8.3 Languages Selection

This page is used to select the programming languages used for the sources of this project. By default, only `Ada` is selected. New languages can be added to this list by using XML files, see the section on customizing GPS (see Section 16.5.12 [Adding support for new languages], page 214).

7.8.4 VCS Selection

The second page in the project wizard allows you to select which Version Control system is to be used for the source files of this project.

GPS doesn't attempt to automatically guess what it should use, so you must specify it if you want the VCS operations to be available to you.

The two actions `Log checker` and `File checker` are the name and location of programs to be run just prior an actual commit of the files in the Version Control System. These should be used for instance if you wish to enforce style checks before a file is actually made available to other developers in your team.

If left blank, no program will be run.

7.8.5 Source Directories Selection

This page lists and edits the list of source directories for the project. Any number of source directory can be used (the default is to use the directory which contains the project file, as specified in the first page of the wizard).

If you do not specify any source directory, no source file will be associated with the project, since GPS wouldn't know where to look for them.

To add source directories to the project, select a directory in the top frame, and click on the down arrow. This will add the directory to the bottom frame, which contains the current list of source directories.

You can also add a directory and all its subdirectories recursively by using the contextual menu in the top frame. This contextual menu also provides an entry to create new directories, if needed.

To remove source directories from the project, select the directory in the bottom frame, and click on the up arrow, or use the contextual menu.

All the files in these directories that match one of the language supported by the project are automatically associated with that project.

The relative sizes of the top and bottom frame can be changed by clicking on the separation line between the two frames and dragging the line up or down.

7.8.6 Build Directory

The object directory is the location where the files resulting from the compilation of sources (e.g. '`.o`' files) are placed. One object directory is associated for each project.

The exec directory is the location where the executables are put. By default, this is the same directory as the object directory.

7.8.7 Main Units

The main units of a project are the files that should be compiled and linked to obtain executables.

Typically, for C applications, these are the files that contain the `main()` function. For Ada applications, these are the files that contain the main subprogram each partition in the project.

These files are treated specially by GPS. Some sub-menus of `Build` and `Debug` will have predefined entries for the main units, which makes it more convenient to compile and link your executables.

To add main units click on the `Add` button. This opens a file selection dialog. No check is currently done that the selected file belongs to the project, but GPS will complain later if it doesn't.

When compiled, each main unit will generate an executable, whose name is visible in the second column in this page. If you are using a recent enough version of GNAT (3.16 or more recent), you can change the name of this executable by clicking in the second column and changing the name interactively.

7.8.8 Library

This page allows you to configure your project so that the output of its compilation is a library (shared or static), as opposed to an executable or a simple set of objet files. This library can then be linked with other executables (and will be automatically if the project is imported by another one.

You need to define the attributes in the top box to transform your project into a library project. See the tooltips that appear when you leave your mouse on top of the label to the left of each field.

If you define any of the attributes in the Standalone Library box, you will compile a standalone library. This is a library that takes care of its elaboration by itself, instead of relying on its caller to elaborate it as is standard in Ada. You also have more control over what files make up the public interface to the library, and what files are private to the library and invisible from the outside.

7.8.9 Naming Scheme

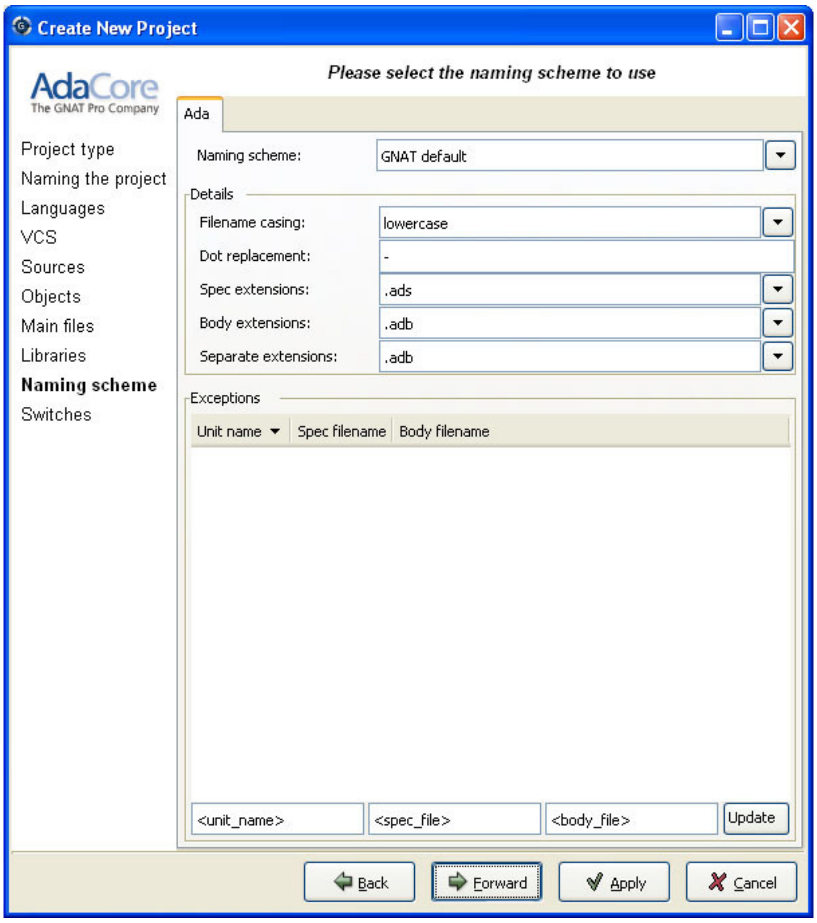
A naming scheme indicates the file naming conventions used in the different languages supported by a given project. For example, all '`.adb`' files are Ada files, all '`.c`' files are C files.

GPS is very flexible in this respect, and allows you to specify the default extension for the files in a given programming language. GPS makes a distinction between spec (or header) files, which generally contain no executable code, only declarations, and body files which contain the actual code. For languages other than Ada, this header file is used rather than the body file when you select `Go To Declaration` in the contextual menu of editors.

In a language like Ada, the distinction between spec and body is part of the definition of the language itself, and you should be sure to specify the appropriate extensions.

The default naming scheme for Ada is GNAT's naming scheme ('`.ads`' for specs and '`.adb`' for bodies). In addition, a number of predefined naming schemes for other compilers are available in the first combo box on the page.

You can also create your own customized scheme by entering a free text in the text entries.



Please select the naming scheme to use

Naming scheme: GNAT default

Filename casing: lowercase

Dot replacement: -

Spec extensions: .ads

Body extensions: .adb

Separate extensions: .adb

<unit_name> <spec_file> <body_file>

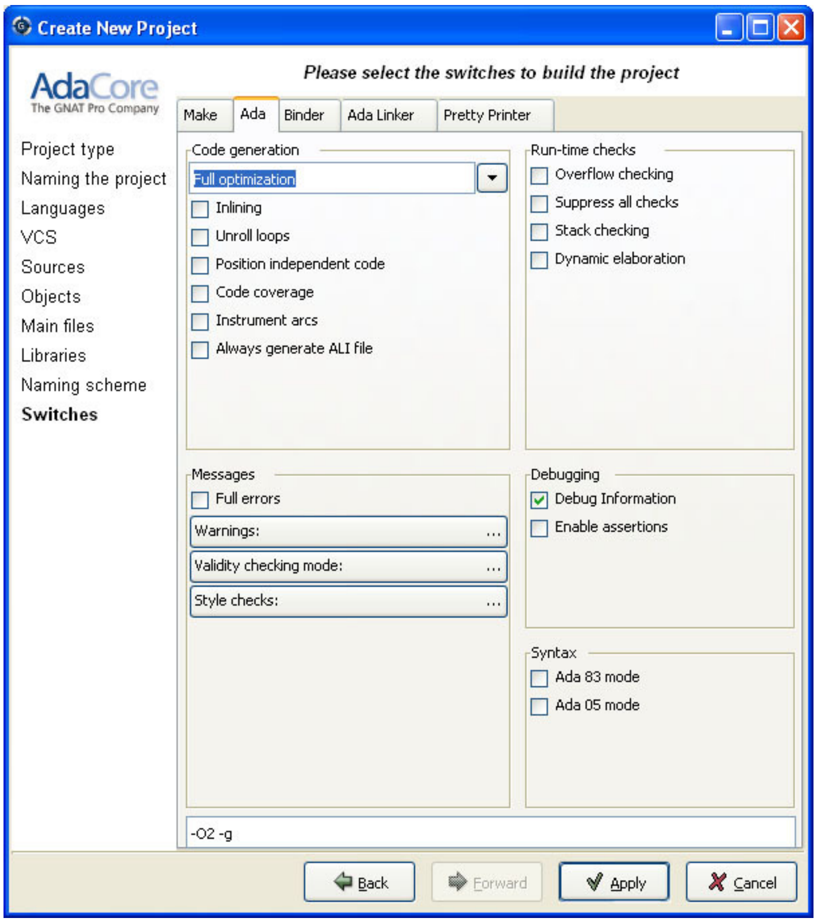
For all languages, GPS accepts exceptions to this standard naming scheme. For instance, this let you specify that in addition to using '`.adb`' for Ada body files, the file '`foo.ada`' should also be considered as an Ada file.

The list of exceptions is displayed in the bottom list of the naming scheme editor. To remove entries from this list, select the line you want to remove, and then press the ⟨Del⟩ key. The contents of the lines can be edited interactively, by double-clicking on the line and column you want to edit.

To add new entries to this list, use the fields at the bottom of the window, and press the update button.

7.8.10 Switches

The last page of the project wizard is used to select the default switches to be used by the various tools that GPS calls (compiler, linker, binder, pretty printer, . . .).



Code generation: Full optimization
- [ ] Inlining
- [ ] Unroll loops
- [ ] Position independent code
- [ ] Code coverage
- [ ] Instrument arcs
- [ ] Always generate ALI file

Run-time checks
- [ ] Overflow checking
- [ ] Suppress all checks
- [ ] Stack checking
- [ ] Dynamic elaboration

Messages
- [ ] Full errors
- Warnings: ...
- Validity checking mode: ...
- Style checks: ...

Debugging
- [✓] Debug Information
- [ ] Enable assertions

Syntax
- [ ] Ada 83 mode
- [ ] Ada 05 mode

```
-O2 -g
```

This page appears as a notebook, where each page is associated with a specific tool. All these pages have the same structure:

Graphical selection of switches

The top part of each page contains a set of buttons, combo boxes, entry fields, . . . which give fast and intuitive access to the most commonly used switches for that tool.

Textual selection of switches
The bottom part is an editable entry field, where you can directly type the switches. This makes it easier to move from an older setup (e.g. Makefile, script) to GPS, by copy-pasting switches.

The two parts of the pages are kept synchronized at any time: clicking on a button will edit the entry field to show the new switch; adding a new switch by hand in the entry field will activate the corresponding button if there is one.

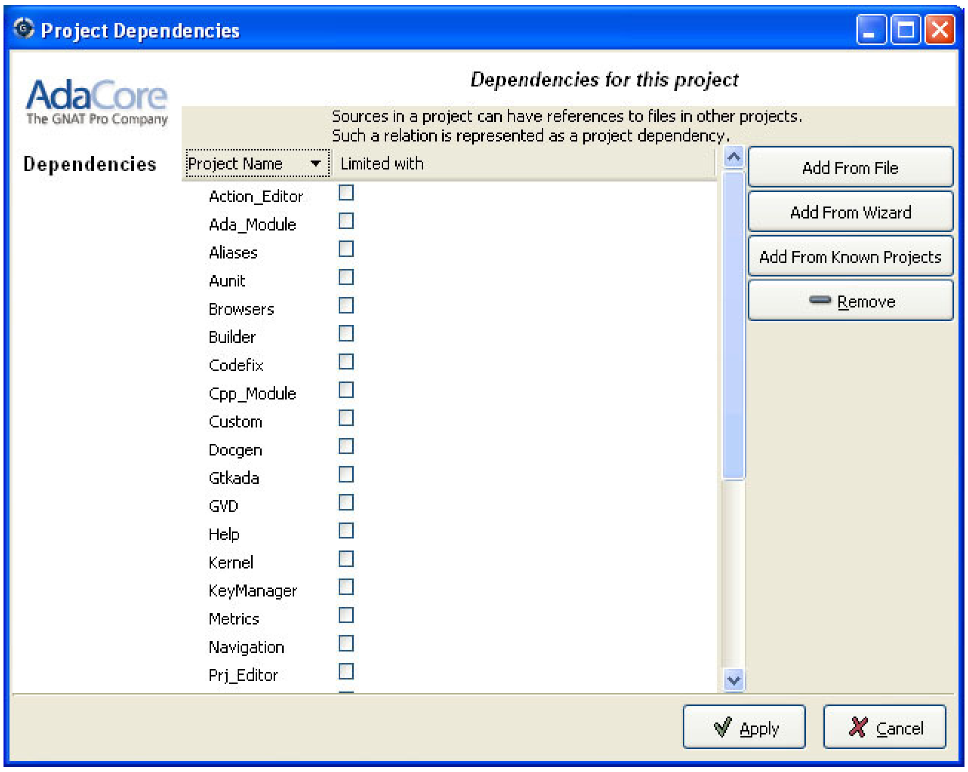
Any switch can be added to the entry field, even if there is no corresponding button. In this case, GPS will simply forward it to the tool when it is called, without trying to represent it graphically.

7.9 The Project Dependencies Editor

You can edit the dependencies between projects through the contextual menu `Project->Dependencies...` in the Project View.

This view makes it easy to indicate that your project depends on external libraries, or other modules in your source code. For instance, you can give access to the GtkAda graphical library in your project by adding a project dependency to gtkada.gpr, assuming GtkAda has been installed in your system.

The dependencies also determine in what order your application is built. When you compile a project, the builder will first make sure that the projects it depends on are up-to-date, and otherwise recompile them.



Sources in a project can have references to files in other projects.
Such a relation is represented as a project dependency.

Project Name	Limited with
Action_Editor	☐
Ada_Module	☐
Aliases	☐
Aunit	☐
Browsers	☐
Builder	☐
Codefix	☐
Cpp_Module	☐
Custom	☐
Docgen	☐
Gtkada	☐
GVD	☐
Help	☐
Kernel	☐
KeyManager	☐
Metrics	☐
Navigation	☐
Prj_Editor	☐

When you select that contextual menu, GPS will open a dialog that allows you to add or remove dependencies to your project. New dependencies are added by selecting a project file name from one of several sources:

- One of the loaded project from the current project tree
- One of the predefined projects

  These are the projects that are found in one of the directories referenced in the `ADA_PROJECT_PATH` environment variable. Typically, these include third party libraries, such as GtkAda, win32ada, . . .
- A new project created through the project wizard
- Any project file located on the disk

In all these cases, you will generally be able to choose whether this should be a simple dependency, or a limited dependency. The latter allows you to have mutually dependent projects (A depends on B, which in turns depends on A even indirectly), although you cannot reference the attribute of such a project in the current project (for instance to indicate that the compiler switches to use for A are the same as for B – you need to duplicate that information).

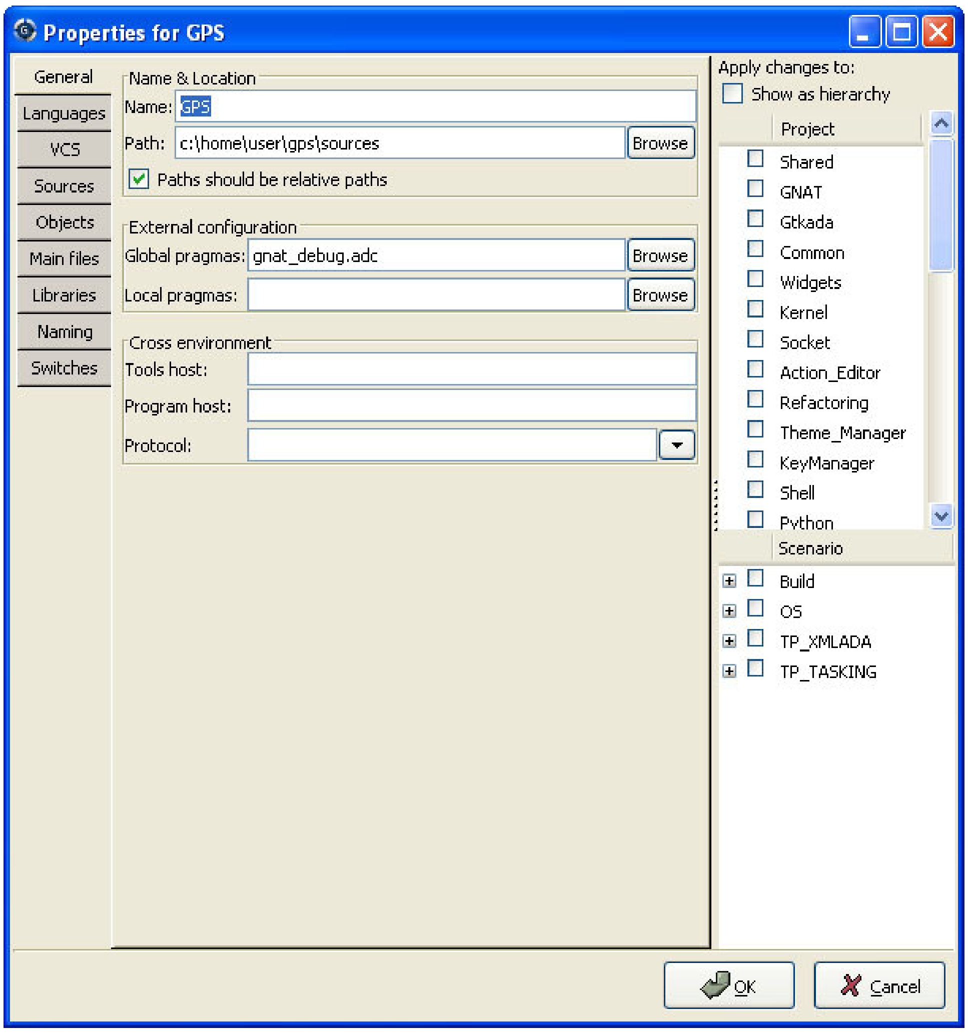
In some cases, GPS will force a limited dependency on you to avoid loops in the dependencies that would make the project tree illegal.

7.10 The Project Properties Editor

The project properties editor gives you access at any time to the properties of your project. It is accessible through the menu `Project->Edit Project Properties`, and through the contextual menu `Edit project properties` on any project item, e.g. from the Project View or the Project Browser.

If there was an error loading the project (invalid syntax, non-existing directories, . . .), a warning dialog is displayed when you select the menu. This reminds you that the project might be only partially loaded, and editing it might result in the loss of data. In such cases, it is recommended that you edit the project file manually, which you can do directly from the pop-up dialog.

Fix the project file as you would for any text file, and then reload it manually (through the `Project->Open...` or `Project->Recent` menus.



Name: GPS
Path: c:\home\user\gps\sources
[✓] Paths should be relative paths
Global pragmas: gnat_debug.adc
Local pragmas:
Tools host:
Program host:
Protocol:

[ ] Show as hierarchy

Project: [ ] Shared, [ ] GNAT, [ ] Gtkada, [ ] Common, [ ] Widgets, [ ] Kernel, [ ] Socket, [ ] Action_Editor, [ ] Refactoring, [ ] Theme_Manager, [ ] KeyManager, [ ] Shell, [ ] Python

Scenario: [ ] Build, [ ] OS, [ ] TP_XMLADA, [ ] TP_TASKING

The project properties editor is divided in three parts:

The attributes editor

The contents of this editor are very similar to that of the project wizard (see Section 7.8 [The Project Wizard], page 70). In fact, all pages but the `General` page are exactly the same, and you should therefore read the description for these in the project wizard chapter.

The general page gives access to more attributes than the general page of the project wizard does. In addition, you can select the name of the external tools that GPS uses (such as compilers, debugger, . . .).

See also Chapter 14 [Working in a Cross Environment], page 157 for more info on the `Cross environment` attributes.

The project selector

This area, in the top-right corner of the properties editor, contains a list of all the projects in the hierarchy. The value in the attributes editor is applied to all the selected projects in this selector. You cannot unselect the project for which you activated the contextual menu.

Clicking on the right title bar (`Project`) of this selector will sort the projects in ascending or descending order.

Clicking on the left title bar (untitled) will select or unselect all the projects.

This selector has two different possible presentations, chosen by the toggle button on top: you can either get a sorted list of all the projects, each one appearing only once. Or you can have the same project hierarchy as displayed in the project view.

The scenario selector

This area, in the bottom-right corner of the properties editor, lists all the scenario variables declared for the project hierarchy. By selecting some or all of their values, you can chose to which scenario the modifications in the attributes editor apply.

Clicking on the left title bar (untitled, on the left of the `Scenario` label) will select or unselect all values of all variables.

To select all values of a given variable, click on the corresponding check button.

7.11 The Switches Editor

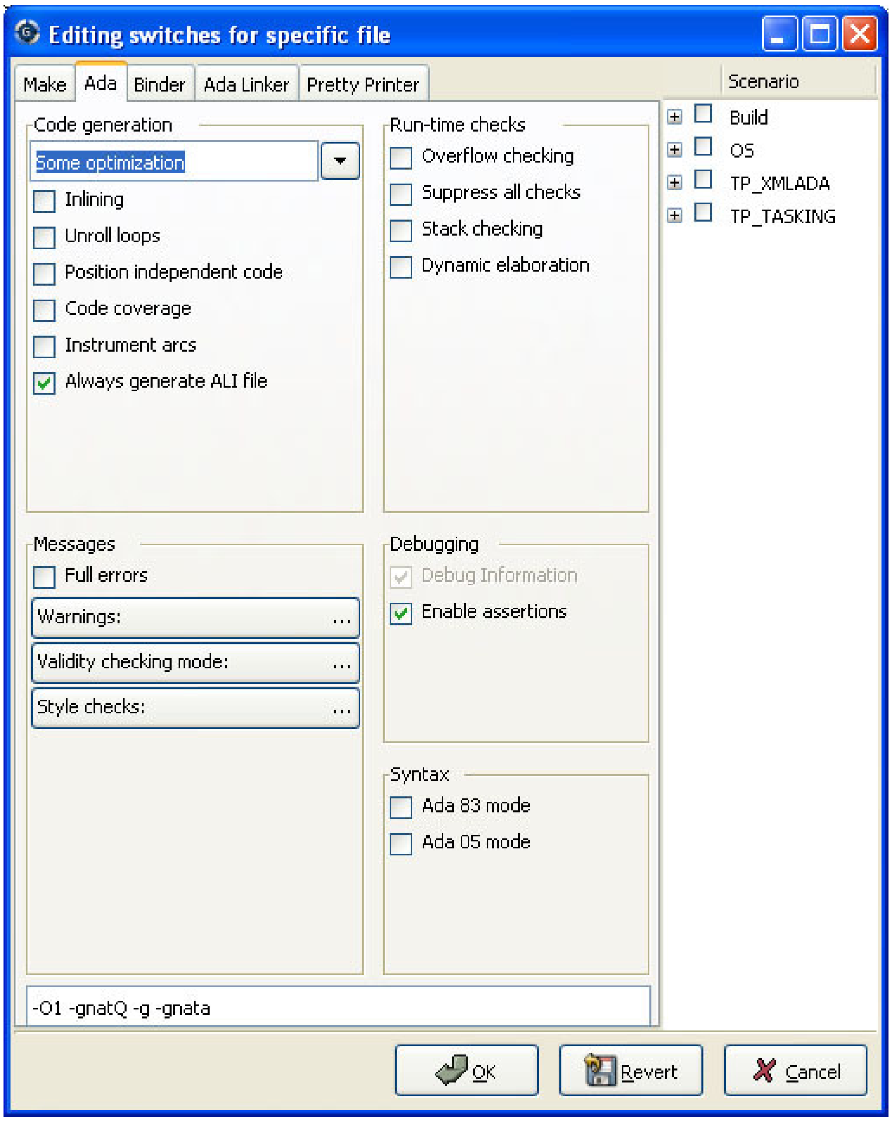
The switches editor, available through the menu `Project->Edit Switches`, lists all the source files associated with the selected project.

For each file, the compiler switches are listed. These switches are displayed in gray if they are the default switches defined at the project level (see Section 7.10 [The Project Properties Editor], page 79). They are defined in black if they are specific to a given file.

Double-clicking in the switches column allows you to edit the switches for a specific file. It is possible to edit the switches for multiple files at the same time by selecting them before displaying the contextual menu (`Edit switches for all selected files`).

When you double-click in one of the columns that contain the switches, a new dialog is opened that allows you to edit the switches specific to the selected files.

This dialog has a button titled `Revert`. Clicking on this button will cancel any file-specific switch, and revert to the default switches defined at the project level.



Code generation: Some optimization
☐ Inlining
☐ Unroll loops
☐ Position independent code
☐ Code coverage
☐ Instrument arcs
☑ Always generate ALI file

Run-time checks
☐ Overflow checking
☐ Suppress all checks
☐ Stack checking
☐ Dynamic elaboration

Messages
☐ Full errors
Warnings: ...
Validity checking mode: ...
Style checks: ...

Debugging
☑ Debug Information
☑ Enable assertions

Syntax
☐ Ada 83 mode
☐ Ada 05 mode

Scenario
☐ Build
☐ OS
☐ TP_XMLADA
☐ TP_TASKING

-O1 -gnatQ -g -gnata

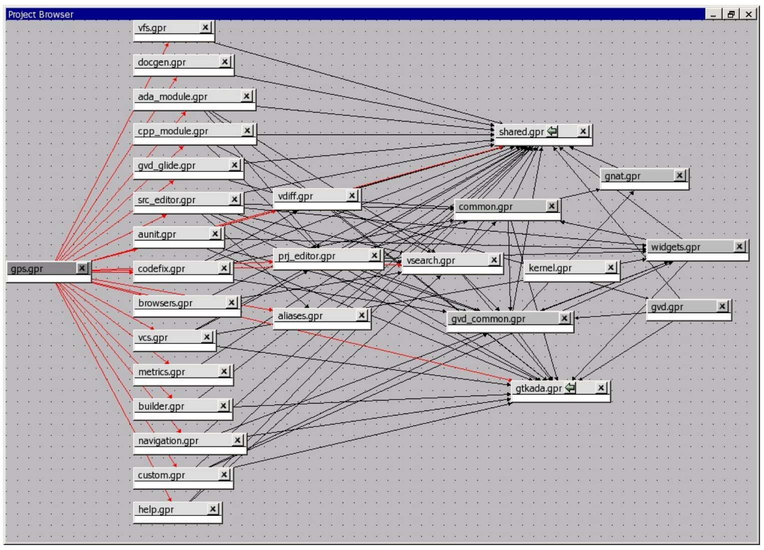
7.12 The Project Browser

The project graph is a special kind of browser (see Chapter 10 [Source Browsing], page 97). It shows the dependencies between all the project in the project hierarchy. Two items in this browser will be linked if one of them imports the other.

It is accessed through the contextual menu in the project view, by selecting the `Show projects imported by...` item, when right-clicking on a project node.

Clicking on the left arrow in the title bar of the items will display all the projects that import that project. Similarly, clicking on the right arrow will display all the projects that are imported by that project.

The contextual menu obtained by right-clicking on a project item contains several items. Most of them are added by the project editor, and gives direct access to editing the properties of the project, adding dependencies... See Section 2.5 [The Project View], page 5.



Some new items are added to the menu:

`Locate in Project View`
: Selecting this item will switch the focus to the project view, and highlight the first project node found that matches the project in the browser item. This is a convenient way to get information like the list of directories or source files for that project.

`Show dependencies`
: This item plays the same role as the right arrow in the title bar, and display all the projects in the hierarchy that are imported directly by the selected project

`Show recursive dependencies`
: This item will display all the dependencies recursively for the project (i.e. the projects it imports directly, the projects that are imported by them, and so on).

`Show projects depending on`
: This item plays the same role as the left arrow in the title bar, and displays all the projects that directly import the selected project.

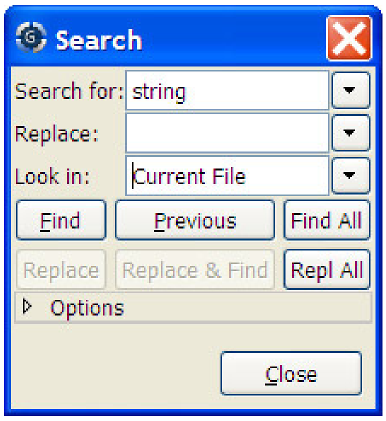
8 Searching and Replacing

GPS provides extensive search capabilities among its different elements. For instance, it is possible to search in the currently edited source file, or in all the source files belonging to the project, even those that are not currently open. It is also possible to search in the project view (on the left side of the main GPS window), ...

All these search contexts are grouped into a single graphical window, that you can open either through the menu `Navigate->Find/Replace...`, or the shortcut ⟨Ctrl-F⟩.

By default, the search window is floating, ie appears as a dialog on top of GPS. You can choose to put it inside the multiple document interface permanently for easier access. This can be done by selecting the menu `Window->Floating`, and then drag-and-dropping the search window in a new location if you wish (for instance above the Project View).

Selecting either of these two options will pop up a dialog on the screen, similar to the following:



On this screen shot, you can see three entry fields:

`Search for`
: This is the location where you type the string or pattern you are looking for. The search widget supports two modes, either fixed strings or regular expressions. You can commute between the two modes by either clicking on the `Options` button and selecting the appropriate check box, or by opening the combo box (click on the arrow on the right of the entry field).

  In this combo box, a number of predefined patterns are provided. The top two ones are empty patterns, that automatically set up the appropriate fixed strings/regular expression mode. The other regular expressions are language-specific, and will match patterns like Ada type definition, C++ method declaration, . . .

`Replace with`
: This field should contain the string that will replace the occurrences of the pattern defined above. The combo box provides a history of previously used replacement strings.

`Look in`
: This field defines the context in which the search should occur. GPS will automatically select the most appropriate context when you open the search dialog, depending on which component currently has the focus. If several contexts are possible for one component (for example, the editor has "Current_File", "Files from Project", "Files..." and "Open Files"), then the last one you've been using will be selected. You can of course change the context to another one if needed.

  Clicking on the arrow on the right will display the list of all possible contexts. This list includes:

  `Project View`
  : Search in the project view. An extra *Scope* box will be displayed where you can specify the scope of your search, which can be a set of: `Projects`, `Directories`, `Files`, `Entities`. The search in entities may take a long time, search each file is parsed during the search.

  `Open Files`
  : Search in all the files that are currently open in the source editor. The *Scope* entry is described in the `Files...` section below.

  `Files...`
  : Search in a given set of files. An extra *Files* box will be displayed where you can specify the files by using standard shell (Unix or Windows) regular expression, e.g. `*.ad?` for all files ending with .ad and any trailing character. The directory specified where the search starts, and the *Recursive search* button whether sub directories will be searched as well.

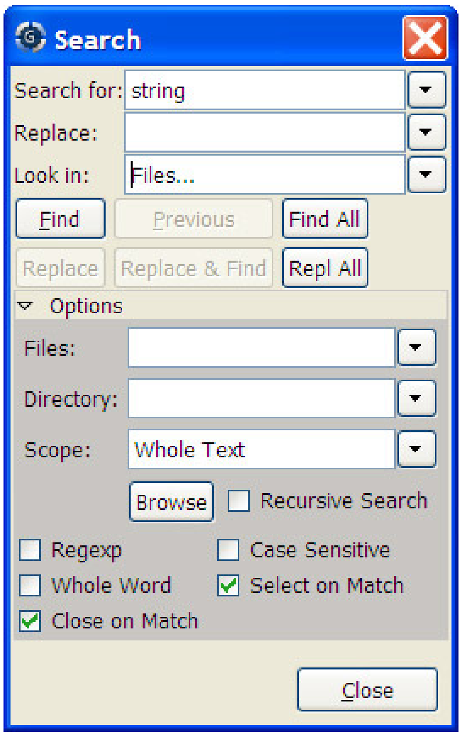
    The *Scope* entry is used to restrict the search to a set of language constructs, e.g. to avoid matching on comments when you are only interested in actual code, or to only search strings and comments, and ignore the code.

`Files From Project`
: Search in all the files from the project, including files from project dependencies. The *Scope* entry is described in the `Files...` section above.

`Current File`
: Search in the current source editor. The *Scope* entry is described in the `Files...` section above.

`Project Browser`
: Search in the project browser (see Section 7.12 [The Project Browser], page 83).

The second part of the window is a row of buttons, to start the search (or continue to the next occurrence), and to display the options.



Search for: string
Replace:
Look in: Files...
Files:
Directory:
Scope: Whole Text
☐ Recursive Search
☐ Regexp
☐ Case Sensitive
☐ Whole Word
✓ Select on Match
✓ Close on Match

There are five check boxes in this options box.

`"Regexp"` This button commutes between fixed string patterns and regular expressions. You can also commute between these two modes by selecting the arrow on the right of the `Search for:` field. The grammar followed by the regular expressions is similar to the Perl and Python regular expressions grammar, and is documented in the GNAT run time file ‘`g-regpat.ads`’. To open it from GPS, you can use the open from project dialog (`File->Open From Project...`) and type g-regpat.ads. See [Open From Project], page 33 for more information on this dialog.

`"Case Sensitive"`
: By default, patterns are case insensitive (upper-case letters and lower-case letters are considered as equivalent). You can change this behavior by clicking on this check box.

`"Whole Word"`
: If activated, this check box will force the search engine to ignore substrings. `"`sensitive`"` will no longer match `"`insensitive`"`.

`Select on Match`
: When this button is selected, the focus is given to the editor that contains the match, so that you can start editing the text immediatly. If the button is not selected, the focus is left on the search window, so that you can press Enter to search for the next occurrence.

`Close on Match`
: This button only appears if the search window is floating. If this button is enabled, the search window will be automatically closed when an occurrence of the search string is found.

Pressing the `Find` / `Previous` buttons performs an interactive search. It stops as soon as one occurrence of the pattern is found. search. Once a first occurrence has been found, the `Find` button is renamed to `Next`. You then have to press the `Next` button (or the equivalent shortcut ⟨Ctrl-N⟩) to go to the next occurrence.

If you use the `Find all` button, the search widget will start searching for all occurrences right away, and put the results in a new window called `Locations`, See Section 2.14 [The Locations Tree], page 16.

The `Replace` and `Replace & Find` buttons are grayed out as long as no occurence of the pattern is found. In order to enable them, you have to start a search, e.g. by pressing the `Find` button. Pressing `Replace` will replace the current occurence (and therefore the two buttons will be grayed out), and `Replace & Find` will replace the occurence and then jump to the next one, if any. If you don’t want to replace the current occurence, you can jump directly to the next one by pressing `Next`.

The `Repl all` button will replace all the occurences found. By default, a popup is displayed and ask for confirmation. It’s possible to disable this popup by either checking the box `"`Do not ask this question again`"`, or by going in the Search pannel of the preferences pages, and unchecking `"`Confirmation for 'Replace all'`"`. The confirmation popup can be reenabled through this checkbox.

As most GPS components, the search window is under control of the multiple document interface, and can thus be integrated into the main GPS window instead of being an external window.

To force this behavior, open the menu `Window`, select `Search` in the list at the bottom of the menu, and then select either `Floating` or `Docked`.

If you save the desktop (`File->Save More->Desktop`, GPS will automatically reopen the search dialog in its new place when it is started next time.

9 Compilation/Build

This chapter describes how to compile files, build executables and run them. Most capabilities can be accessed through the `Build` menu item, or through the `Build` and `Run` contextual menu items, as described in the following section.

When compiler messages are detected by GPS, an entry is added in the *Locations tree*, allowing you to easily navigate through the compiler messages (see Section 2.14 [The Locations Tree], page 16), or even to automatically correct some errors or warnings (see Section 13.3 [Code Fixing], page 150).

9.1 The Build Menu

The build menu gives access to capabilities related to checking, parsing and compiling files, as well as creating and running executables.

Check Syntax
: Check the syntax of the current source file. Display an error message in the *Messages* window if no file is currently selected.

Compile File
: Compile the current file. Display an error message in the *Messages* window if no file is selected.

  If errors or warnings occur during the compilation, the corresponding locations will appear in the Locations Tree. If the corresponding Preference is set, the source lines will be highlighted in the editors (see Section 16.1 [The Preferences Dialog], page 165). To remove the highlighting on these lines, remove the files from the Locations Tree.

Make

Compile all sources
: Compile all source files defined in the currently selected project, or by default the top level project.

All
: Build and link all main units defined in your project. If no main unit is specified in your project, build all files defined in your project and subprojects recursively. For a library project file, compile sources and recreate the library when needed.

<current file>
: Consider the currently selected file as a main file, and build it.

Custom...
: Display a text entry where you can enter any external command. This menu is very useful when you already

have existing build scripts, make files, . . . and want to invoke them from GPS. If the `SHELL` environment variable is defined (to e.g. `/bin/sh`), then the syntax used to execute the command is the one for this shell. Otherwise, the command will be spawned directly by GPS without any shell interpretation.

Clean

Root Project
Remove all object files and other compilation artifacts associated to the root project. It does not clean objects from other related projects.

all
Remove all object files and other compilation artifacts associated to all projects related to the current one. It allows to restart a complete build from scratch.

Recompute C/C++ Xref info
Recompute the cross-reference information for C and C++ source files. See Section 6.1 [Support for Cross-References], page 51.

Load xref info in meomry
Load all the cross-reference information in memory. This menu is generally not needed, See Section 6.1 [Support for Cross-References], page 51.

Run

main
For each main source file defined in your top level project, an entry is listed to run the executable associated with this main file. Running an application will first open a dialog where you can specify command line arguments to your application, if needed. You can also specify whether the application should be run within GPS (the default), or using an external terminal.

When running an application from GPS, a new execution window is added in the bottom area where input and output of the application is handled. This window is never closed automatically, even when the application terminates, so that you can still have access to the application's output. If you explicitly close an execution window while an application is still running, a dialog window will be displayed to confirm whether the application should be terminated.

When using an external terminal, GPS launches an external terminal utility that will take care of the execution and input/output of your application. This external utility can be configured in the preferences dialog (*External Commands->Execute command*).

The GPS execution windows have several limitations compared to external terminals. In particular, they do not handle signals like ⟨ctrl-z⟩ and ⟨control-c⟩. In general, if you are running an interactive application, we strongly encourage you to run in an external terminal.

Similarly, the `Run` contextual menu accessible from a project entity contains the same entries.

Custom... Similar to the entry above, except that you can run any arbitrary executable. If the `SHELL` environment variable is defined (to e.g. `/bin/sh`), then the syntax used to execute the command is the one for this shell. Otherwise, the command will be spawned directly by GPS without any shell interpretation.

The `Tools->Interrupt` menu can be used to interrupt the last compilation or run command. Once you have interrupted that last operation, you can interrupt the previous one by selecting the same menu again.

However, the easiest way to interrupt a specific operation, no matter if it was started last or not, is to use the `Task Manager`, through the `Tools->Views->Tasks` menu. It will show one line per running process, and right-clicking on any of these lines gives the possibility to interrupt that process.

If your application is build through a Makefile, you should probably load the '`Makefile.py`' startup script (see the menu `/Tools/Plug-ins`).

10 Source Browsing

10.1 General Issues

GPS contains several kinds of browsers, that have a common set of basic functionalities. There are currently four such browsers: the project browser (see Section 7.12 [The Project Browser], page 83), the call graph (see Section 10.2 [Call Graph], page 99), the dependency browser (see Section 10.3 [Dependency Browser], page 101) and the entity browser (see Section 10.4 [Entity Browser], page 104).

All these browsers are interactive viewers. They contain a number of items, whose visual representation depends on the type of information displayed in the browser (they can be projects, files, entities, . . .).

In addition, the following capabilities are provided in all browsers:

Scrolling
When a lot of items are displayed in the canvas, the currently visible area might be too small to display all of them. In this case, scrollbars will be added on the sides, so that you can make other items visible. Scrolling can also be done with the arrow keys.

Layout
A basic layout algorithm is used to organize the items. This algorithm is layer oriented: items with no parents are put in the first layer, then their direct children are put in the second layer, and so on. Depending on the type of browser, these layers are organized either vertically or horizontally. This algorithm tries to preserve as much as possible the positions of the items that were moved interactively.

The `Refresh layout` menu item in the background contextual menu can be used to recompute the layout of items at any time, even for items that were previously moved interactively.

Interactive moving of items
Items can be moved interactively with the mouse. Click and drag the item by clicking on its title bar. The links will still be displayed during the move, so that you can check whether it overlaps any other item. If you are trying to move the item outside of the visible part of the browser, the latter will be scrolled.

Links
Items can be linked together, and will remain connected when items are moved. Different types of links exist, see the description of the various browsers.

By default, links are displayed as straight lines. You can choose to use orthogonal links instead, which are displayed only with vertical or horizontal lines. Select the entry `orthogonal links` in the background contextual menu.

Exporting
The entire contents of a browser can be exported as a `PNG` image using the entry `Export to PNG...` in the background contextual menu. It can also be exported in `SVG` format using the `Export to SVG...` entry.

Zooming Several different zoom levels are available. The contextual menu in the background of the browser contains three entries: `zoom in`, `zoom out` and `zoom`. The latter is used to select directly the zoom level you want.

This zooming capability is generally useful when lots of items are displayed in the browser, to get a more general view of the layout and the relationships between the items.

Selecting items
Items can be selected by clicking inside them. Multiple items can be selected by holding the ⟨control⟩ key while clicking in the item. Alternatively, you can click and drag the mouse inside the background of the browser. All the items found in the selection rectangle when the mouse is released will be selected.

Selected items are drawn with a different title bar color. All items linked to them also use a different title bar color, as well as the links. This is the most convenient way to understand the relationships between items when lots of them are present in the browser.

Hyper-links
Some of the items will contain hyper links, displayed in blue by default, and underlined. Clicking on these will generally display new items.

Two types of contextual menus are available in the browsers: the background contextual menu is available by right-clicking in the background area (i.e. outside of any item). As described above, it contains entries for the zooming, selecting of orthogonal links, and refresh; the second kind of contextual menu is available by right-clicking in items.

The latter menu contains various entries. Most of the entries are added by various modules in GPS (VCS module, source editor, . . .). In addition, each kind of browser also has some specific entries, which is described in the corresponding browser's section.

There are two common items in all item contextual menus:

`Hide Links`
: Browsers can become confusing if there are many items and many links. You can lighten them by selecting this menu entry. As a result, the item will remain in the canvas, but none of the links to or from it will be visible. Selecting the item will still highlight linked items, so that this information remains available.

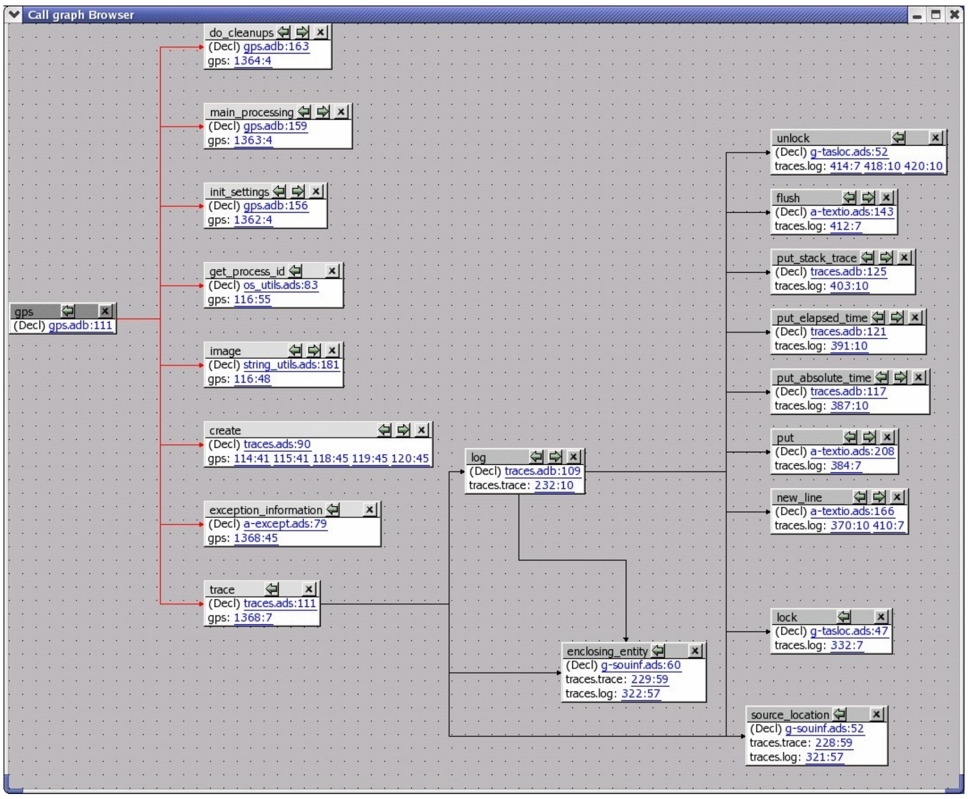
`Remove unselected items`
: Selecting this menu will remove all the items that are not currently selected. This is a convenient method to clean up the contents of the browser.

`Remove selected items`
: Selecting this menu will remove all the items that are currently selected.

10.2 Call Graph

The call graph shows graphically the relationship between subprogram callers and callees. A link between two items indicate that one of them is calling the other.

A special handling is provided for renaming entities (in Ada): if a subprogram is a renaming of another one, both items will be displayed in the browser, with a special hashed link between the two. Since the renaming subprogram doesn't have a proper body, you will then need to ask for the subprograms called by the renamed to get the list.


Call graph Browser
gps (Decl) gps.adb:111
do_cleanups (Decl) gps.adb:163 gps: 1364:4
main_processing (Decl) gps.adb:159 gps: 1363:4
init_settings (Decl) gps.adb:156 gps: 1362:4
get_process_id (Decl) os_utils.ads:83 gps: 116:55
image (Decl) string_utils.ads:181 gps: 116:48
create (Decl) traces.ads:90 gps: 114:41 115:41 118:45 119:45 120:45
exception_information (Decl) a-except.ads:79 gps: 1368:45
trace (Decl) traces.ads:111 gps: 1368:7
log (Decl) traces.adb:109 traces.trace: 232:10
enclosing_entity (Decl) g-souinf.ads:60 traces.trace: 229:59 traces.log: 322:57
unlock (Decl) g-tasloc.ads:52 traces.log: 414:7 418:10 420:10
flush (Decl) a-textio.ads:143 traces.log: 412:7
put_stack_trace (Decl) traces.adb:125 traces.log: 403:10
put_elapsed_time (Decl) traces.adb:121 traces.log: 391:10
put_absolute_time (Decl) traces.adb:117 traces.log: 387:10
put (Decl) a-textio.ads:208 traces.log: 384:7
new_line (Decl) a-textio.ads:166 traces.log: 370:10 410:7
lock (Decl) g-tasloc.ads:47 traces.log: 332:7
source_location (Decl) g-souinf.ads:52 traces.trace: 228:59 traces.log: 321:57

In this browser, clicking on the right arrow in the title bar will display all the entities that are called by the selected item.

Clicking on the left arrow will display all the entities that call the selected item (i.e. its callers).

This browser is accessible through the contextual menu in the project view and source editor, by selecting one of the items:

All boxes in this browser list several information: the location of their declaration, and the list of all their references in the other entities currently displayed in the browser. If you close the box for an entity that calls them, the matching references are also hidden, to keep the contents of the browser simpler.

`Browsers->`*Entity* `calls`
: Display all the entities called by the selected entity. This has the same effect as clicking on the right title bar arrow if the item is already present in the call graph.

`Browsers->`*Entity* `is called by`
: Display all the entities called by the selected entity. This has the same effect as clicking on the left title bar arrow if the item is already present in the call graph.

The contextual menu available by right-clicking on the entities in the browser has the following new entries, in addition to the ones added by other modules of GPS.

Entity `calls`
: Same as described above.

Entity `is called by`
: Same as described above.

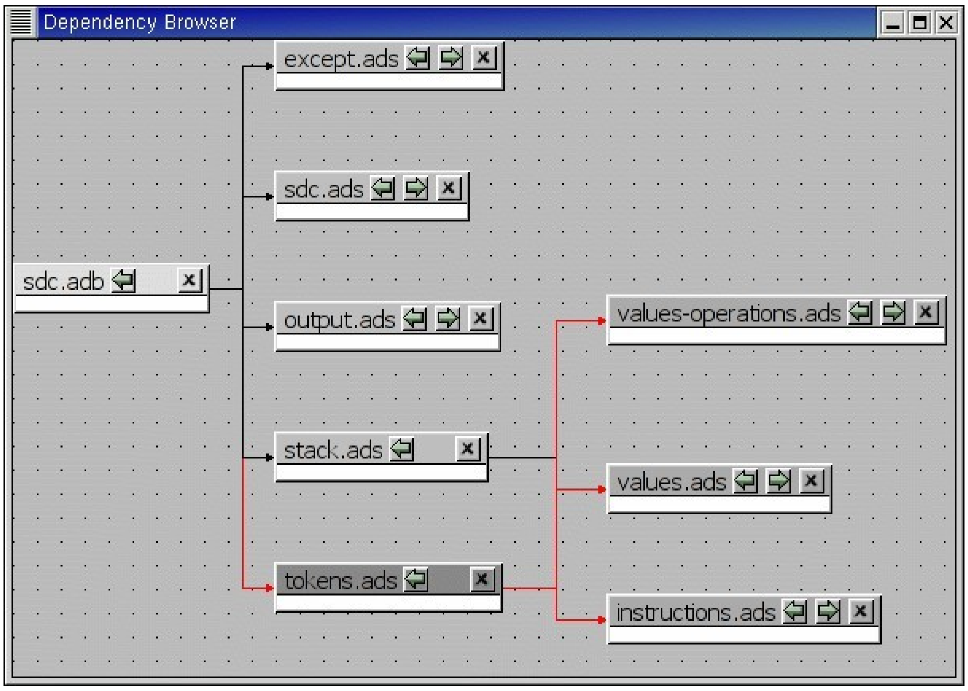
`Go To Spec`
: Selecting this item will open a source editor that displays the declaration of the entity.

`Go To Body`
: Selecting this item will open a source editor that displays the body of the entity.

`Locate in Project View`
: Selecting this menu entry will move the focus to the project view, and select the first node representing the file in which the entity is declared. This makes it easier to see which other entities are declared in the same file.

10.3 Dependency Browser

The dependency browser shows the dependencies between source files. Each item in the browser represents one source file.



In this browser, clicking on the right arrow in the title bar will display the list of files that the selected file depends on. A file depend on another one if it explicitly imports it (`with` statement in Ada, or `#include` in C/C++). Implicit dependencies are currently not displayed in this browser, since the information is accessible by opening the other direct dependencies.

Clicking on the left arrow in the title bar will display the list of files that depend on the selected file.

This browser is accessible through the contextual menu in the project view and the source editor, by selecting one of the following items:

`Show dependencies for` *file*
: This has the same effect as clicking on the right arrow for a file already in the browser, and will display the direct dependencies for that file.

`Show files depending on` *file*
: This has the same effect as clicking on the left arrow for a file already in the browser, and will display the list of files that directly depend on that file.

The background contextual menu in the browser adds a few entries to the standard menu:

`Open file...`
: This menu entry will display an external dialog in which you can select the name of a file to analyze.

`Recompute dependencies`
: This menu entry will check that all links displays in the dependency browser are still valid. If not, they are removed. The arrows in the title bar are also reset if necessary, in case new dependencies were added for the files.

  The browser is not refreshed automatically, since there are lots of cases where the dependencies might change (editing source files, changing the project hierarchy or the value of the scenario variables, . . .)

  It also recomputes the layout of the graph, and will change the current position of the boxes.

`Show system files`
: This menu entry indicates whether standard system files (runtime files for instance in the case of Ada) are displayed in the browser. By default, these files will only be displayed if you explicitly select them through the `Open file` menu, or the contextual menu in the project view.

`Show implicit dependencies`
: This menu entry indicates whether implicit dependencies should also be displayed for the files. Implicit dependencies are files that are required to compile the selected file, but that are not explicitly imported through a `with` or `#include` statement. For instance, the body of generics in Ada is an implicit dependency. Any time one of the implicit dependencies is modified, the selected file should be recompiled as well.

The contextual menu available by right clicking on an item also adds a number of entries:

`Analyze other file`
: This will open a new item in the browser, displaying the complement file for the selected one. In Ada, this would be the body if you clicked

on a spec file, or the opposite. In C, it depends on the naming conventions you specified in the project properties, but you would generally go from a '`.h`' file to a '`.c`' file and back.

`Show dependencies for` *file*
These play the same role as in the project view contextual menu

10.4 Entity Browser

The entity browser displays static information about any source entity.

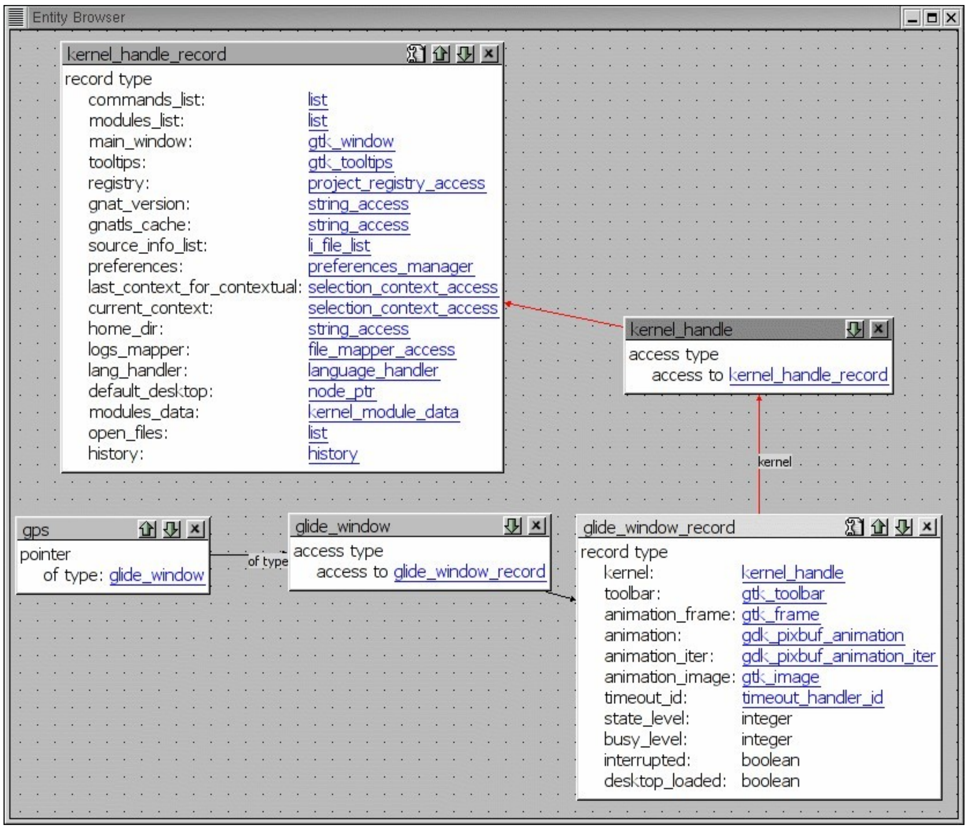
The exact content of the items depend on the type of the item. For instance:

`Ada record / C struct`
The list of fields, each as an hyper link, is displayed. Clicking on one of the fields will open a new item for the type.

`Ada tagged type / C++ class`
The list of attributes and methods is displayed. They are also clickable hyper-links.

`Subprograms`
The list of parameters is displayed

`Packages` The list of all the entities declared in that package is displayed `and more...`



kernel_handle_record
record type

commands_list:	list
modules_list:	list
main_window:	gtk_window
tooltips:	gtk_tooltips
registry:	project_registry_access
gnat_version:	string_access
gnatls_cache:	string_access
source_info_list:	li_file_list
preferences:	preferences_manager
last_context_for_contextual:	selection_context_access
current_context:	selection_context_access
home_dir:	string_access
logs_mapper:	file_mapper_access
lang_handler:	language_handler
default_desktop:	node_ptr
modules_data:	kernel_module_data
open_files:	list
history:	history

kernel_handle
access type
access to kernel_handle_record

gps
pointer
of type: glide_window

glide_window
access type
access to glide_window_record

glide_window_record
record type

kernel:	kernel_handle
toolbar:	gtk_toolbar
animation_frame:	gtk_frame
animation:	gdk_pixbuf_animation
animation_iter:	gdk_pixbuf_animation_iter
animation_image:	gtk_image
timeout_id:	timeout_handler_id
state_level:	integer
busy_level:	integer
interrupted:	boolean
desktop_loaded:	boolean

This browser is accessible through the contextual menu in the project view and source editor, when clicking on an entity:

`Browsers/Examine entity` *entity*
: Open a new item in the entity browser that displays information for the selected entity.

Most information in the items are click-able (by default, they appear as underlined blue text). Clicking on one of these hyper links will open a new item in the entity browser for the selected entity.

This browser can display the parent entities for an item. For instance, for a C++ class or Ada tagged type, this would be the types it derives from. This is accessible by clicking on the up arrow in the title bar of the item.

Likewise, children entities (for instance types that derive from the item) can be displayed by clicking on the down arrow in the title bar.

An extra button appear in the title bar for the C++ class or Ada tagged types, which toggles whether the inherited methods (or primitive operations in Ada) should be displayed. By default, only the new methods, or the ones that override an inherited one, are displayed. The parent's methods are not shown, unless you click on this title bar button.

11 Debugging

GPS is also a graphical front-end for text-based debuggers such as GDB. A knowledge of the basics of the underlying debugger used by GPS will help understanding how GPS works and what kind of functionalities it provides.

Please refer to the debugger-specific documentation - e.g. the GDB documentation - for more details.

The integrated debugger provided by GPS is using an improved version of the GVD engine, so the functionalities between GVD and GPS are very similar. If you are familiar with GVD, you may be interested in reading Section 11.9 [Upgrading from GVD to GPS], page 126 which explains the differences between the two environments.

Debugging is tightly integrated with the other components of GPS. For example, it is possible to edit files and navigate through your sources while debugging.

To start a debug session, go to the menu `Debug->Initialize`, and choose either the name of your executable, if you have specified the name of your main program(s) in the project properties, or start an empty debug session using the `<no main file>` item. It is then possible to load any file to debug, by using the menu `Debug->Debug->Load File...`

Note that you can create multiple debuggers by using the `Initialize` menu several times: this will create a new debugger each time. All the debugger-related actions (e.g. stepping, running) are performed on the current debugger, which is represented by the current debugger console. To switch between debuggers, simply select its corresponding console.

After the debugger has been initialized, you have access to two new windows: the data window (in the top of the working area), and the debugger console (in a new page, after the Messages and Shell windows). All the menus under `Debugger` are now also accessible, and you also have access to additional contextual menus, in particular in the source editor where it is possible to easily display variables, set breakpoints, and get automatic display (via *tool tips*) of object values.

When you want to quit the debugger without quitting GPS, go to the menu `Debug->Terminate Current`, that will terminate your current debug session, or the menu `Debug->Terminate` that will terminate all your debug sessions at once.

11.1 The Debug Menu

The `Debug` entry in the menu bar provides operations that act at a global level. Key shortcuts are available for the most common operations, and are displayed in the menus themselves. Here is a detailed list of the menu items that can be found in the menu bar:

Run... Opens a dialog window allowing you to specify the arguments to pass to the program to be debugged, and whether this program should be stopped at the beginning of the main subprogram. If you confirm by clicking on the *OK* button, the program will be launched according to the arguments entered.

Step Execute the program until it reaches a different source line.

Step Instruction
Execute the program for one machine instruction only.

Next Execute the program until it reaches the next source line, stepping over subroutine calls.

Next Instruction
Execute the program until it reaches the next machine instruction, stepping over subroutine calls.

Finish Continue execution until selected stack frame returns.

Continue
Continue execution of the program being debugged.

Interrupt
Asynchronously interrupt the program being debugged. Note that depending on the state of the program, you may stop it in low-level system code that does not have debug information, or in some cases, not even a coherent state. Use of breakpoints is preferable to interrupting programs. Interrupting programs is nevertheless indispensable in some situations, for example when the program appears to be in an infinite (or at least very time-consuming) loop.

Terminate Current
Terminate the current debug session, by closing the data window and the debugger console, as well as terminating the underlying debugger (e.g `gdb`) used to handle the low level debugging.

Terminate
Terminate all your debug sessions. Same as `Terminate Current` if there is only one debugger open.

11.1.1 Debug

Connect to Board...
Opens a simple dialog to connect to a remote board. This option is only relevant to cross debuggers.

Load File...

Opens a file selection dialog that allows you to choose a program to debug. The program to debug is either an executable for native debugging, or a partially linked module for cross environments (e.g VxWorks).

Add Symbols...
Add the symbols from a given file/module. This corresponds to the gdb command *add-symbol-file*. This menu is particularly useful under VxWorks targets, where the modules can be loaded independently of the debugger. For instance, if a module is independently loaded on the target (e.g. using windshell), it is absolutely required to use this functionality, otherwise the debugger won't work properly.

Attach... Instead of starting a program to debug, you can instead attach to an already running process. To do so, you need to specify the process id of the process you want to debug. The process might be busy in an infinite loop, or waiting for event processing. Note that as for [core files], page 109, you need to specify an executable before attaching to a process.

Detach Detaches the currently debugged process from the underlying debugger. This means that the executable will continue to run independently. You can use the *Attach To Process* menu later to re-attach to this process.

Debug Core File...
This will open a file selection dialog that allows you to debug a core file instead of debugging a running process. Note that you must first specify an executable to debug before loading a core file.

Kill Kills the process being debugged.

11.1.2 Data

Note that most items in this menu need to access the underlying debugger when the process is stopped, not when it is running. This means that you first need to stop the process on a breakpoint or interrupt it, before using the following commands. Failing to do so will result in blank windows.

Data Window
Displays the Data window. If this window already exists, it is raised so that it becomes visible

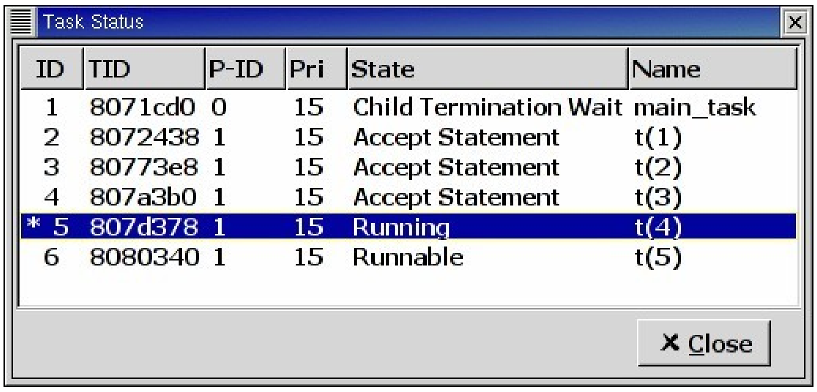
Call Stack
Displays the Call Stack window. See Section 11.2 [The Call Stack Window], page 111 for more details.

Threads Opens a new window containing the list of threads currently present in the executable as reported by the underlying debugger. For each thread, it will give information such as internal identifier, name and status. This information is language- and debugger-dependent. You should refer to the underlying debugger's documentation for more details. As indicated above, the process being debugged needs to be stopped before using this command, otherwise a blank list will be displayed.

When supported by the underlying debugger, clicking on a thread will change the context (variables, call stack, source file) displayed, allowing you to inspect the stack of the selected thread.

Tasks For GDB only, this will open a new window containing the list of Ada tasks currently present in the executable. Similarly to the thread window, you can switch to a selected task context by clicking on it, if supported by GDB. See the GDB documentation for the list of items displayed for each task.

As for the thread window, the process being debugged needs to be stopped before using this window.



ID	TID	P-ID	Pri	State	Name
1	8071cd0	0	15	Child Termination Wait	main_task
2	8072438	1	15	Accept Statement	t(1)
3	80773e8	1	15	Accept Statement	t(2)
4	807a3b0	1	15	Accept Statement	t(3)
* 5	807d378	1	15	Running	t(4)
6	8080340	1	15	Runnable	t(5)

Protection Domains
For VxWorks AE only, this will open a new window containing the list of available protection domains in the target. To change to a different protection domain, simply click on it. A indicates the current protection domain.

Assembly
Opens a new window displaying an assembly dump of the current code being executed. See Section 11.7 [The Assembly Window], page 123 for more details.

Edit Breakpoints
Opens an advanced window to create and modify any kind of breakpoint, including watchpoints (see Section 11.4 [The Breakpoint Editor], page 117). For simple breakpoint creation, see the description of the source window.

Examine Memory
Opens a memory viewer/editor. See Section 11.5 [The Memory Window], page 120 for more details.

Command History
Opens a dialog with the list of commands executed in the current session. You can select any number of items in this list and replay the selection automatically.

Display Local Variables
Opens an item in the Data Window containing all the local variables for the current frame.

Display Arguments
Opens an item in the Data Window containing the arguments for the current frame.

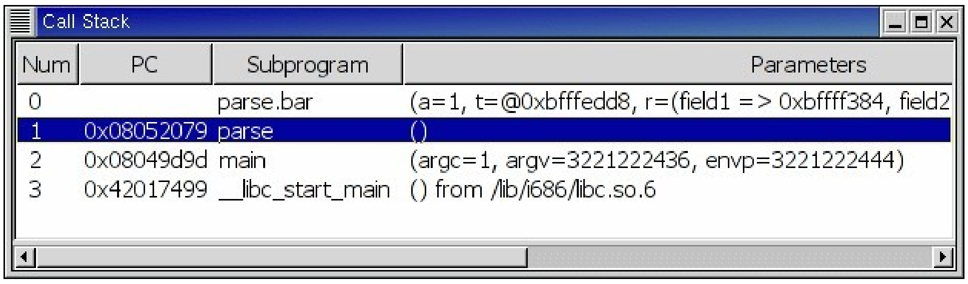
Display Registers
Opens an item in the Data Window containing the machine registers for the current frame.

Display Any Expression...
Opens a small dialog letting you specify an arbitrary expression in the Data Window. This expression can be a variable name, or a more complex expression, following the syntax of the underlying debugger. See the documentation of e.g gdb for more details on the syntax. The check button *Expression is a subprogram call* should be enabled if the expression is actually a debugger command (e.g `p/x var`) or a procedure call in the program being debugged (e.g `call my_proc`).

Recompute
Recomputes and refreshes all the items displayed in the Data Window.

11.2 The Call Stack Window

The call stack window gives a list of frames corresponding to the current execution stack for the current thread/task.



Num	PC	Subprogram	Parameters
0		parse.bar	(a=1, t=@0xbfffedd8, r=(field1 => 0xbffff384, field2
1	0x08052079	parse	()
2	0x08049d9d	main	(argc=1, argv=3221222436, envp=3221222444)
3	0x42017499	__libc_start_main	() from /lib/i686/libc.so.6

The bottom frame corresponds to the outermost frame where the thread is currently stopped. This frame corresponds to the first function executed by the current thread (e.g main if the main thread is in C). You can click on any frame to switch to the caller's context, this will update the display in the source window. See also the up and down buttons in the tool bar to go up and down one frame in the call stack.

The contextual menu (right mouse button) allows you to choose which information you want to display in the call stack window (via check buttons):

- Frame number: the debugger frame number (usually starts at 0 or 1)
- Program Counter: the low level address corresponding to the function's entry point.
- Subprogram Name: the name of the subprogram in a given frame
- Parameters: the parameters of the subprogram
- File Location: the filename and line number information.

By default, only the subprogram name is displayed. You can hide the call stack window by closing it, as for other windows, and show it again using the menu `Data->Call Stack`.

11.3 The Data Window

11.3.1 Description

The Data Window is the area in which various information about the debugged process can be displayed. This includes the value of selected variables, the current contents of the registeres, the local variables, . . .

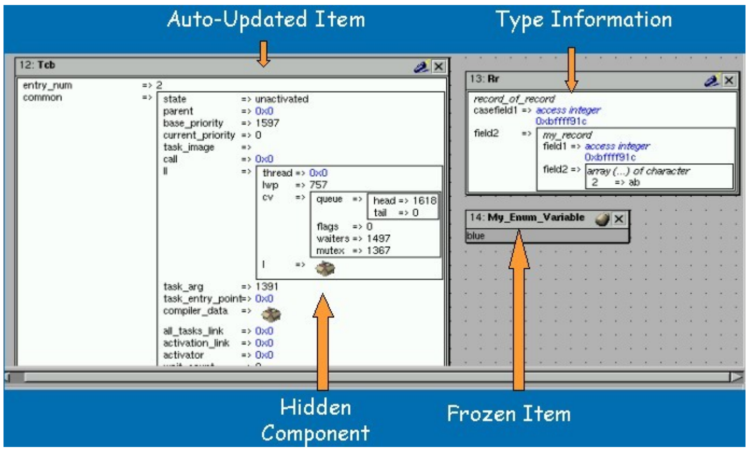
This window is not open by default when you start the debugger. It will be created automatically when needed (e.g. when using the Debug constextual menu to display a variable). You can also force its display through the menu `Debug->Data->Data Window`.

However, if you save the desktop through the menu `File->Save More->Desktop` while the data window is open, it will be automatically reopen the next time the desktop is loaded, for instance when restarting GPS.

The contents of the data window is preserved by default whenever you close it. Thus, if you reopen the data window either during the same debugger session, or automatically when you start a debugger on the same executable, it will display the same items again. This behavior is controlled by the `Preserve State on Exit` preference.

The data window contains all the graphic boxes that can be accessed using the *Data->Display* menu items, or the data window *Display Expression...* contextual menu, or the source window *Display* contextual menu items, or finally the *graph* command in the debugger console.

For each of these commands, a box is displayed in the data window with the following information:



```
12: Tcb
entry_num          => 2
common             => state             => unactivated
                      parent            => 0x0
                      base_priority     => 1597
                      current_priority  => 0
                      task_image        =>
                      call              => 0x0
                      ll                => thread => 0x0
                                           lwp    => 757
                                           cv     => queue   => head => 1618
                                                                tail => 0
                                                     flags   => 0
                                                     waiters => 1497
                                                     mutex   => 1367
                                           l      =>
                      task_arg          => 1391
                      task_entry_point  => 0x0
                      compiler_data     =>
                      all_tasks_link    => 0x0
                      activation_link   => 0x0
                      activator         => 0x0
```

```
13: Rr
record_of_record
casefield1 => access integer
              0xbffff91c
field2     => my_record
              field1 => access integer
                        0xbffff91c
              field2 => array (...) of character
                        2      => ab
```

```
14: My_Enum_Variable
blue
```

- A title bar containing:
  - The number of this expression: this is a positive number starting from 1 and incremented for each new box displayed. It represents the internal identifier of the box.
  - The name of the expression: this is the expression or variable specified when creating the box.
  - An icon representing either a flash light, or a lock. This is a click-able icon that will change the state of the box from automatically updated (the flash light icon) to frozen (the lock icon). When frozen, the value

is grayed, and will not change until you change the state. When updated, the value of the box will be recomputed each time an execution command is sent to the debugger (e.g step, next).

   - An icon representing an 'X'. You can click on this icon to close/delete any box.

- A main area. The main area will display the data value hierarchically in a language-sensitive manner. The canvas knows about data structures of various languages (e.g `C`, `Ada`, `C++`) and will organize them accordingly. For example, each field of a record/struct/class, or each item of an array will be displayed separately. For each subcomponent, a thin box is displayed to distinguish it from the other components.

A contextual menu, that takes into account the current component selected by the mouse, gives access to the following capabilities:

Close *component*
Closes the selected item.

Hide all *component*
Hides all subcomponents of the selected item. To select a particular field or item in a record/array, move your mouse over the name of this component, not over the box containing the values for this item.

Show all *component*
Shows all subcomponents of the selected item.

Clone *component*
Clones the selected component into a new, independent item.

View memory at address of *component*
Brings up the memory view dialog and explore memory at the address of the component.

Set value of *component*
Sets the value of a selected component. This will open an entry box where you can enter the new value of a variable/component. Note that GDB does not perform any type or range checking on the value entered.

Update Value
Refreshes the value displayed in the selected item.

Show Value
Shows only the value of the item.

Show Type
Shows only the type of each field for the item.

Show Value+Type
Shows both the value and the type of the item.

Auto refresh
Enables or disables the automatic refreshing of the item upon program execution (e.g step, next).

A contextual menu can be accessed in the canvas itself (point the mouse to an empty area in the canvas, and click on the right mouse button) with the following entries:

Display Expression...
Open a small dialog letting you specify an arbitrary expression in the Data Window. This expression can be a variable name, or a more complex expression, following the syntax of the current language and underlying debugger. See the documentation of e.g gdb for more details on the syntax. The check button *Expression is a subprogram call* should be enabled if the expression is actually not an expression but rather a debugger command (e.g `p/x var`) or a procedure call in the program being debugged (e.g `call my_proc`).

Align On Grid
Enables or disables alignment of items on the grid.

Detect Aliases
Enables or disables the automatic detection of shared data structures. Each time you display an item or dereference a pointer, all the items already displayed on the canvas are considered and their addresses are compared with the address of the new item to display. If they match, (for example if you tried to dereference a pointer to an object already displayed) instead of creating a new item a link will be displayed.

Zoom in Redisplays the items in the data window with a bigger font

Zoom out
Displays the items in the data window with smaller fonts and pixmaps. This can be used when you have several items in the window and you can't see all of them at the same time (for instance if you are displaying a tree and want to clearly see its structure).

Zoom Allows you to choose the zoom level directly from a menu.

Clear When this item is selected, all the boxes currently displayed are removed.

11.3.2 Manipulating items

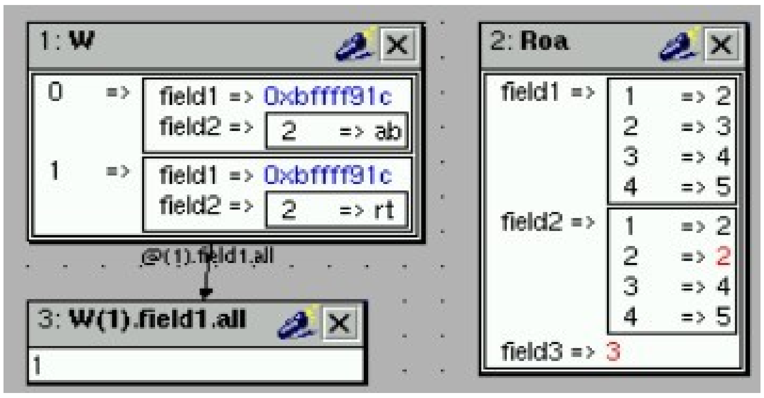
11.3.2.1 Moving items

All the items on the canvas have some common behavior and can be fully manipulated with the mouse. They can be moved freely anywhere on the canvas, simply by clicking on them and then dragging the mouse. Note that if you are trying to move an item outside of the visible area of the data window, the latter will be scrolled so as to make the new position visible.

Automatic scrolling is also provided if you move the mouse while dragging an item near the borders of the data window. As long as the mouse remains close to the border and the button is pressed on the item, the data window is scrolled and the item is moved. This provides an easy way to move an item a long distance from its initial position.

11.3.2.2 Colors

Most of the items are displayed using several colors, each conveying a special meaning. Here is the meaning assigned to all colors (note that the exact color can be changed through the preferences dialog; these are the default colors):



black This is the default color used to print the value of variables or expressions.

blue This color is used for C pointers (or Ada access values), i.e. all the variables and fields that are memory addresses that denote some other value in memory.

You can easily dereference these (that is to say see the value pointed to) by double-clicking on the blue text itself.

red This color is used for variables and fields whose value has changed since the data window was last displayed. For instance, if you display an array in the data window and then select the *Next* button in the tool bar, then the elements of the array whose value has just changed will appear in red.

As another example, if you choose to display the value of local variables in the data window (*Display->Display Local Variables*), then only the variables whose value has changed are highlighted, the others are left in black.

11.3.2.3 Icons

Several different icons can be used in the display of items. They also convey special meanings.

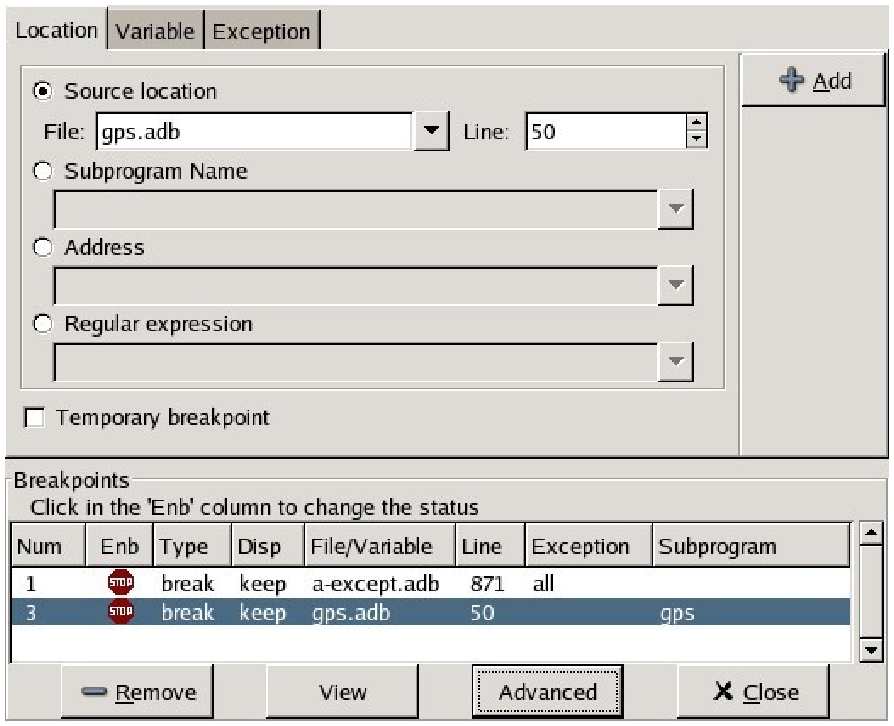
trash bin icon
This icon indicates that the debugger could not get the value of the variable or expression. There might be several reasons, for instance the variable is currently not in scope (and thus does not exist), or it might have been optimized away by the compiler. In all cases, the display will be updated as soon as the variable becomes visible again.

package icon
This icon indicates that part of a complex structure is currently hidden. Manipulating huge items in the data window (for instance if the variable is an array of hundreds of complex elements) might not be very helpful. As a result, you can shrink part of the value to save some screen space and make it easier to visualize the interesting parts of these variables.

Double-clicking on this icon will expand the hidden part, and clicking on any sub-rectangle in the display of the variable will hide that part and replace it with that icon.

See also the description of the contextual menu to automatically show or hide all the contents of an item. Note also that one alternative to hiding subcomponents is to clone them in a separate item (see the contextual menu again).

11.4 The Breakpoint Editor



(● Source location)

File: gps.adb

Line: 50

☐ Temporary breakpoint

Breakpoints

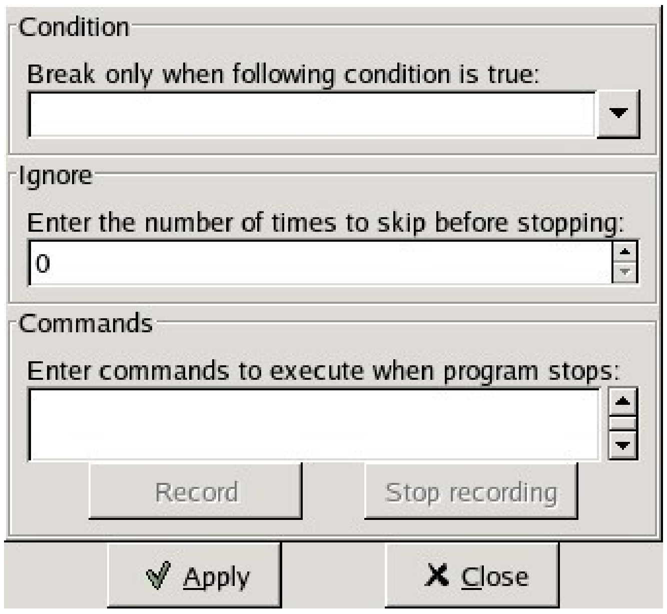
Click in the 'Enb' column to change the status

Num	Enb	Type	Disp	File/Variable	Line	Exception	Subprogram
1	STOP	break	keep	a-except.adb	871	all	
3	STOP	break	keep	gps.adb	50		gps

The breakpoint editor can be accessed from the menu *Data->Edit Breakpoints*. It allows manipulation of different kinds of breakpoints: at a source location, on a subprogram, at an executable address, on memory access (watchpoints), and on Ada exceptions.

The top area provides an interface to create the different kinds of breakpoints, while the bottom area lists existing breakpoints and their characteristics.

It is possible to access advanced breakpoint characteristics for a given breakpoint. First, select a breakpoint in the list. Then, click on the *Advanced* button, which will display a new dialog window. You can specify commands to run automatically after a breakpoint is hit, or specify how many times a selected breakpoint will be ignored. If running VxWorks AE, you can also change the Scope and Action settings for breakpoints.


Condition

Break only when following condition is true:

Ignore

Enter the number of times to skip before stopping:

0

Commands

Enter commands to execute when program stops:

11.4.1 Scope/Action Settings for VxWorks AE

In VxWorks AE breakpoints have two extra properties:

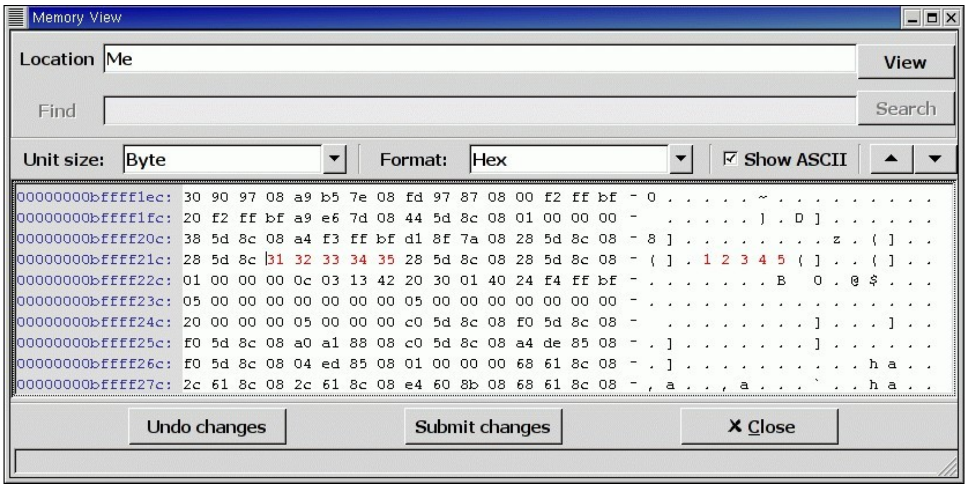
- Scope: which task(s) can hit a given breakpoint. Possible Scope values are:
  - task: the breakpoint can only be hit by the task that was active when the breakpoint was set. If the breakpoint is set before the program is run, the breakpoint will affect the environment task
  - pd: any task in the current protection domain can hit that breakpoint
  - any: any task in any protection domain can hit that breakpoint. This setting is only allowed for tasks in the Kernel domain.
- Action: when a task hits a breakpoints, which tasks are stopped:
  - task: stop only the task that hit the breakpoint.
  - pd: stop all tasks in the current protection domain
  - all: stop all breakable tasks in the system

These two properties can be set/changed through the advanced breakpoints characteristics by clicking on the *Advanced* button. There are two ways of setting these properties:

- Per breakpoint settings: after setting a breakpoint (the default Scope/Action values will be task/task), select the *Scope/Action* tab in the *Advanced* settings. To change these settings on a given breakpoint, select it from the breakpoints list, select the desired values of Scope and Action and click on the *Update* button.
- Default session settings: select the *Scope/Action* tab in the *Advanced* settings. Select the desired Scope and Action settings, check the *Set as session defaults* check box below and click the *Close* button. From now on, every new breakpoint will have the selected values for Scope and Action.

If you have enabled the preference `Preserve state on exit`, GPS will automatically save the currently set breakpoints, and restore them the next time you debug the same executable. This allows you to immediately start debugging your application again, without reseting the breakpoints every time.

11.5 The Memory Window



Location: Me
Unit size: Byte
Format: Hex
☑ Show ASCII

```
00000000bffff1ec: 30 90 97 08 a9 b5 7e 08 fd 97 87 08 00 f2 ff bf - 0 . . . . . . ~ . . . . . . . . .
00000000bffff1fc: 20 f2 ff bf a9 e6 7d 08 44 5d 8c 08 01 00 00 00 -   . . . . . . ] . D ] . . . . . .
00000000bffff20c: 38 5d 8c 08 a4 f3 ff bf d1 8f 7a 08 28 5d 8c 08 - 8 ] . . . . . . . . . z . ( ] . .
00000000bffff21c: 28 5d 8c 31 32 33 34 35 28 5d 8c 08 28 5d 8c 08 - ( ] . 1 2 3 4 5 ( ] . . ( ] . .
00000000bffff22c: 01 00 00 00 0c 03 13 42 20 30 01 40 24 f4 ff bf - . . . . . . . . B   0 . @ $ . . .
00000000bffff23c: 05 00 00 00 00 00 00 00 05 00 00 00 00 00 00 00 - . . . . . . . . . . . . . . . .
00000000bffff24c: 20 00 00 00 05 00 00 00 c0 5d 8c 08 f0 5d 8c 08 -   . . . . . . . . . ] . . . . ] . .
00000000bffff25c: f0 5d 8c 08 a0 a1 88 08 c0 5d 8c 08 a4 de 85 08 - . ] . . . . . . . ] . . . . . .
00000000bffff26c: f0 5d 8c 08 04 ed 85 08 01 00 00 00 68 61 8c 08 - . ] . . . . . . . . . . h a . .
00000000bffff27c: 2c 61 8c 08 2c 61 8c 08 e4 60 8b 08 68 61 8c 08 - , a . . , a . . . ` . . h a . .
```

The memory window allows you to display the contents of memory by specifying either an address, or a variable name.

To display memory contents, enter the address using the C hexadecimal notation: 0xabcd, or the name of a variable, e.g foo, in the *Location* text entry. In the latter case, its address is computed automatically. Then either press *Enter* or click on the *View* button. This will display the memory with the corresponding addresses in the bottom text area.

You can also specify the unit size (*Byte*, *Halfword* or *Word*), the format (*Hexadecimal*, *Decimal*, *Octal* or *ASCII*), and you can display the corresponding ASCII value at the same time.

The *up* and *down* arrows as well as the ⟨Page up⟩ and ⟨Page down⟩ keys in the memory text area allows you to walk through the memory in order of ascending/descending addresses respectively.

Finally, you can modify a memory area by simply clicking on the location you want to modify, and by entering the new values. Modified values will appear in a different color (red by default) and will only be taken into account (i.e written to the target) when you click on the *Submit changes* button. Clicking on the *Undo changes* or going up/down in the memory will undo your editing.

Clicking on *Close* will close the memory window, canceling your last pending changes, if any.

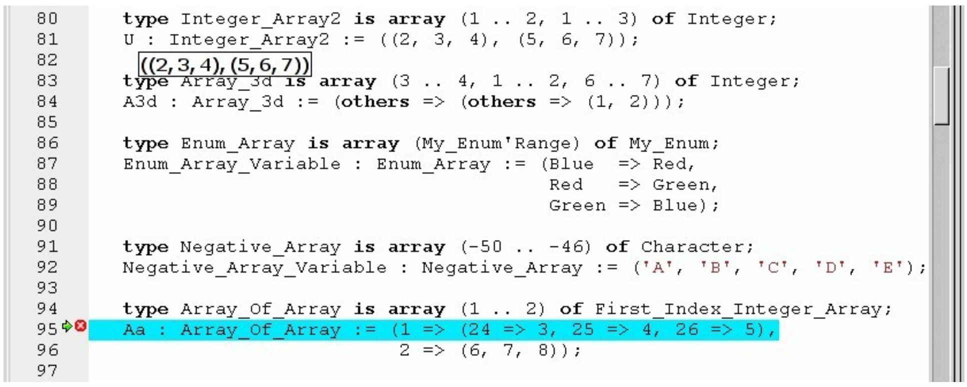
11.6 Using the Source Editor when Debugging

When debugging, the left area of each source editor provides the following information:

Lines with code
In this area, blue dots are present next to lines for which the debugger has debug information, in other words, lines that have been compiled with debug information and for which the compiler has generated some code. Currently, there is no check when you try to set a breakpoint on a non dotted line: this will simply send the breakpoint command to the underlying debugger, and usually (e.g in the case of gdb) result in setting a breakpoint at the closest location that matches the file and line that you specified.

Current line executed
This is a green arrow showing the line about to be executed.

Lines with breakpoints
For lines where breakpoints have been set, a red mark is displayed on top of the blue dot for the line. You can add and delete breakpoints by clicking on this area (the first click will set a breakpoint, the second click will remove it).



```
type Integer_Array2 is array (1 .. 2, 1 .. 3) of Integer;
U : Integer_Array2 := ((2, 3, 4), (5, 6, 7));
  ((2,3,4), (5,6,7))
type Array_3d is array (3 .. 4, 1 .. 2, 6 .. 7) of Integer;
A3d : Array_3d := (others => (others => (1, 2)));

type Enum_Array is array (My_Enum'Range) of My_Enum;
Enum_Array_Variable : Enum_Array := (Blue  => Red,
                                     Red   => Green,
                                     Green => Blue);

type Negative_Array is array (-50 .. -46) of Character;
Negative_Array_Variable : Negative_Array := ('A', 'B', 'C', 'D', 'E');

type Array_Of_Array is array (1 .. 2) of First_Index_Integer_Array;
Aa : Array_Of_Array := (1 => (24 => 3, 25 => 4, 26 => 5),
                        2 => (6, 7, 8));
```

The second area in the source window is a text window on the right that displays the source files, with syntax highlighting. If you leave the cursor over a variable, a tooltip will appear showing the value of this variable. Automatic tooltips can be disabled in the preferences menu. See [preferences dialog], page 165.

When the debugger is active, the contextual menu of the source window contains a sub menu called `Debug` providing the following entries.

Note that these entries are dynamic: they will apply to the entity found under the cursor when the menu is displayed (depending on the current language). In addition, if a selection has been made in the source window the text of the selection will be used instead. This allows you to display more complex expressions easily (for example by adding some comments to your code with the complex expressions you want to be able to display in the debugger).

Print *selection*
: Prints the selection (or by default the name under the cursor) in the debugger console.

Display *selection*
: Displays the selection (or by default the name under the cursor) in the data window. The value will be automatically refreshed each time the process state changes (e.g after a step or a next command). To freeze the display in the canvas, you can either click on the corresponding icon in the data window, or use the contextual menu for the specific item (see Section 11.3 [The Data Window], page 112 for more information).

Print *selection***.all**
: Dereferences the selection (or by default the name under the cursor) and prints the value in the debugger console.

Display *selection***.all**
Dereferences the selection (or by default the name under the cursor) and displays the value in the data window.

View memory at address of *selection*
Brings up the memory view dialog and explores memory at the address of the selection.

Set Breakpoint on Line *xx*
Sets a breakpoint on the line under the cursor, in the current file.

Set Breakpoint on *selection*
Sets a breakpoint at the beginning of the subprogram named *selection*

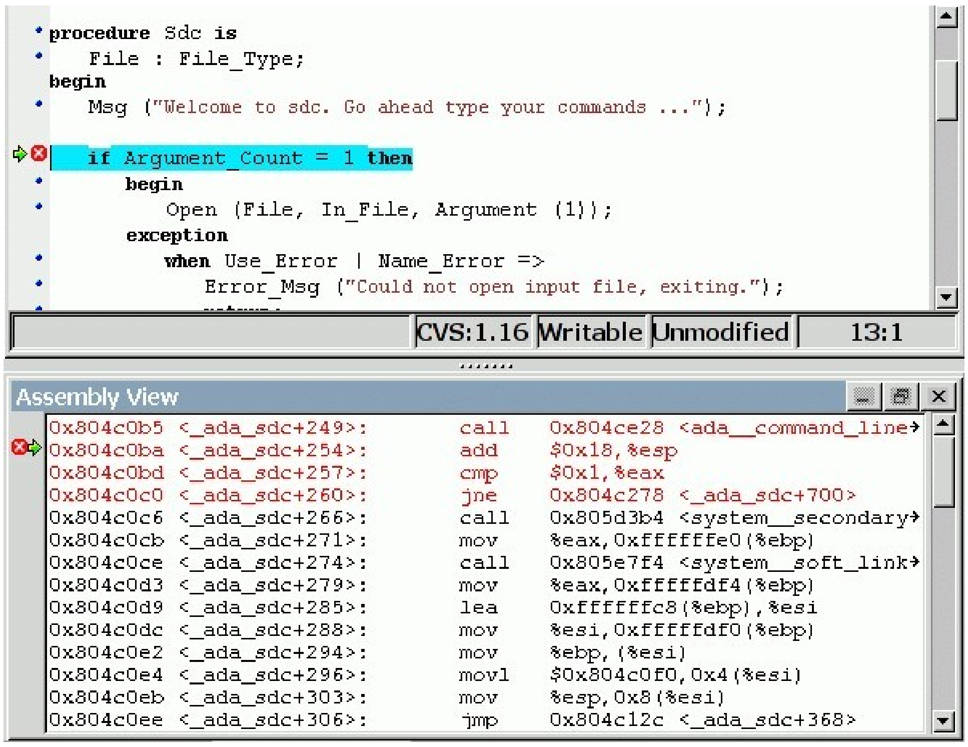
Continue Until Line *xx*
Continues execution (the program must have been started previously) until it reaches the specified line.

Show Current Location
Jumps to the current line of execution. This is particularly useful after navigating through your source code.

11.7 The Assembly Window

It is sometimes convenient to look at the assembly code for the subprogram or source line you are currently debugging.

You can open the assembly window by using the menu `Debug->Data->Assembly`.



```
procedure Sdc is
   File : File_Type;
begin
   Msg ("Welcome to sdc. Go ahead type your commands ...");

   if Argument_Count = 1 then
      begin
         Open (File, In_File, Argument (1));
      exception
         when Use_Error | Name_Error =>
            Error_Msg ("Could not open input file, exiting.");
```

```
CVS:1.16 Writable Unmodified    13:1
```

Assembly View

```
0x804c0b5 <_ada_sdc+249>:      call    0x804ce28 <ada__command_line>
0x804c0ba <_ada_sdc+254>:      add     $0x18,%esp
0x804c0bd <_ada_sdc+257>:      cmp     $0x1,%eax
0x804c0c0 <_ada_sdc+260>:      jne     0x804c278 <_ada_sdc+700>
0x804c0c6 <_ada_sdc+266>:      call    0x805d3b4 <system__secondary>
0x804c0cb <_ada_sdc+271>:      mov     %eax,0xffffffe0(%ebp)
0x804c0ce <_ada_sdc+274>:      call    0x805e7f4 <system__soft_link>
0x804c0d3 <_ada_sdc+279>:      mov     %eax,0xfffffdf4(%ebp)
0x804c0d9 <_ada_sdc+285>:      lea     0xffffffc8(%ebp),%esi
0x804c0dc <_ada_sdc+288>:      mov     %esi,0xfffffdf0(%ebp)
0x804c0e2 <_ada_sdc+294>:      mov     %ebp,(%esi)
0x804c0e4 <_ada_sdc+296>:      movl    $0x804c0f0,0x4(%esi)
0x804c0eb <_ada_sdc+303>:      mov     %esp,0x8(%esi)
0x804c0ee <_ada_sdc+306>:      jmp     0x804c12c <_ada_sdc+368>
```

The current assembly instruction is highlighted with a green arrow on its left. The instructions corresponding to the current source line are highlighted in red by default. This allows you to easily see where the program counter will point to, once you have pressed the "Next" button on the tool bar.

Moving to the next assembly instruction is done through the "Nexti" (next instruction) button in the tool bar. If you choose "Stepi" instead (step instruction), this will also jump to the subprogram being called.

For efficiency reasons, only a small part of the assembly code around the current instruction is displayed. You can specify in the [preferences dialog], page 165 how many instructions are displayed by default. Also, you can easily display the instructions immediately preceding or following the currently displayed instructions by pressing one of the ⟨Page up⟩ or ⟨Page down⟩ keys, or by using the contextual menu in the assembly window.

A convenient complement when debugging at the assembly level is the ability of displaying the contents of machine registers. When the debugger supports it (as gdb does), you can select the `Data->Display Registers` menu to get an item in the canvas that will show the current contents of each machine register, and that will be updated every time one of them changes.

You might also choose to look at a single register. With gdb, select the `Data->Display Any Expression`, entering something like

```
output /x $eax
```

in the field, and selecting the toggle button "Expression is a subprogram call". This will create a new canvas item that will be refreshed every time the value of the register (in this case eax) changes.

11.8 The Debugger Console

This is the text window located at the bottom of the main window. In this console, you have direct access to the underlying debugger, and can send commands (you need to refer to the underlying debugger's documentation, but usually typing *help* will give you an overview of the commands available).

If the underlying debugger allows it, pressing ⟨Tab⟩ in this window will provide completion for the command that is being typed (or for its arguments).

There are also additional commands defined to provide a simple text interface to some graphical features.

Here is the complete list of such commands. The arguments between square brackets are optional and can be omitted.

`graph (print|display) expression [dependent on display_num] [link_name name] [at x, y] [num num]`

This command creates a new item in the canvas, that shows the value of *`Expression`*. *`Expression`* should be the name of a variable, or one of its fields, that is in the current scope for the debugger.

The command `graph print` will create a frozen item, that is not automatically refreshed when the debugger stops, whereas `graph display` displays an automatically refreshed item.

The new item is associated with a number, that is visible in its title bar. This number can be specified through the `num` keyword, and will be taken into account if no such item already exists. These numbers can be used to create links between the items, using the second argument to the command, *`dependent on`*. The link itself (i.e. the line) can be given a name that is automatically displayed, using the third argument.

`` graph (print|display) `command` ``

This command is similar to the one above, except it should be used to display the result of a debugger command in the canvas.

For instance, if you want to display the value of a variable in hexadecimal rather than the default decimal with gdb, you should use a command like:

```
graph display `print /x my_variable`
```

This will evaluate the command between back-quotes every time the debugger stops, and display this in the canvas. The lines that have changed will be automatically highlighted (in red by default).

This command is the one used by default to display the value of registers for instance.

`graph (enable|disable) display display_num [display_num ...]`
: This command will change the refresh status of items in the canvas. As explained above, items are associated with a number visible in their title bar.

  Using the `graph enable` command will force the item to be automatically refreshed every time the debugger stops, whereas the `graph disable` command will freeze the item.

`graph undisplay display_num`
: This command will remove an item from the canvas

`view (source|asm|source_asm)`
: This command indicates what should be displayed in the source window. The first option indicates that only the source code should be visible, the second one specifies that only the assembly code should be visible, and the last one indicates that both should be displayed.

11.9 Upgrading from GVD to GPS

This section is intended for users already familiar with GVD, in order to help them transitioning to GPS. If you have not used GVD, you may want to skip this section.

This section outlines the differences between GVD and GPS, and also lists some of the advantages of GPS compared to GVD.

11.9.1 Command Line Switches

The following command line switches related to debugging are available in GPS:

`--debug`
: Automatically start a debug session, as done by GVD. You can also specify a program name and its arguments, so this option replaces the `--pargs` and `executable-file` arguments in GVD.

`--debugger`
: Equivalent to the same GVD option, with the difference that arguments can be specified as well, replacing the `--dargs` option.

`--target` Same as in GVD.

For example, the equivalent of the following command line using a sh-like shell would be:

```
$ gvd --debugger=gdb-5 executable --pargs 1 2 3
```

would be

```
$ gps --debug="executable 1 2 3" --debugger=gdb-5
```

`--traceon=GVD.OUT`
: This switch replaces the –log-level=4 option that was used to get the full log of the communications between GVD and the underlying debugger.

11.9.2 Menu Items

All the debugger-related menus in GVD can be found under the 'Debug' menu in GPS, with the following mapping:

`File->xxx`
: available under `Debug->Debug->xxx`

`Program->xxx`
: available under `Debug->xxx`

`Data->xxx`
: available under `Debug->Data->xxx`

The menu `File->New Debugger...` is replaced by the combination of the menu `Debug->Initialize` and the project properties, available under `Project->Edit Project Properties` where you can similarly specify your *Debugger Host* (called *Tools Host*), your *Program Host*, the *Protocol* used by the underlying debugger to communicate with the target, and the name of the debugger. To conveniently switch between multiple debugger configurations, we recommend to use a scenario variable and set different properties based on the value of this variable. See Section 7.3 [Scenarios and Configuration Variables], page 62 and Chapter 14 [Working in a Cross Environment], page 157 for more details.

11.9.3 Tool Bar Buttons

GPS provides by default fewer debugger buttons than GVD, because some buttons are actually not used very often, and others have been merged. In addition, it will be possible in the future to completely configure the GPS tool bar.

`Run`	Menu `Debug->Run...` (⟨F2⟩)
`Start`	Start/Continue button
`Step`	Step button
`Stepi`	Menu `Debug->Step Instruction` (⟨Shift-F5⟩)

`Next`	Next button
`Nexti`	Menu `Debug->Next Instruction` (⟨Shift-F6⟩)
`Finish`	Finish button
`Cont`	Start/Continue button
`Up`	Up button
`Down`	Down button
`Interrupt`	Menu `Debug->Interrupt` (⟨Control-Backslash⟩)

11.9.4 Key Short Cuts

The same key shortcuts have been kept by default between GVD and GPS except for the Interrupt menu, which is now ⟨Control-Backslash⟩ instead of ⟨Esc⟩.

11.9.5 Contextual Menus

All the debugger-related contextual menus can now be found under the `Debug` sub-menu.

The only difference is the contextual menu `Show` used to display the assembly dump of the current code. It is replaced by the menu `Debug->Data->Assembly`, see Section 11.7 [The Assembly Window], page 123 for more details.

11.9.6 File Explorer

The file explorer provided in GVD is replaced by the `Project View` and the `File View` in GPS.

When using the `--debug` command line switch and no explicit project file, GPS will automatically create a project file in a way very similar to what GVD does to display its file explorer, and available under the `Project View`.

In addition, the `File View` gives access to any file in your file system, even if it is not available as part of the debug information.

11.9.7 Advantages of GPS

The advantages when using GPS instead of GVD can be classified in two main categories: when not using project files, and when using them.

When not using project files, you get access to the following advantages in GPS:

- Complete source editor including indentation, shortcuts, multiple views, . . . See Chapter 5 [Editing Files], page 25 for more details.
- A more stable and robust debugger engine. The debugger engine included in GPS corresponds to GVD version 2.0. In effect, GPS *is* the new version of GVD.

- Better look and feel. GPS uses the new version of the graphical toolkit used by GVD, which provides a modern look and feel and a more stable interface under Windows (with additions such as support for the mouse wheel).
- Support for version control systems which is integrated and available through a few mouse clicks or key bindings. See Chapter 12 [Version Control System], page 133 for more details.
- A more flexible window handling, see Chapter 4 [Multiple Document Interface], page 21 for more details.

When using project files, you will get, in addition to the advantages listed above:

- Source navigation, see Chapter 6 [Source Navigation], page 51 for more details.
- Source Browsers, in particular the entity browser, a nice complement of the debugger data window. See Chapter 10 [Source Browsing], page 97 for more details.
- Builds, see Chapter 9 [Compilation/Build], page 93 for more details.
- Semantic support. In particular, GPS is be able to e.g. differentiate variables from types when displaying a contextual menu, which is not possible in GVD.
- Flexibility of project files, see Chapter 7 [Project Handling], page 59 for more details.

11.10 Customizing the Debugger

GPS is a high-level interface to several debugger backends, in particular gdb. Each back end has its own strengths, but you can enhance the command line interface to these backends through GPS, using Python.

This section will provide a small such example. The idea is to provide the notion of "alias" in the debugger console. For example, this can be used so that you type "foo", and this really executes a longer command, like displaying the value of a variable with a long name.

`gdb` already provides this feature through the `define` keywords, but we will in fact rewrite that feature in terms of python.

GPS provides an extensive Python API to interface with each of the running debugger. In particular, it provides the function "send", which can be used to send a command to the debugger, and get its output, and the function "set_output", which can be used when you implement your own functions.

It also provides, through `hook`, the capability to monitor the state of the debugger back-end. In particular, one such hook, `debugger_command_action_hook` is called when the user has typed a command in the debugger console, and before the command is executed. This can be used to add your own commands. The example below uses this hook.

Here is the code:

```
import GPS

aliases={}

def set_alias (name, command):
   """Set a new debugger alias. Typing this alias in a debugger window
      will then execute command"""
   global aliases
   aliases[name] = command

def execute_alias (debugger, name):
   return debugger.send (aliases[name], output=False)

def debugger_commands (hook, debugger, command):
   global aliases
   words = command.split()
   if words[0] == "alias":
      set_alias (words[1], " ".join (words [2:]))
      return True
   elif aliases.has_key (words [0]):
      debugger.set_output (execute_alias (debugger, words[0]))
      return True
   else:
      return False

GPS.Hook ("debugger_command_action_hook").add (debugger_commands)
```

The list of aliases is stored in the global variable `aliases`, which is modified by `set_alias`. Whenever the user executes an alias, the real command send to the debugger is sent through `execute_alias`.

The real part of the work is done by `debugger_commands`. If the user is executing the `alias` command, it defines a new alias. Otherwise, if he typed the name of an alias, we really want to execute that alias. Else, we let the debugger back-end handle that command.

After you have copied this example in the '`$HOME/.gps/plug-ins`' directory, you can start a debugger as usual in GPS, and type the following in its console:

```
(gdb) alias foo print a_long_long_name
(gdb) foo
```

The first command defines the alias, the second line executes it.

This alias can also be used within the `graph display` command, so that the value of the variable is in fact displayed in the data window automatically, for instance:

```
(gdb) graph display ‘foo‘
```

Other examples can be programmed. You could write complex python functions, which would for instance query the value of several variables, and pretty print the result. This complex python function can then be called from the debugger console, or automatically every time the debugger stops through the `graph display` command.

12 Version Control System

GPS offers the possibility for multiple developers to work on the same project, through the integration of version control systems (VCS). Each project can be associated to a VCS, through the `VCS` tab in the Project property editor. See Section 7.10 [The Project Properties Editor], page 79.

GPS does not come with any version control system: it uses underlying command-line systems such as CVS, Subversion or ClearCase to perform the low level operations, and provides a high level user interface on top of them. Be sure to have a properly installed version control system before enabling it under GPS.

The systems that are supported out of the box in GPS are CVS, Subversion and ClearCase. There are two interfaces to ClearCase: the standard ClearCase interface, which is built-in and uses a generic GPS terminology for VCS operations, and the Native ClearCase interface, which is fully customizable and uses by default the terminology specific to ClearCase. There are also two interfaces for Subversion on Windows, one for Cygwin/Subversion and one for native Subversion.

Note that, at the moment, only Snapshot Views are supported in the ClearCase integration; Dynamic Views are not supported.

It is also possible to add your own support for other version control systems, or modify the existing CVS, Subversion and ClearCase interfaces, see Section 16.9 [Adding support for new Version Control Systems], page 274 for more information.

When using CVS or Subversion, GPS will also need a corresponding `patch` command that usually comes with it. If you are under Windows, be sure to install a set of CVS and patch executables that are compatible. Additionally a GNU `diff` command is required to use Subversion.

It is recommended that you first get familiar with the version control system that you intend to use in GPS first, since many concepts used in GPS assume basic knowledge of the underlying system.

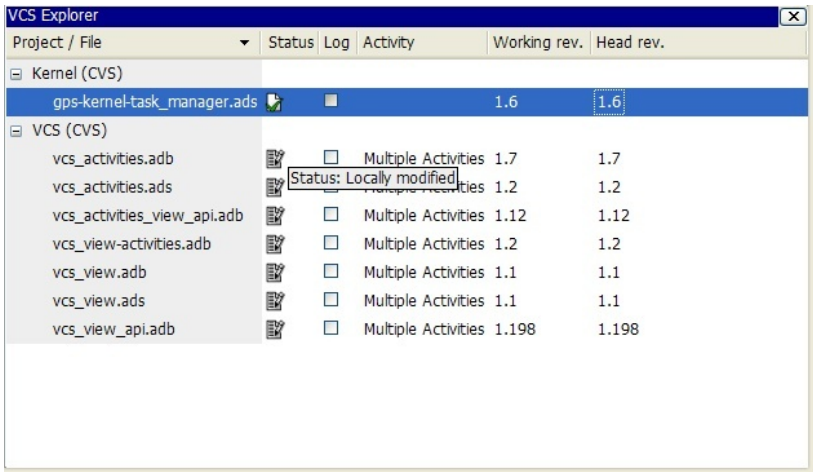
Associating a VCS to a project enables the use of basic VCS features on the source files contained in the project. Those basic features typically include the checking in and out of files, the querying of file status, file revision history, comparison between various revisions, and so on.

Administration of VCS systems is not handled by GPS at this stage. Therefore, before working on a project using version control system, make sure that the system is properly set-up before launching GPS.

Note: the set-up must make sure that the VCS commands can be launched without entering a password.

12.1 The VCS Explorer

The VCS Explorer provides an overview of source files and their status. A file edited in GPS will be automatically added on the VCS Explorer with a Modified status (see below).



VCS Explorer

Project / File	Status	Log	Activity	Working rev.	Head rev.
Kernel (CVS)					
gps-kernel-task_manager.ads		☐		1.6	1.6
VCS (CVS)					
vcs_activities.adb		☐	Multiple Activities	1.7	1.7
vcs_activities.ads		☐	Multiple Activities	1.2	1.2
vcs_activities_view_api.adb		☐	Multiple Activities	1.12	1.12
vcs_view-activities.adb		☐	Multiple Activities	1.2	1.2
vcs_view.adb		☐	Multiple Activities	1.1	1.1
vcs_view.ads		☐	Multiple Activities	1.1	1.1
vcs_view_api.adb		☐	Multiple Activities	1.198	1.198

Status: Locally modified

The easiest way to bring up the VCS Explorer is through the menu `VCS->Explorer`. The Explorer can also be brought up using the contextual menu `Version Control->Query status` on files, directories and projects in the file and project views, and on file editors. See Section 12.4 [The Version Control Contextual Menu], page 140.

The VCS Explorer contains the following columns:

Project / File
This is a two levels tree, the first level contains the name of the project and the second the name of files inside the project. Next to the project name the VCS name, if any, is displayed. This is the only information available for a project. The columns described below are for the files only. This column can be sorted by clicking on the header.

Status Shows the status of the file. This column can be sorted by clicking on the header. The different possible status for files are the following:

`Unknown` The status is not yet determined or the VCS repository is not able to give this information (for example if it is unavailable, or locked).

`Not registered`	The file is not known to the VCS repository.
`Up-to-date`	The file corresponds to the latest version in the corresponding branch on the repository.
`Added`	The file has been added remotely but is not yet updated in the local view.
`Removed`	The file still exists locally but is known to have been removed from the VCS repository.
`Modified`	The file has been modified by the user or has been explicitly opened for editing.
`Needs merge`	The file has been modified locally and on the repository.
`Needs update`	The file has been modified in the repository but not locally.
`Contains merge conflicts`	

The file contains conflicts from a previous update operation.

Log This column indicates whether a revision log exists for this file.

Activity The name of the activity the file belongs to. See Section 12.2 [The VCS Activities], page 136 for more details.

Working rev.
Indicates the version of the local file.

Head rev.
Indicates the most recent version of the file in the repository.

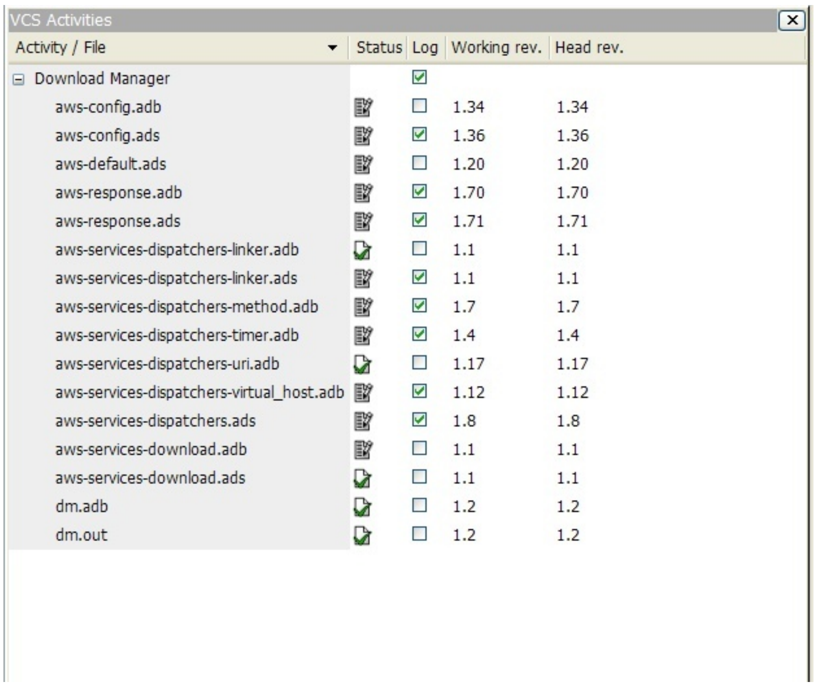
The VCS Explorer supports multiple selections. To select a single line, simply left-click on it. To select a range of lines, select the first line in the range, then hold down the ⟨Shift⟩ key and select the last line in the range. To add or remove single columns from the selection, hold down the ⟨Control⟩ key and left-click on the columns that you want to select/unselect. It is also possible to select files having the same status using the `Select files same status` menu entry. See Section 12.4 [The Version Control Contextual Menu], page 140.

The explorer also provides an interactive search capability allowing you to quickly look for a given file name. The default key to start an interactive search is ⟨Ctrl-i⟩. See [Interactive Search], page 6 for more details.

The VCS contextual menu can be brought up from the VCS explorer by left-clicking on a selection or on a single line. See Section 12.4 [The Version Control Contextual Menu], page 140.

12.2 The VCS Activities

The VCS Activities give the ability to group files to be committed together. The set of files can be committed atomically if supported by the version control system used.



VCS Activities

Activity / File	Status	Log	Working rev.	Head rev.
⊟ Download Manager		☑		
aws-config.adb	✎	☐	1.34	1.34
aws-config.ads	✎	☑	1.36	1.36
aws-default.ads	✎	☐	1.20	1.20
aws-response.adb	✎	☑	1.70	1.70
aws-response.ads	✎	☑	1.71	1.71
aws-services-dispatchers-linker.adb	✓	☐	1.1	1.1
aws-services-dispatchers-linker.ads	✎	☑	1.1	1.1
aws-services-dispatchers-method.adb	✎	☑	1.7	1.7
aws-services-dispatchers-timer.adb	✎	☑	1.4	1.4
aws-services-dispatchers-uri.adb	✓	☐	1.17	1.17
aws-services-dispatchers-virtual_host.adb	✎	☑	1.12	1.12
aws-services-dispatchers.ads	✎	☑	1.8	1.8
aws-services-download.adb	✎	☐	1.1	1.1
aws-services-download.ads	✓	☐	1.1	1.1
dm.adb	✓	☐	1.2	1.2
dm.out	✓	☐	1.2	1.2

The way to bring up the VCS Activities view is through the `VCS->Activities` menu.

The VCS Activities view contains the following columns:

Activity / File
: The name of the activity or files belonging to an activity. This column can be sorted by clicking on the header.

Status
: Shows the status of the file. This column can be sorted by clicking on the header. See Section 12.1 [The VCS Explorer], page 134 for a full description.

Log
: This column indicates whether a revision log exists for this file.

Working rev.
: Indicates the version of the local file.

Head rev.
Indicates the most recent version of the file in the repository.

The VCS Explorer supports multiple selections. To select a single line, simply left-click on it. To select a range of lines, select the first line in the range, then hold down the ⟨Shift⟩ key and select the last line in the range. To add or remove single columns from the selection, hold down the ⟨Control⟩ key and left-click on the columns that you want to select/unselect.

There are different contextual menu entries depending on the position on the screen. On an empty area we have a simple contextual menu:

Create new activity
Create a new activity. The name can be edited by double clicking on it.

On an activity line the contextual menu is:

Group commit
This is a selectable menu entry. It is activated only if the VCS supports atomic commit and absolute filenames. See Section 16.9.2.1 [The VCS node], page 274 for full details.

Create new activity
Create a new activity. The name can be edited by double clicking on it.

Re-open activity / Close activity
If the activity is closed it is possible to re-open it and if it is opened it is possible to close it manually.

Delete activity
Remove the activity.

Commit activity
Commit the activity. If group commit is activated then the commit log content is generated using a template file fully configurable. See Section 17.4 [Files], page 286. If group commit is not activated then the log content for each activity file is the file log catenated with the activity log. After this operation the file's log are removed but the activity log is kept as documentation.

Query status
Query the status for all the source files contained in the activity.

Update Update all the source files contained in the activity.

Compare against head revision
Show a visual comparison between the local activity files and the most recent version of those files in the repository.

Build patch file
: Create a patch file (in text format) for the activity. The patch file contains a header (the activity log and file's logs) and the diff of each file. The header format is fully configurable using a template file. See Section 17.4 [Files], page 286.

Edit revision log
: Edit the current revision log for activity. This log is shared with all the activity files.

On a file line the contextual menu contains:

Create new activity
: Create a new activity. The name can be edited by double clicking on it.

Remove from activity
: Remove the selected file from the activity and delete the activity log.

Edit revision log
: Edit the current revision log for the selected file.

12.3 The VCS Menu

Basic VCS operations can be accessed through the VCS menu. Most of these functions act on the current selection, i.e. on the selected items in the VCS Explorer if it is present, or on the currently selected file editor, or on the currently selected item in the `Tools->Views->Files`. In most cases, the VCS contextual menu offers more control on VCS operations. See Section 12.4 [The Version Control Contextual Menu], page 140.

Explorer
: Open or raise the VCS Explorer. See Section 12.1 [The VCS Explorer], page 134.

Update all projects
: Update the source files in the current project, and all imported subprojects, recursively.

Query status for all projects
: Query the status of all files in the project and all imported subprojects.

Create tag...
: Create a tag or branch tag starting from a specific root directory. The name of the tag is a simple name.

Switch tag...
: Switch the local copy to a specific tag. The name of the tag depends on the external VCS used. For CVS this this the simple tag name,

for Subversion the tag must conform to the default repository layout. For a branch tag this is `/branches/<tag_name>/<root_dir>`.

For a description of the other entries in the VCS menu, see Section 12.4 [The Version Control Contextual Menu], page 140

12.4 The Version Control Contextual Menu

This section describes the version control contextual menu displayed when you right-click on an entity (e.g. a file, a directory, a project) from various parts of GPS, including the project view, the source editor and the VCS Explorer.

Depending on the context, some of the items described in this section won't be shown, which means that they are not relevant to the current context.

Remove project
: Only displayed on a project line. This will remove the selected project from the VCS Explorer.

Expand all
: Expand all VCS Explorer project nodes.

Collapse all
: Collapse all VCS Explorer project nodes.

Clear View
: Clear the VCS Explorer.

Query status
: Query the status of the selected item. Brings up the VCS Explorer.

Update
: Update the currently selected item (file, directory or project).

Commit
: Submits the changes made to the file to the repository, and queries the status for the file once the change is made.

  It is possible to tell GPS to check the file before the actual commit happens. This is done by specifying a `File checker` in the `VCS` tab of the project properties dialog. This `File checker` is in fact a script or executable that takes an absolute file name as argument, and displays any error message on the standard output. The VCS commit operation will actually occur only if nothing was written on the standard output.

  It is also possible to check the change-log of a file before commit, by specifying a `Log checker` in the project properties dialog. This works on change-log files in the same way as the `File checker` works on source files.

Open
: Open the currently selected file for writing. On some VCS systems, this is a necessary operation, and on other systems it is not.

View entire revision history
: Show the revision logs for all previous revisions of this file.

View specific revision history
: Show the revision logs for one previous revision of this file.

Compare against head revision
: Show a visual comparison between the local file and the most recent version of that file in the repository.

Compare against other revision
: Show a visual comparison between the local file and one specific version of that file in the repository.

Compare two revisions
: Show a visual comparison between two specific revisions of the file in the repository.

Compare base against head
: Show a visual comparison between the corresponding version of the file in the repository and the most recent version of that file.

Compare against tag/branch
: Only available on a Revision View and over a tag/branch. Show a visual comparison between the corresponding version of the file in the repository and the version of that file in the tag/branch.

Annotate
: Display the annotations for the file, i.e. the information for each line of the file showing the revision corresponding to that file, and additional information depending on the VCS system.

  When using CVS or Subversion, the annotations are clickable. Left-clicking on an annotation line will query and display the changelog associated to the specific revision for this line.

Remove Annotate
: Remove the annotations from the selected file.

Edit revision log
: Edit the current revision log for the selected file.

Edit global ChangeLog
: Edit the global ChangeLog entry for the selected file. see Section 12.5 [Working with global ChangeLog file], page 144.

Remove revision log
: Clear the current revision associated to the selected file.

Add Add a file to the repository, using the current revision log for this file. If no revision log exists, activating this menu will create one. The file is committed in the repository.

Add/No commit
Add a file to the repository, using the current revision log for this file. If no revision log exists, activating this menu will create one. The file is not committed in the repository.

Remove Remove a file from the repository, using the current revision log for this file. If no revision log exists, activating this menu will create one. The modification is committed in the repository.

Remove/No commit
Remove a file from the repository, using the current revision log for this file. If no revision log exists, activating this menu will create one. The modification is not committed in the repository.

Revert Revert a locale file to the repository revision, discarding all local changes.

Resolved
Mark files' merge conflics as resolved. Some version control systems (like Subversion) will block any commit until this action is called.

Switch tag/bracnh
Only available on a Revision View and over a tag/branch name. Will switch the tree starting from a selected root to this specific tag or branch.

Merge Only available on a Revision View and over a tag/branch name. Merge file changes made on this specific tag/branch.

View revision
Only available on a Revision View and over a revision.

Commit as new Activity
An action to prepare a group-commit in just one-click. This action will:

- create an anonymous activity,
- add all files selected into the VCS Explorer into the newly created anonymous activity,
- open the activity log,

Just fill the activity log and commit the anonymous activity.

Add to Activity
A menu containing all the current activities. Selecting one will add the current file to this activity. This menu is present only if the file is not already part of an activity.

Remove from Activity
Remove file from the given activity. This menu is present only if the file is already part of an activity.

Directory
Only available when the current context contains directory information

Add/No commit
Add the selected directory into the VCS.

Remove/No commit
Remove the selected directory from the VCS.

Commit Commit the selected directory into the VCS. This action is available only if the VCS supports commit on directories, see Section 16.9.2.1 [The VCS node], page 274.

Add to Activity
Add the selected directory into the VCS. This action is available only if the VCS supports commit on directories, see Section 16.9.2.1 [The VCS node], page 274.

Query status for directory
Query status for the files contained in the selected directory.

Update directory
Update the files in the selected directory.

Query status for directory recursively
Query status for the files in the selected directory and all subdirectories recursively. Links and hidden directories are not included.

Update directory recursively
Update the files in the selected directory and all subdirectories recursively. Links and hidden directories not included..

Project Only available when the current context contains project information

List all files in project
: Bring up the VCS Explorer with all the source files contained in the project.

Query status for project
: Query the status for all the source files contained in the project.

Update project
: Update all the source files in the project.

List all files in project and sub-projects
: Bring up the VCS Explorer with all the source files contained in the project and all imported sub-projects.

Query status for project and sub-projects
: Query the status for all the source files contained in the project and all imported sub-projects.

Update project and sub-projects
: Update all the source files in the project and all imported sub-projects.

Select files same status
: Select the files having the same status as the current selected file.

Filters Only available from the VCS Explorer. This menu controls filtering of the items displayed in the list.

Show all status
: Do not filter out any file from the list in the VCS Explorer.

Hide all status
: Filter out all the files from the list in the VCS Explorer.

Show <status>
: When disabled, filter out the files with the given status from the VCS Explorer.

12.5 Working with global ChangeLog file

A global ChangeLog file contains revision logs for all files in a directory and is named 'ChangeLog'. The format for such a file is:

```
ISO-DATE  name  <e-mail>

<HT>* filename[, filename]:
<HT>revision history
```

where:

ISO-DATE
A date with the ISO format YYYY-MM-DD

name A name, generally the developer name

<**e-mail**> The e-mail address of the developer surrounded with '<' and '>' characters.

HT Horizontal tabulation (or 8 spaces)

The *name* and *<e-mail>* items can be entered automatically by setting the *GPS_CHANGELOG_USER* environment variable. Note that there is two spaces between the *name* and the *<e-mail>*.

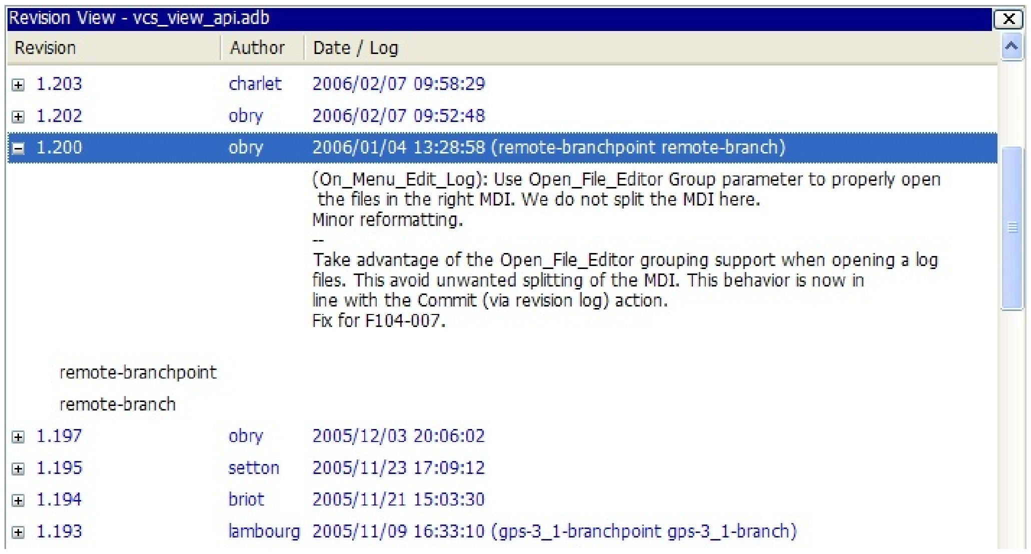
```
On sh shell:

   export GPS_CHANGELOG_USER="John Doe  <john.doe@home.com>"

On Windows shell:
   set GPS_CHANGELOG_USER="John Doe  <john.doe@home.com>"
```

Using the menu entry **Edit global ChangeLog** will open the file 'ChangeLog' in the directory where the current selected file is and create the corresponding 'ChangeLog' entry. This means that the ISO date and filename headers will be created if not yet present. You will have to enter your name and e-mail address.

This 'ChangeLog' file serve as a repository for revision logs, when ready to check-in a file use the standard **Edit revision log** menu command. This will open the standard revision log buffer with the content filled from the global 'ChangeLog' file.

12.6 The Revision View

The revision view is used to display a revision tree for a given file. Each node contains information for a specific revision of the file.



Revision View - vcs_view_api.adb

Revision	Author	Date / Log
⊞ 1.203	charlet	2006/02/07 09:58:29
⊞ 1.202	obry	2006/02/07 09:52:48
⊟ 1.200	obry	2006/01/04 13:28:58 (remote-branchpoint remote-branch)
		(On_Menu_Edit_Log): Use Open_File_Editor Group parameter to properly open the files in the right MDI. We do not split the MDI here. Minor reformatting. -- Take advantage of the Open_File_Editor grouping support when opening a log files. This avoid unwanted splitting of the MDI. This behavior is now in line with the Commit (via revision log) action. Fix for F104-007.
remote-branchpoint		
remote-branch		
⊞ 1.197	obry	2005/12/03 20:06:02
⊞ 1.195	setton	2005/11/23 17:09:12
⊞ 1.194	briot	2005/11/21 15:03:30
⊞ 1.193	lambourg	2005/11/09 16:33:10 (gps-3_1-branchpoint gps-3_1-branch)

the revision number
: This corresponds to the external VCS revision number.

author
: The author of this revision.

date / log
: For root nodes this column contains the check-in date and eventually the list of tags and branches associated with this revision. For children nodes this contains the log for the corresponding revision.

13 Tools

13.1 The Tools Menu

The `Tools` menu gives access to additional tools. Some items are currently disabled, meaning that these are planned tools not yet available.

The list of active items includes:

Views

Bookmarks
See Section 2.11 [Bookmarks], page 14.

Call Tree
Open a tree view of function callers and callees. See also Section 10.2 [Call Graph], page 99.

Clipboard
See Section 2.9 [The Clipboard View], page 12.

Files Open a file system explorer on the left area. See Section 2.6 [The File View], page 9.

File Switches
See [File Switches], page 69.

Outline Open a view of the current source editor. See Section 2.8 [The Outline View], page 11.

Project See Section 2.5 [The Project View], page 5.

Remote See Section 15.3 [Setup a remote project], page 163.

Scenario See Section 7.3 [Scenarios and Configuration Variables], page 62.

Tasks See Section 2.17 [The Task Manager], page 17.

VCS Explorer
See Section 12.1 [The VCS Explorer], page 134.

VCS Activities
See Section 12.2 [The VCS Activities], page 136.

Windows
Open a view containing all currently opened files. See Section 2.7 [The Window View], page 11.

Browsers

Call Graph
See Section 10.2 [Call Graph], page 99.

Dependency
See Section 10.3 [Dependency Browser], page 101.

Entity See Section 10.4 [Entity Browser], page 104.

Coding Standard

Compare
See Section 13.2 [Visual Comparison], page 148.

Consoles

GPS Shell
Open a shell console at the bottom area of GPS. Note that this not an OS shell console, but a GPS shell console, where you can type GPS specific commands such as `help`.

See Section 2.13 [The Shell and Python Windows], page 15.

Python Open a python console to access the python interpreter. See Section 2.13 [The Shell and Python Windows], page 15.

Coverage
See Section 13.6 [Code Coverage], page 153.

Documentation
See Section 13.4 [Documentation Generation], page 151.

Macro See Section 5.5 [Recording and replaying macros], page 40.

Metrics See Section 13.5 [Metrics], page 152.

Plug-ins See Section 16.4 [The Plug-ins Editor], page 186.

Interrupt
Interrupt the last task launched (e.g. compilation, vcs query, . . .).

13.2 Visual Comparison

The visual comparison, available either from the VCS menus or from the Tools menu, provide a way to display graphically differences between two or three files, or two different versions of the same file.

The 2-file comparison tool is based on the standard text command `diff`, available on all Unix systems. Under Windows, a default implementation is provided with GPS, called `gnudiff.exe`. You may want to provide an alternate implementation by e.g. installing a set of Unix tools such as cygwin (`http://www.cygwin.com`).

The 3-file comparison tool is based on the text command `diff3`, available on all Unix systems. Under Windows, this tool is not shipped with GPS. It is available as part of cygwin, for example.

When querying a visual comparison in GPS, the user area will show, side by side, editors for the files involved in the comparison. The reference file is placed by default on the left side.

Color highlighting will be added to the file editors:

gray This color is used for all the chunks on the reference (left) file. Only the modified (right) file is displayed with different colors.

yellow This color is used to display lines that have been modified compared to the reference file. When there are fine differences within one line, they are shown in a brighter yellow.

green Used to display lines added compared to the reference file; in other words, lines that are not present in the reference file.

red Used to display lines removed from the reference file; in other words, lines that are present only in the reference file.

These colors can be configured, see Section 16.1 [The Preferences Dialog], page 165.

As with all highlighted lines in GPS, the visual differences highlights are visible in the Speed Column at the left of the editors.

Blank lines are also added in the editors, in places that correspond to existing lines in the other editors. The vertical and horizontal scrolling are synchronized between all editors involved in a visual comparison.

When a visual comparison is created, the Locations View is populated with the entries for each chunk of differences, and can be used to navigate between those.

Closing one of the editors involved in a visual comparison removes the highlighting, blank lines, and scrolling in the other editors.

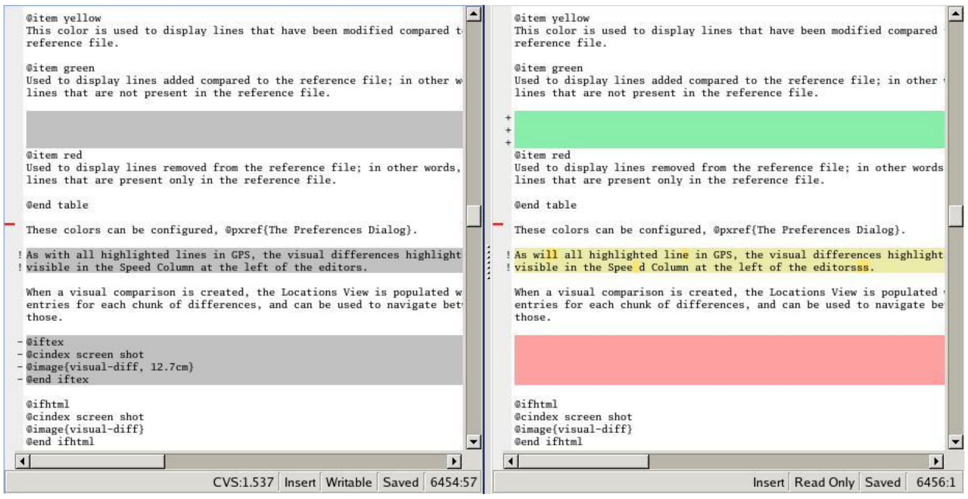
Editors involved in a visual comparison have a contextual menu `Visual diff` that contains the following entries:

`Recompute`
Regenerates the visual comparison. This is useful, for example, when one of the editors has been modified by hand while it was involved in a visual comparison

`Hide` Removes the highlighting corresponding to the visual comparison from all editors involved

`Close editors`
Closes all editors involved in this visual comparison

`Use this editor as reference`
: Change the reference to this editor. (This is only visible when displaying a visual comparison involving 3 files).



```
@item yellow
This color is used to display lines that have been modified compared t
reference file.

@item green
Used to display lines added compared to the reference file; in other w
lines that are not present in the reference file.



@item red
Used to display lines removed from the reference file; in other words,
lines that are present only in the reference file.

@end table

These colors can be configured, @pxref{The Preferences Dialog}.

! As with all highlighted lines in GPS, the visual differences highlight
! visible in the Speed Column at the left of the editors.

When a visual comparison is created, the Locations View is populated w
entries for each chunk of differences, and can be used to navigate bet
those.

- @iftex
- @cindex screen shot
- @image{visual-diff, 12.7cm}
- @end iftex

@ifhtml
@cindex screen shot
@image{visual-diff}
@end ifhtml
```

CVS:1.537 | Insert | Writable | Saved | 6454:57

```
@item yellow
This color is used to display lines that have been modified compared
reference file.

@item green
Used to display lines added compared to the reference file; in other
lines that are not present in the reference file.

+
+
+
@item red
Used to display lines removed from the reference file; in other words
lines that are present only in the reference file.

@end table

These colors can be configured, @pxref{The Preferences Dialog}.

! As will all highlighted line in GPS, the visual differences highlight
! visible in the Spee d Column at the left of the editorsss.

When a visual comparison is created, the Locations View is populated
entries for each chunk of differences, and can be used to navigate be
those.




@ifhtml
@cindex screen shot
@image{visual-diff}
@end ifhtml
```

Insert | Read Only | Saved | 6456:1

13.3 Code Fixing

GPS provides an interactive way to fix or improve your source code, based on messages (errors and warnings) generated by the GNAT compiler.

This capability is integrated with the *Locations tree* (see Section 2.14 [The Locations Tree], page 16): when GPS can take advantage of a compiler message, an icon is added on the left side of the line.

For a simple fix, a wrench icon is displayed. If you click with the left button on this icon, the code will be fixed automatically, and you will see the change in the corresponding source editor. An example of a simple fix, is the addition of a missing semicolon.

You can also check what action will be performed by clicking on the right button which will display a contextual menu with a text explaining the action that will be performed. Similarly, if you display the contextual menu anywhere else on the message line, a sub menu called *Code Fixing* gives you access to the same information. In the previous example of a missing semicolon, the menu will contain an entry labeled *Add expected string* `";"`.

Once the code change has been performed, the tool icon is no longer displayed.

For more complex fixes, where more than one change is possible, the icon will display in additional of the tool, a red question mark. In this case, clicking on the icon will display the contextual menu directly, giving you access to the possible choices. For example, this will be the case when an ambiguity is reported by the compiler for resolving an entity.

13.4 Documentation Generation

GPS provides a documentation generator which processes source files and generates annotated HTML files.

Note that starting with GPS 4.2, a brand new Documentation generator has been put in place. This new generator is much faster than the previous one, and produces cleaner and clearer html files.

It is based on the source cross-reference information (e.g. generated by GNAT for Ada files). This means that you should ensure that cross-reference information has been generated before generating the documentation. It also relies on standard comments that it extracts from the source code. Note that unlike other similar tools, no macro needs to be put in your comments. The engine in charge of extracting them coupled with the cross-reference engine gives GPS all the flexibility needed to generate accurate documentation.

The documentation is put into a directory called '`doc`', created under the object directory of the root project loaded in GPS.

Once the documentation is generated, the main documentation file is loaded in your default browser.

The documentation generator uses a set of templates files to control the final rendering. This means that you can control precisely the rendering of the generated documentation. The templates used for generating the documentation can be found under '`<install_dir>/share/gps/docgen2`'. If you need a different layout as the proposed one, you can change directly those files.

The documentation generator can be invoked from two places inside GPS:

Section 13.1 [The Tools Menu], page 147

`Generate project`
: Generate documentation for all files from the loaded project.

`Generate projects & subprojects`
: Generate documentation for all files from the loaded project as well all its subprojects.

`Generate current file`
: Generate documentation for the file you are currently editing.

`Generate for...`
This will open a File Selector Dialog (see Section 5.3 [The File Selector], page 31) and documentation will be generated for the file you select.

The Contextual Menu

When relevant (depending on the context), right-clicking with your mouse will show a `Documentation` contextual menu.

From a source file contextual menu, you have one option called `Generate for <filename>`, that will generate documentation for this file and if needed its corresponding body (see Section 16.1 [The Preferences Dialog], page 165).

From a project contextual menu (see Section 2.5 [The Project View], page 5), you will have the choice between generating documentation for all files from the selected project only or from the selected project recursively.

You will find the list of all documentation options in Section 16.1 [The Preferences Dialog], page 165.

Restrictions

There are some restrictions in the generated documentation:

- The formal part of generics is not always displayed.

Furthermore, the documentation generator relies on the ALI files created by GNAT. Depending on the version of GNAT used, the following restrictions may or may not apply:

- A type named *type* may be generated in the type index.
- Parameters and objects of private generic types may be considered as types.

13.5 Metrics

GPS provides an interface with the GNAT software metrics generation tool `gnatmetric`.

The metrics can be computed for the entire project, one source file belonging to the project, or (when applicable) a specific entity in the source file, e.g. a subprogram.

The metrics generator can be invoked from two places inside GPS:

Section 13.1 [The Tools Menu], page 147

`Metrics->Compute metrics for root project`
Generate metrics for all files from the root project.

`Metrics->Compute metrics for current file`
Generate metrics for the current source file.

The Contextual Menu
When relevant (depending on the context), right-clicking with your mouse will show metrics-related contextual menu entries.

From a source file contextual menu, you have an option called `Metrics for file` that will generate the metrics for the current file.

From a project contextual menu (see Section 2.5 [The Project View], page 5), you have an option `Metrics for project` that will generate the metrics for all files in the project.

Each of these commands produces a new window in the left-side area, which shows the computed metrics as a hierarchical tree view. The metrics are arranged by files, and then by scopes inside the files in a nested fashion. Double-clicking on any of the files or scopes displayed will open the appropriate source location in the editor. Any errors encountered during metrics computation will be displayed in the Locations Window.

13.6 Code Coverage

GPS is fitted with a strong integration of Gcov, the GNU code coverage utility.

Code coverage information can be computed from, loaded and visualized in GPS. This can be done file by file, for each files of the current project, project by project (in case of dependencies) or for the entire project hierarchy currently used in GPS.

Once computed then loaded, the coverage information is summarized in a graphical report (shaped as a tree-view with percentage bars for each item) and used to decorate source code through mechanisms such as line highlighting or coverage annotations.

All the coverage related operations are reachable via the `Tools->Coverage` menu.

In order to be loaded in GPS, the coverage information need to be computed before, using the `Tools->Coverage->Compute coverage files` menu for instance.

At each attempt, GPS automatically tries to load the needed information and reports errors for missing or corrupted `.gcov` files.

To be able to produce coverage information from Gcov, your project must have been compiled with the `-fprofile-arcs` and `-ftest-coverage"` switches, respectively "Instrument arcs" and "Code coverage" entries in Section 7.10 [The Project Properties Editor], page 79, and run once.

Section 13.1 [The Tools Menu], page 147

The `Tools->Coverage` menu have an incremental set of entries, depending on the context.

`Coverage->Compute coverage files`
: Generates the `.gcov` files of current and properly compiled and run projects.

`Coverage->Remove coverage files`
: Deletes all the `.gcov` of current projects.

`Coverage->Show report`
: Open a new window summarizing the coverage information currently loaded in GPS.

`Coverage->Load data for all projects`
: Load or re-load the coverage information of every projects and subprojects.

`Coverage->Load data for project XXX`
: Load or re-load the coverage information of the project `XXX`.

`Coverage->Load data for 'xxxxxxxx.xxx'`
: Load or re-load the coverage information of the specified source file.

`Coverage->Clear coverage from memory`
: Drop every coverage information loaded in GPS.

The Contextual Menu

When clicking on a project, file or subprogram entity (including the entities listed in the coverage report), you have access to a `Coverage` submenu.

These submenus contain the following entries, adapted to the context related element. For instance, if you click on a file, you will have:

`Coverage->Show coverage information`
: Append an annotation column to the left side of the current source editor. This column indicates which lines are covered and which aren't. Unexecuted lines are also listed in the Section 2.14 [The Locations Tree], page 16.

`Coverage->Hide coverage information`
: Withdraw from the current source editor a previously set coverage annotation column and clear Section 2.14 [The Locations Tree], page 16 from the eventually listed uncovered lines.

`Coverage->Load data for 'xxxxxxxx.xxx'`
: Load or re-load the coverage information of the specified source file.

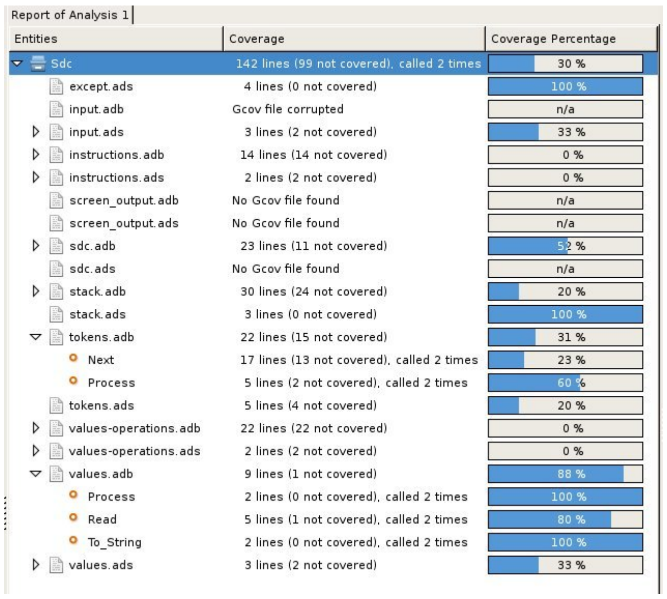
`Coverage->Remove data of 'xxxxxxxx.xxx'`
: Remove the coverage information of the specified source file from GPS memory.

`Coverage->Show Coverage report`
: Open a new window summarizing the coverage information. (This entry appears only if the contextual menu has been created from outside of the Coverage Report.)

The Coverage Report

When coverage information are loaded into GPS, a graphical report of coverage is displayed.

This report contains a tree of Projects, Files and Subprograms with corresponding coverage information for each node in sided columns.

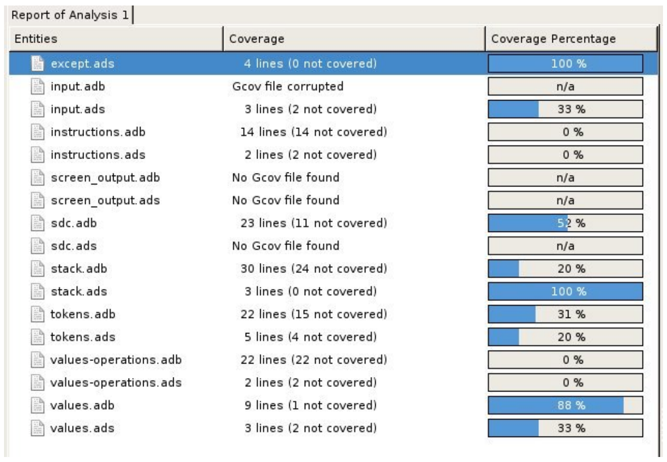


Report of Analysis 1

Entities	Coverage	Coverage Percentage
Sdc	142 lines (99 not covered), called 2 times	30 %
except.ads	4 lines (0 not covered)	100 %
input.adb	Gcov file corrupted	n/a
input.ads	3 lines (2 not covered)	33 %
instructions.adb	14 lines (14 not covered)	0 %
instructions.ads	2 lines (2 not covered)	0 %
screen_output.adb	No Gcov file found	n/a
screen_output.ads	No Gcov file found	n/a
sdc.adb	23 lines (11 not covered)	52 %
sdc.ads	No Gcov file found	n/a
stack.adb	30 lines (24 not covered)	20 %
stack.ads	3 lines (0 not covered)	100 %
tokens.adb	22 lines (15 not covered)	31 %
Next	17 lines (13 not covered), called 2 times	23 %
Process	5 lines (2 not covered), called 2 times	60 %
tokens.ads	5 lines (4 not covered)	20 %
values-operations.adb	22 lines (22 not covered)	0 %
values-operations.ads	2 lines (2 not covered)	0 %
values.adb	9 lines (1 not covered)	88 %
Process	2 lines (0 not covered), called 2 times	100 %
Read	5 lines (1 not covered), called 2 times	80 %
To_String	2 lines (0 not covered), called 2 times	100 %
values.ads	3 lines (2 not covered)	33 %

The contextual menus generated on this widget contain, in addition to the regular entries, some specific Coverage Report entries.

These entries allow you to expand or fold the tree, and also to display flat lists of files or subprograms instead of the tree. A flat list of file will look like:



Report of Analysis 1

Entities	Coverage	Coverage Percentage
except.ads	4 lines (0 not covered)	100 %
input.adb	Gcov file corrupted	n/a
input.ads	3 lines (2 not covered)	33 %
instructions.adb	14 lines (14 not covered)	0 %
instructions.ads	2 lines (2 not covered)	0 %
screen_output.adb	No Gcov file found	n/a
screen_output.ads	No Gcov file found	n/a
sdc.adb	23 lines (11 not covered)	52 %
sdc.ads	No Gcov file found	n/a
stack.adb	30 lines (24 not covered)	20 %
stack.ads	3 lines (0 not covered)	100 %
tokens.adb	22 lines (15 not covered)	31 %
tokens.ads	5 lines (4 not covered)	20 %
values-operations.adb	22 lines (22 not covered)	0 %
values-operations.ads	2 lines (2 not covered)	0 %
values.adb	9 lines (1 not covered)	88 %
values.ads	3 lines (2 not covered)	33 %

GPS and Gcov both support many different programming languages, and so code coverage features are available in GPS for many languages. But, note that subprogram coverage details are not available for every supported languages.

To finish, note that if you change the current main project in GPS, using the `Project->Open` menu for instance, you will also drop every loaded coverage information as they are related to the working project.

14 Working in a Cross Environment

This chapter explains how to adapt your project and configure GPS when working in a cross environment.

14.1 Customizing your Projects

This section describes some possible ways to customize your projects when working in a cross environment. For more details on the project capabilities, see Chapter 7 [Project Handling], page 59.

When using the project editor to modify the project's properties, two areas are particularly relevant to cross environments: `Cross environment` part of the `General` page and `Tools`, part of the `Languages` page.

In the `Tools` section, you will typically need to change the name of the compiler(s) and the debugger, as well as gnatls' name if you are using Ada.

For example, assuming you have an Ada project, and using a powerpc VxWorks configuration. You will set the *Ada compiler* to `powerpc-wrs-vxworks-gnatmake`; *Gnatls* to `powerpc-wrs-vxworks-gnatls` and *Debugger* to `powerpc-wrs-vxworks-gdb`.

If you are using an alternative run time, e.g. a *soft float* run time, you need to add the option `--RTS=soft-float` to the *Gnatls* property, e.g: `powerpc-wrs-vxworks-gnatls --RTS=soft-float`, and add this same option to the *Make* switches in the switch editor. See [Switches], page 76 for more details on the switch editor.

To modify your project to support configurations such as multiple targets, or multiple hosts, you can create scenario variables, and modify the setting of the Tools parameters based on the value of these variables. See Section 7.3 [Scenarios and Configuration Variables], page 62 for more information on these variables.

For example, you may want to create a variable called `Target` to handle the different kind of targets handled in your project:

Target	Native, Embedded
Target	Native, PowerPC, M68K

Similarly, you may define a `Board` variable listing the different boards used in your environment and change the *Program host* and *Protocol* settings accordingly.

In some cases, it is useful to provide a different body file for a given package (e.g. to handle target specific differences). A possible approach in this case is to use a configuration variable (e.g. called `TARGET`), and specify a different naming scheme for this body file (in the project properties, `Naming` tab), based on the value of `TARGET`.

14.2 Debugger Issues

This section describes some debugger issues that are specific to cross environments. You will find more information on debugging by reading Chapter 11 [Debugging], page 107.

To connect automatically to the right remote debug agent when starting a debugging session (using the menu `Debug->Initialize`), be sure to specify the `Program host` and `Protocol` project properties, as described in the previous section.

For example, if you are using the *Tornado* environment, with a target server called `target_ppc`, set the `Protocol` to `wtx` and the `Program host` to `target_ppc`.

Once the debugger is initialized, you can also connect to a remote agent by using the menu `Debug->Debug->Connect to Board...`. This will open a dialog where you can specify the target name (e.g. the name of your board or debug agent) and the communication protocol.

In order to load a new module on the target, you can select the menu `Debug->Debug->Load File...`.

If a module has been loaded on the target and is not known to the current debug session, use the menu `Debug->Debug->Add Symbols...` to load the symbol tables in the current debugger.

Similarly, if you are running the underlying debugger (gdb) on a remote machine, you can specify the name of this machine by setting the `Tools host` field of the project properties.

15 Using GPS for Remote Development

In a network environment, it is common for programmers to use as a desktop a computer that is not directly suitable for their development tasks. For instance, each developers may have a PC running Windows or GNU/Linux as their main entrypoint to the company network and do all their development activities on servers potentially running a different operating system and on which the various project resources are shared. A typical way of operating in such an environment is to access the server through X-Window. GPS does naturally work in such a context but it is not necessarily the most efficient organization. Running GPS remotely on a shared remote server will increase the workload of the server as well as the traffic on the network. When the network is slow or saturated, the user interactions can become uncomfortably sluggish. This is a pity when the desktop used to access the network is often a powerful PC which remains idle most of the time. GPS offers the possibility to run natively on the desktop while compilation, run and/or debug activities are performed transparently on one or several remote server.

15.1 Requirements

In order to compile, run or debug on a remote host from GPS, three conditions need to be met:

- Have a remote connection to the host using 'rsh', 'ssh' or 'telnet'. Note that GPS can now handle passwords for such connections.
- Either have a Network Filesystem (i.e. NFS, SMB or equivalent) sharing the project files between the host and the target, or having rsync installled on both client and server.
- Subprojects must be withed by the main project using relative paths, or the same absolute paths exist on the involved machines.

The full remote development setup is performed in several steps:

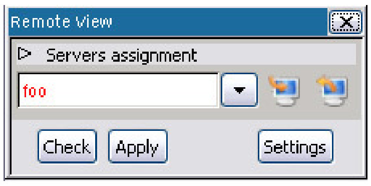
- Setup the remote servers configuration.
- Setup a remote project.

15.2 Setup the remote servers

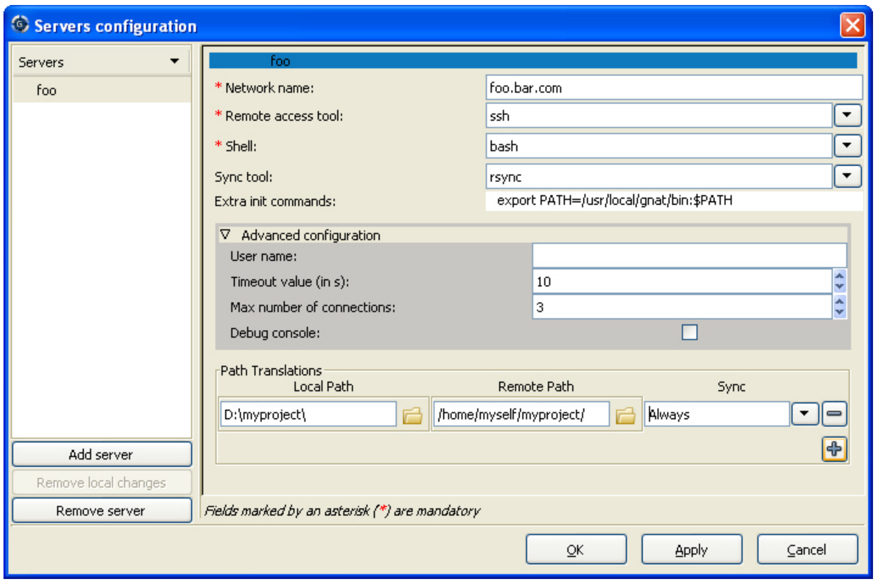
15.2.1 The remote configuration dialog

In order to configure remote servers, you need to open the remote configuration dialog. A predefined configuration can also be set when installing GPS, using xml files. See Section 16.5.19.4 [Defining a remote server], page 237, and See Section 16.5.19.5 [Defining a remote path translation], page 238, for more information.

The remote configuration dialog is opened via the remote view. You can open it using the menu `Tools->Views->Remote`.



Once the Remote View is opened, click on `Settings` to open the servers configuration dialog.



foo

* Network name: foo.bar.com
* Remote access tool: ssh
* Shell: bash
Sync tool: rsync
Extra init commands: export PATH=/usr/local/gnat/bin:$PATH

Advanced configuration
User name:
Timeout value (in s): 10
Max number of connections: 3
Debug console:

Path Translations

Local Path	Remote Path	Sync
D:\myproject\	/home/myself/myproject/	Always

Fields marked by an asterisk (*) are mandatory

This dialog is composed of two parts:

- The left part of the dialog contains the list of configured servers, identified by their nickname. Three buttons allow you to create, reinitialize or delete a server.
- The right part of the dialog contains the selected server's configuration.

You need first to create a new server. For this, click on the button `Add Server` on the bottom left part of the dialog. Enter a nickname identifying the server you want to connect to (this is not necessarily the network name of this server). Note that this nickname identifies the server and thus needs to be unique. This new server is then automatically selected, and the right part of the dialog shows its configuration, which is empty for the most part.

15.2.2 Connection settings

The first configuration part that needs to be filled concerns the way we will connect to this server:

You have to enter first all mandatory fields, identified by an asterisk:

- The network name is the name used to connect to this server via your network. It can be either an IP address, a host name of your local network, or a fully qualified network name.
- The remote access tool is the tool used to connect to this server. You select it using the drop down list. The following tools are supported natively by GPS: ssh, rsh, telnet and plink (Windows tool) in ssh, rsh or telnet mode. See Section 16.5.19.1 [Defining a remote connection tool], page 234, if you need to add a specific tool. Note also that if one of those tools is not installed (e.g. is not in your path), then it won't appear in the tools list.
- The shell tells GPS what shell runs on the remote server. The following unix shells are supported by GPS: sh, bash, csh and tcsh. Windows' shell is also supported (cmd.exe). See Section 15.4 [Limitations], page 164, for cygwin's shell usage on windows: it is preferable to use cmd.exe as a remote shell on Windows servers.

Other fields might need to be taken into consideration, but they are not mandatory. They are for the most part accessible through the advanced configuration pane.

- The remote sync tool is used to synchronize remote and local filesystems, if these are not shared filesystems. For now, only rsync is supported.
- The Extra Init Commands field represent initialization commands sent to the server upon connection: when GPS connects to your remote machine, the chosen shell is launched, and your default initialization files are read (i.e. .bashrc file for the bash shell). Then GPS sends these extra init commands, allowing you for example to specify a compilation toolchain.
- (In Advanced configuration pane) The user name specifies the name used to connect to the server. If unspecified, the remote access tool will most of the time use your current login name. If not, and a user name is requested, gps will prompt you for a user name when requested.
- (In Advanced configuration pane) The timeout value is used to determine if a connection to a remote host is dead. All elementary operations performed on the remote host (i.e. operations that are normally almost immediate to perform) will use this timeout value. By default, this value is set to 10s. If you have a very slow network connection or a very overloaded server, set this timeout to a higher value.
- (In Advanced configuration pane) The maximum number of connections determines the maximum number of simultaneous connections GPS is al-

lowed to perform to this server. In fact, if you want to compile, debug and execute at the same time on the machine, GPS will need more that one connection to do this. The default value is 3.

- (In Advanced configuration pane) The Debug console allow you to easily debug a remote connection. If checked, it will open a console reporting all exchanges between GPS and the selected server.

15.2.3 Paths settings

The last configuration part is to define the path translations between your local host and the remote server.

The remote paths definition will allow GPS to translate your locally loaded project (e.g. the project that resides in your local filesystem) to paths used on the remote server. This part also tells GPS how to keep those paths synchronized between the local machine and the remote server.

All your project's dependencies must then reside in a path that is defined here. Note that you can retrieve those paths by using `gnat list -v -Pyour_project`.

To add a new path, click on the `+` button, and enter the corresponding local and remote paths.

You can easily select the desired paths by clicking on the icon next to the path's entry. Remote browsing is allowed only when the connection configuration is set (See Section 15.2.2 [Connection settings], page 161.) Clicking on `Apply` will apply your connection configuration and allow you to browse the remote host to select the remote paths.

Four kind of paths synchronisation can be set for each defined path:

- `None`: no synchronisation is required from GPS, the paths are shared using an OS mechanism like NFS.
- `Always`: source path of your project. They are kept synchronised by GPS before and after every remote action.
- `Once to local`/`Once to remote`: project's dependencies. They are synchronized once when a remote project is loaded or when a local project is set remote. They can be still manually synchronized using the Remote View (See Section 15.3.2 [The remote view], page 163.)

The way those paths need to be configured depend on your network architecture.

- If your project is on a filesystem that is shared between your host and the remote host (using NFS of SMB filestems, for example), then only the roots of those filesystems need to be specified, using each server's native paths (on Windows, the paths will be expressed using X:\my\mounted\directory\ while on unix, the paths will be expressed using /mnt/path/).

- In case the project's files are synchronized using rsync, then defining a too generic path translation will lead to very slow synchronization. You will then need to define as specific paths as possible, in order to speed up the synchronization process.

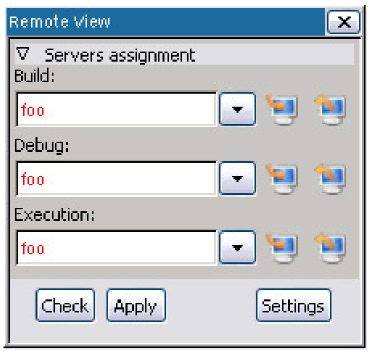
15.3 Setup a remote project

15.3.1 Remote operations

GPS defines three different remote operation categories: Build operations, Debug operations and Execution operations. All compiler related operations are performed on the Build_Server. The debugger is run on the Debug_Server, and the project's resulting programs are run on the Execution_Server. The GPS_Server (the local machine) is used for all other operations.

15.3.2 The remote view

The Remote view (`Tools->Views->Remote`) allows you to assign to each operation category a configured server (when the Servers assignment tab is fully expanded) or assign at once all categories to a unique server (when the Servers assignment tab is collapsed) for the currently loaded project.



When a server is selected for a particular category, the change is not immediately performed. Thus, the server's name will appear in red. You can check the configuration before applying it by pressing the `Check` button. This will test for correct remote hosts connection, and will check that the project path exists on the build server and has an equivalence on the local machine.

Clicking on the `Apply` button will perform the following actions:

- Read the default project paths on the Build machine and translate them into local paths.

- Synchronize from the build server the paths marked as Sync `Always` or `Once to local`.
- Load the translated local project.
- Assign the Build, Execution and Debug servers.

If one of the above operations fail, then errors are reported in the `Messages` view, and the previous project is kept.

Once a remote server is assigned, this remote configuration will be automatically loaded each time the project is loaded.

15.3.3 Loading a remote project

If the project you want to work with is already on a distant server, you can directly load it on your local GPS.

To do this, you need to use the `Project->Open From Host` menu. Then you select the server's nickname. This will show you its file tree. Navigate to your project, select it. The project will be loaded as described above, with all remote operations categories assigned to the selected server by default.

You can reload your project using the local files on your machine, the remote configuration will then be automatically reapplied.

15.4 Limitations

The GPS remote mode involves a few limitations:

- Execution: you cannot use an external terminal to remotely execute your application. The `Use external terminal` checkbox of the run dialog will then have no effect if the program is run remotely.
- Debugging: you cannot use a separate execution window. The `Use separate execution window` option is ignored for remote debugging sessions.
- Cygwin on remote host: the GNAT compilation toolchain does not understand cygwin's mounted directories. In order to use GPS with a remote Windows server using cygwin's bash, you need to use directories that are the same on Windows and Cygwin (absolute paths). For example, a project having a C:\my_project will be accepted if cygwin's path is /my_project, but will not if /cygdrive/c/my_project is used.

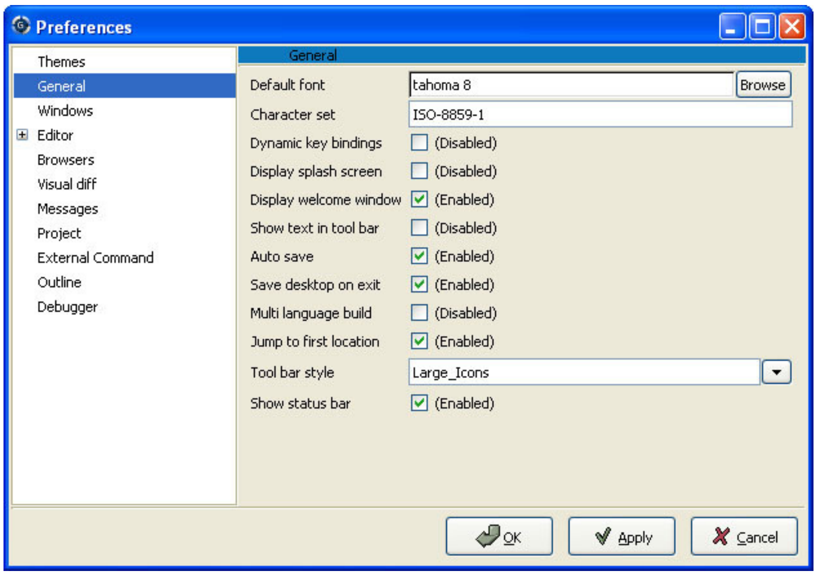
  Note that even if you use cygwin's sshd on such a server, you can still access it using cmd.exe (See Section 15.2.2 [Connection settings], page 161.)

16 Customizing and Extending GPS

GPS provides several levels of customization, from simple preferences dialog to powerful scripting capability through the `python` language. This chapters describes each of these capabilities.

16.1 The Preferences Dialog

This dialog, available through the menu `Edit->Preferences`, allows you to modify the global preferences of GPS. To enable the new preferences, you simply need to confirm by pressing the `OK` button. To test your changes, you can use the `Apply` button. Pressing the `Cancel` button will undo all your changes.



General

Default font	tahoma 8
Character set	ISO-8859-1
Dynamic key bindings	☐ (Disabled)
Display splash screen	☐ (Disabled)
Display welcome window	✓ (Enabled)
Show text in tool bar	☐ (Disabled)
Auto save	✓ (Enabled)
Save desktop on exit	✓ (Enabled)
Multi language build	☐ (Disabled)
Jump to first location	✓ (Enabled)
Tool bar style	Large_Icons
Show status bar	✓ (Enabled)

Each preference is composed of a label displaying the name of the preference, and an editing area to modify its value. If you leave to mouse over the label, a tool tip will be displayed giving an on-line help on the preference.

The preferences dialog is composed of several areas, accessible through the tabs at the left of the dialog. Each page corresponds to a set of preferences.

- **Themes**

  This page allows you to quickly change the current settings for GPS, including preferences, key bindings, menus. . . ; See Section 16.2 [GPS Themes], page 184 for more information on themes. It is only displayed when there are themes registered.

- **General**

  Default font
  : The default font used in GPS

  Fixed view font
  : The fixed (monospace) font used in views like the outline view, the bookmark view, . . .; As much as possible, this font should use a fixed width for characters, for a better rendering

  Character set
  : Name of character set to use when reading or writting text files. GPS uses UTF-8 and Unicode internally, which can handle any character in any language. However, your system will generally not support Unicode natively, and thus the contents of the files should be translated from the file system encoding to unicode.

    This preference indicates the file system encoding in use. It defaults to ISO-8859-1, which corresponds to western european characters.

  Display splash screen
  : Whether a splash screen should be displayed when starting GPS.

  Display welcome window
  : Whether GPS should display the welcome window for the selection of the project to use.

  Tool bar style
  : How the tool bar should be displayed: not at all, with small icons or with large icons

  Show status bar
  : Whether the status bar at the bottom of the GPS window should be displayed. This status bar contains one or more progress bars while GPS is executing long actions like a build or a search. These progress bars can be used to monitor the progress of those actions.

    If you wish to save vertical screen space, you can hide this status bar. The progress bars will no longer be visible. Instead, you can display the Task Manager through the `Tools->Views->Tasks` menu, to get similar information. This manager can then be put on the right or left side of the GPS window, for instance just below the Project View.

  Show text in tool bar
  : Whether the tool bar should show both text and icons, or only icons.

Auto save Whether unsaved files and projects should be saved automatically before calling external tools (e.g. before a build).

Save project-specific desktop on exit
Whether the desktop (size and positions of all windows) should be saved when exiting. The default desktop is never saved automatically, i.e. GPS will only save a desktop associated with the current project. If you are working with a project created automatically by GPS, the desktop will not be saved.

Save editor in desktop
Determines when source editors should be saved in the desktop: `Never`, `Always`, or when a source file is associated with the current project (`From_Project`).

Clipboard size
This controls the size of the list where all the entries copied into the clipboard through `Edit->Copy` and `Edit->Cut` are saved. This list is navigated through the menu `Edit->Paste` and `Edit->Paste Previous`, as described earlier in this guide.

Multi language build
Whether GPS should build more than just Ada sources for projects containing Ada and other languages (e.g. C).

By default, GPS will call gnatmake to build projects containing Ada sources, meaning that non Ada sources won't be built. By enabling this preference, a multi-language build tool (see below), will be called.

Multi language builder
The multi-language builder to be used in case multi-language build has been activated (see above).

By default, `gprbuild` will be used. Alternatively, its prototype `gprmake` can be selected although we do not recommend it at this stage.

Jump to first location
Whether the first entry of the location window should be selected automatically, and thus whether the corresponding editor should be immediately open.

- **Windows**

  This section specifies preferences that apply to the *Multiple Document Interface* described in Chapter 4 [Multiple Document Interface], page 21.

  Opaque If True, items will be resized or moved opaquely when not maximized.

Destroy floats
: If False, closing the window associated with a floating item will put the item back in the main GPS window, but will not destroy it. If True, the item is destroyed.

All floating
: If True, then all the windows will be floating by default, i.e. be under the control of your system (Windows) or your window manager (Unix machines). This replaces the MDI.

Short titles for floats
: If True, all floating windows will have a short title. In particular, base file names will be used for editors instead of full names.

Background color
: Color to use for the background of the MDI.

Title bar color
: Color to use for the title bar of unselected items.

Selected title bar color
: Color to use for the title bar of selected items.

Show title bars
: If True, each window in GPS will have its own title bars, showing some particular information (like the name of the file edited for editors), and some buttons to iconify, maximize or close the window. This title bar is highlighted when the window is the one currently selected.

  If False, the title bar is not displayed, to save space on the screen. The tabs of the notebooks will then be highlighted.

Notebook tabs policy
: Indicates when the notebook tabs should be displayed. If set to `"Never"`, you will have to select the window in the Window menu, or through the keyboard. If set to `"Automatic"`, then the tabs will be shown when two or more windows are stacked.

Notebook tabs position
: Indicates where the notebook tabs should be displayed

- **Editor**

  General

  Strip blanks
  : Whether the editor should remove trailing blanks when saving a file.

Line terminator
Choose between *Unix*, *Windows* and *Unchanged* line terminators when saving files. Choosing *Unchanged* will use the original line terminator when saving the file; *Unix* will use LF line terminators; *Windows* will use CRLF line terminators.

Display line numbers
Whether the line numbers should be displayed in file editors.

Display subprogram names
Whether the subprogram name should be displayed in the editor's status bar.

Tooltips Whether tool tips should be displayed automatically.

Tooltips timeout
Time (in milliseconds) before displaying tooltips.

Highlight delimiters
Determine whether the delimiter matching the character following the cursor should be highlighted. The list of delimiters includes: `{}[]()`

Autosave delay
The period (in seconds) after which an editor is automatically saved, 0 if none.

Each modified file is saved under a file called `.#filename#`, which is removed on the next explicit save operation.

Right margin
The right margin to highlight. 0 if none. This value is also used to implement the `Edit->Refill` command.

Block highlighting
Whether the editor should highlight the current block. The current block depends on the programming language, and will include e.g. procedures, loops, if statements, . . .

Block folding
Whether the editor should provide the ability to fold/unfold blocks.

Speed Column Policy
When the Speed Column should be shown on the side of the editors:

`Never`	The Speed Column is never displayed.
`Automatic`	The Speed Column is shown whenever lines are highlighted in the editor, for example to show the current execution point, or lines containing compilation errors, . . .; It disappears when no lines are highlighted.
`Always`	The Speed Column is always displayed.

External editor
The default external editor to use.

Custom editor command
Specify the command line for launching a custom editor. It is assumed that the command will create a new window/terminal as needed. If the editor itself does not provide this capability (such as vi or pico under Unix systems), you can use an external terminal command, e.g:

```
xterm -geo 80x50 -exe vi +%l %f
```

The following substitutions are provided:

`%l`	line to display
`%c`	column to display
`%f`	full pathname of file to edit
`%e`	extended lisp inline command
`%p`	top level project file name
`%%`	percent sign ('%')

Always use external editor
True if all editions should be done with the external editor. This will deactivate completely the internal editor. False if the external editor needs to be explicitly called by the user.

Smart completion
When enabled, GPS loads on startup all the information needed for the Smart completion to work.

Smart completion timeout
The timeout, expressed in milliseconds, after which the Smart completion window appears automatically after entering a triggering character, such as '.'

Fonts & Colors

Default The default font, default foreground and default background colors used in the source editor.

Keywords
Font and colors used to highlight keywords.

Comments
Font and colors used to highlight comments. Setting the color to white will set a transparent color.

Annotated Comments
Font and colors used to highlight annotated comments. Only relevant to Ada currently. Annotated comments are comments immediately followed by a special character, e.g. `#[]`. Setting the color to white will set a transparent color.

Strings Font and colors used to highlight strings. Setting the color to white will set a transparent color.

Current line color
Color for highlighting the current line. Leave it to blank for no highlighting. Setting the color to white will set a transparent color.

Current block color
Color for highlighting the current source block.

Delimiter highlighting color
Color for highlighting delimiters.

Search results highlighting
Color for highlighting the search results in the text of source editors.

Cursor color
Color used for the cursor in editors and interactive consoles

Cursor aspect ratio
Defines the size of the cursor, relatively to characters. 100 means the cursor will occupy the same size

as a character, 10 means it will only occupy 10% of the size occupies by a character.

Ada

Auto indentation
How the editor should indent Ada sources. None means no indentation; Simple means that indentation from the previous line is used for the next line; Extended means that a language specific parser is used for indenting sources.

Use tabulations
Whether the editor should use tabulations when indenting.

Default indentation
The number of spaces for the default Ada indentation.

Continuation lines
The number of extra spaces for continuation lines.

Declaration lines
The number of extra spaces for multiple line declarations. For example, using a value of 4, here is how the following code would be indented:

```
variable1,
    variable2,
    variable3 : Integer;
```

Conditional continuation lines
The number of extra spaces used to indent multiple lines conditionals within parentheses.

For example, when this preference is set to 1 (the default), continuation lines are indented based on the previous parenthesis plus one space:

```
if (Condition1
    and then Condition2)
then
```

When this preference is set to 3, this gives:

```
if (Condition1
      and then Condition2)
then
```

Record indentation
The number of extra spaces for record definitions, when the `record` keyword is on its own line.

For example, when this preference is set to 3 (the default), the following sample will be indented as:

```
type T is
   record
      F : Integer;
   end record;
```

When this preference is set to 1, this gives:

```
type T is
 record
    F : Integer;
 end record;
```

Case indentation
Whether GPS should indent case statements with an extra level, as used in the Ada Reference Manual, e.g:

```
case Value is
   when others =>
      null;
end case;
```

If this preference is set to `Non_Rm_Style`, this would be indented as:

```
case Value is
when others =>
   null;
end case;
```

By default (`Automatic`), GPS will choose to indent with an extra level or not based on the first `when` construct: if the first `when` is indented by an extra level, the whole case statement will be indented following the RM style.

Casing policy
The way the editor will handle the case settings below. `Disabled` no auto-casing will be done; `End_Of_Line` auto-casing will be done when hitting ⟨Enter⟩ key; `On_The_Fly` auto-casing will be done word-by-word while typing. For the `End_Of_Line` and `On_The_Fly` policies it is always possible to force the casing of the current line by pressing the indentation key (⟨Ctrl-Tab⟩ by default).

Reserved word casing
How the editor should handle reserved words casing. `Unchanged` will keep the casing as-is; `Upper`

will change the casing of all reserved words to upper case; `Lower` will change the casing to lower case; `Mixed` will change the casing to mixed case (all characters to lower case except first character and characters after an underscore which are set to upper case); `Smart_Mixed` As above but do not force upper case characters to lower case.

Identifier casing
How the editor should handle identifiers casing. The values are the same as for the *Reserved word casing* preference.

Format operators/delimiters
Whether the editor should add extra spaces around operators and delimiters if needed. If enabled, an extra space will be added when needed in the following cases: before an opening parenthesis; after a closing parenthesis, comma, semicolon; around all Ada operators (e.g. `<=`, `:=`, `=>`, ...)

Align colons in declarations
Whether the editor should automatically align colons in declarations and parameter lists. Note that the alignment is computed by taking into account the current buffer up to the current line (or end of the current selection), so if declarations continue after the current line, you can select the declarations lines and hit the reformat key.

Align associations on arrows
Whether the editor should automatically align arrows in associations (e.g. aggregates or function calls). See also previous preference.

Align declarations after colon
Whether the editor should align continuation lines in variable declarations based on the colon character.

Consider the following code:

```
Variable : constant String :=
  "a string";
```

If this preference is enabled, it will be indented as follows:

```
Variable : constant String :=
             "a string";
```

Indent comments
: Whether to indent lines containing only comments and blanks, or to keep these lines unchanged.

Align comments on keywords
: Whether to align comment lines following `record` and `is` keywords immediately with no extra space.

When enabled, the following code will be indented as:

```
package P is
--  Comment

   [...]
end P;
```

When disabled, the indentation will be:

```
package P is
   --  Comment

   [...]
end P;
```

C/C++

Auto indentation
: How the editor should indent C/C++ sources. None means no indentation; Simple means that indentation from the previous line is used for the next line; Extended means that a language specific parser is used for indenting sources.

Use tabulations
: Whether the editor should use tabulations when indenting. If True, the editor will replace each occurrence of eight characters by a tabulation character.

Default indentation
: The number of spaces for the default indentation.

- **Debugger**

Preserve State on Exit
: If this preference is enabled, the debugger will automatically save breakpoints when it exists, and restore them the next time the same executable is debugged. This is a convenient way to work on an executable, where the typical usage looks like compile, debug, compile, debug, . . .

When the preference is enabled, the debugger will also preserve the contents of the data window whenever it is closed. Reopening the window either during the same debugger session, or automatically when a new debugger is started on the same executable, will recreate the same boxes within the data window.

Break on exceptions
Specifies whether a breakpoint on all exceptions should be set by default when loading a program. This setup is only taken into account when a new debugger is initialized, and will not modify a running debugger (use the breakpoint editor for running debuggers).

Execution window
Specifies whether the debugger should create a separate execution window for the program being debugged.

Note that this preference cannot be taken into account for the current debug session: you need to terminate the current debug session and restart a new one.

If true, a separate console will be created. Under Unix systems, this console is another window in the bottom part of the main window; under Windows, this is a separate window created by the underlying gdb, since Windows does not have the notion of separate terminals (aka ttys).

Note that in this mode under Windows, the `Debug->Interrupt` menu will not interrupt the debugged program. Instead, you need to hit ⟨Ctrl-C⟩ in the separate execution window to interrupt it while it is running. On Windows this separate execution window uses the default system-wide console properties (the size of the window, the colors...). It is possible to change those properties using the default console menu (top-left of the console) on Windows XP or using the control panel on Windows NT.

If false, no execution window will be created. The debugger assumes that the program being debugged does not require input, or that if it does, input is handled outside GPS. For example, when you attach to a running process, this process already has a separate associated terminal.

Show lines with code
Specifies whether the source editor should display blue dots for lines that contain code. If set to *False*, gray dots will be displayed instead on each line, allowing breakpoint on any line. Disabling this option provides a faster feedback, since GPS does not need to query the debugger about which lines contain code.

Detect aliases
: If enabled, do not create new items when an item with the same address is already present on the canvas.

Assembly range size
: Number of assembly lines to display in the initial display of the assembly window. If the size is 0, then the whole subprogram is displayed, but this can take a very long time on slow machines.

Current assembly line
: Color used to highlight the assembly code for the current line.

Color highlighting
: Color used for highlighting in the debugger console.

Clickable item
: Indicates color to be used for the items that are click-able (e.g pointers).

Changed data
: Indicates color to be used to highlight fields in the data window that have changed since the last update.

Memory color
: Color used by default in the memory view window.

Memory highlighting
: Color used for highlighted items in the memory view.

Memory selection
: Color used for selected items in the memory view.

Item name
: Indicates the font to be used for the name of the item in the data window.

Item type
: Indicates font to be used to display the type of the item in the data window.

Max item width
: The maximum width an item can have.

Max item height
: The maximum height an item can have.

- **External Commands**

List processes
: Command used to list processes running on the machine.

Remote shell
Program used to run a process on a remote machine. You can specify arguments, e.g. `rsh -l user`

Remote copy
Program used to copy a file from a remote machine. You can specify arguments, e.g. `rcp -l user`

Execute command
Program used to execute commands externally.

HTML Browser
Only used under Unix, not relevant under Windows where the default HTML browser is used. Program used to execute view HTML files, for instance the documentation. Empty by default, which means that GPS will try to find a suitable HTML browser automatically. Only change the value if GPS cannot find a HTML browser, or if the browser found is not your preferred one.

Print command
External program used to print files.

This program is required under Unix systems in order to print, and is set to `a2ps` by default. If `a2ps` is not installed on your system, you can download it from `ftp://ftp.enst.fr/pub/unix/a2ps/`, although other printing programs such as `lp` can be specified instead.

Under Windows systems, this program is optional and is empty by default, since a built-in printing is provided. An external tool will be used if specified, such as the PrintFile freeware utility available from `http://www.lerup.com/printfile/descr.html`

- **Search**

Confirmation for "Replace all"
Enable or disable the confirmation popup for the replace all action.

Close on Match
If this option is enabled, the search window will be closed when a match is found.

Select on Match
If this option is enabled, the focus will be given to the editor when a match is found.

Preserve Search Context
: If this option is enabled, the contents of the `"Look in:"` field will be preserved between consecutive searches in files.

- **Browsers**

  General

  Selected item color
  : Color to use to draw the selected item.

  Background color
  : Color used to draw the background of the browsers.

  Hyper link color
  : Color used to draw the hyper links in the items.

  Selected link color
  : Color to use for links between selected items.

  Default link color
  : Color used to draw the links between unselected items.

  Ancestor items color
  : Color to use for the background of the items linked to the selected item.

  Offspring items color
  : Color to use for the background of the items linked from the selected item.

  Vertical layout
  : Whether the layout of the graph should be vertical (*True*) or horizontal (*False*). This setting applies to most browsers (call graph for instance), but does not apply to the entities browsers.

  File Dependencies

  Show system files
  : Whether the system files (Ada runtime or standard C include files) should be visible in the browser.

  Show implicit dependencies
  : If False, then only the explicit dependencies are shown in the browser. Otherwise, all dependencies, even implicit, are displayed.

- **Visual diff**

  Note that in order to perform visual comparison between files, GPS needs to call external tool (not distributed with GPS) such as `diff` or `patch`. These tools are usually found on most unix systems, and may not be available by default on other OSes. Under Windows, you can download them from one of the unix toolsets available, such as msys (`http://www.mingw.org/msys.shtml`) or cygwin (`http://www.cygwin.com`).

Diff command
Command used to compute differences between two files. Arguments can also be specified. The visual diff expects a standard diff output with no context (that is, no `-c` nor `-u` switch). Arguments of interest may include (this will depend on the version of diff used):

-b	Ignore changes in amount of white space.
-B	Ignore changes that just insert or delete blank lines.
-i	Ignore changes in case; consider upper and lower case letters equivalent.
-w	Ignore white space when comparing lines.

Patch command
Command used to apply a patch. Arguments can also be specified. This command is used internally by GPS to perform the visual comparison on versioned files (e.g. when performing a comparison with a version control system).

This command should be compatible with the `GNU patch` utility.

Use old diff
Use the old version of the visual comparison.

Diff3 command
This item is only displayed if the preference *Use old diff* is disabled. Command used to query a 3-way diff. See *Diff command* for a description of the parameters.

Default color
This item is only displayed if the preference *Use old diff* is disabled. The color used to indicate lines on which there is a difference, in the "reference" editor.

Old color This item is only displayed if the preference *Use old diff* is disabled. The color used to indicate spaces used by lines not present in one of the editors in a 3-way diff and present in the other editors.

Append color
: This item is only displayed if the preference *Use old diff* is disabled. The color used to display the lines that are present in an editor but not in the reference editor.

Remove color
: This item is only displayed if the preference *Use old diff* is disabled. The color used to display the lines that are present in the reference editor but not in other editors.

Change color
: This item is only displayed if the preference *Use old diff* is disabled. The color used to display the lines that have changed between the reference editor and the other editors.

Fine change color
: This item is only displayed if the preference *Use old diff* is disabled. The color used to highlight fine differences within a modified line.

Context length
: This item is only displayed if the preference *Use old diff* is enabled. The number of lines displayed before and after each chunk of differences. Specifying -1 will display the whole file.

- **Messages**

Color highlighting
: Color used to highlight text in the messages window.

Color highlighting
: Color used to highlight lines causing compilation errors/warnings in the source editors. When this color is set to white, the errors/warnings are not highlighted. (Chapter 9 [Compilation/Build], page 93)

File pattern
: Pattern used to detect file locations and the type of the output from the messages window. This is particularly useful when using an external tool such as a compiler or a search tool, so that GPS will highlight and allow navigation through source locations. This is a standard system V regular expression containing from two to five parenthesized subexpressions corresponding to the file, line, column, warnings or style error patterns.

File index Index of filename in the file pattern.

Line index
: Index of the line number in the file pattern.

Column index
Index of the column number in the file pattern.

Warning index
Index of the warning identifier in the file pattern.

Style index
Index of the style error identifier in the file pattern.

- **Project**

Relative project paths
Whether paths should be absolute or relative when the projects are modified.

Fast Project Loading
If the project respects a number of restrictions, activating the preference will provide major speed up when GPS parses the project. This is especially noticeable if the source files are on a network drive.

GPS assumes that the following restricitions are true when the preference is activated. If this isn't the case, no error is reported, and only minor drawacks will be visible in GPS (no detection that two files are the same if one of them is a symbolic link for instance, although GPS will still warn you if you are trying to overwrite a file modified on the disk).

The restrictions are the following:

- Symbolic links shouldn't be used in the project. More precisely, you can only have symbolic links that point to files outside of the project, but not to another file in the project
- Directories can't have source names. No directory name should match the naming scheme defined in the project. For instance, if you are using the default GNAT naming scheme, you cannot have directories with names ending with ".ads" or ".adb"

Load Xref info on project load
Whether the Xref information should be automatically loaded into memory when a new project is loaded. See Section 6.1 [Support for Cross-References], page 51.

Hidden directories pattern
A regular expression used to match hidden directories. Such directories are not displayed by default in the project view, and are not taken into account for VCS operations working on directories.

- **Outline**

  Font
  : You can choose a specific font for the outline view. Typically, this will be used to use a slightly smaller font than in the editor, so that you can see more entities at once on the screen.

  Show Profiles
  : For some of the languages, in particular Ada, GPS can display the profile (list of parameters) for the subprograms. This can be used to differentiate between overloaded entities (ie entities with the same name). Disabling this preference will only show the entity name.

  Sort alphabetically
  : If this preference is activated, the entities will be sorted alphabetically in the outline view. If disabled, they will be displayed in the order they are found in the source file.

  Link with Editor
  : If this option is set, the current subprogram will be selected in the outline view every time the cursor position changes in the current editor. This option requires some computation for GPS, and you might want to avoid the slow down by disabling it.

  Show file name
  : If this option is set, the outline view will show the name of the file on its first line, and indent slightly all following lines. If this option is unset, this will save some screen real estate, but you will have to look at the current editor to see what file is descrived in the Outline View.

- **Documentation**

  This section specifies preferences that apply to the *Documentation Generator*. Section 13.4 [Documentation Generation], page 151 for more information.

  Process body files
  : If this preference is enabled, implementation files will be processed. Otherwise, only the specification files will.

  Show private entities
  : By default, no documentation is generated for private entities. Enabling this preference will change this behavior.

  Call graph
  : If enabled, the documentation tool will compute and take advantage of source references to e.g generate call graph information.

Activating this option will slow down the documentation generation process.

Up-to-date files only
If enabled, only files having up-to-date cross references information will be documented.

Comments filter regexp
A regular expression used to filter to comments found in the source code before using them for generating documentation. For example `"^!.*"` will remove all comments starting with '!'.

16.2 GPS Themes

GPS provides an extensive support for themes. Themes are predefined set of value for the preferences, for the key bindings, or any other configurable aspect of GPS.

For instance, color themes are a convenient way to change all colors in GPS at once, according to predefined choices (strongly contrasted colors, monochrome,...). It is also possible to have key themes, defining a set of key bindings to emulate e.g. other editors.

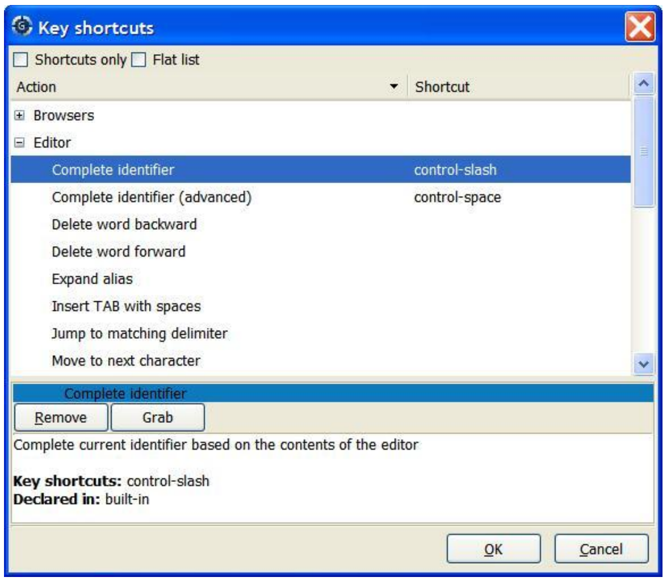
Any number of themes can be activated at the same time through the preferences dialog (`Edit->Preferences`). This dialog contains a list of all themes that GPS knows about, organized into categories for convenient handling. Just click on the buttons on the left of each theme name to activate that theme.

Note that this will immediately change the current preferences settings. For instance, if the theme you just selected changes the colors in the editor, these are changed immediately in the `Editor->Fonts & Colors`. You can of course still press `Cancel` to keep your previous settings

If multiple themes are active at the same time and try to override the same preferences, the last theme which is loaded by GPS will override all previously loaded themes. However, there is no predefined order in which the themes are loaded.

16.3 The Key Manager Dialog

The key manager is accessible through the menu `Edit->Key Shortcuts`. This dialog provides an easy way to associate key shortcuts with actions. These actions are either predefined in GPS, or defined in your own customization files, as documented in Section 16.5 [Customizing through XML and Python files], page 187. It also provides an easy way to redefine the menu shortcuts.



Action	Shortcut
Browsers	
Editor	
Complete identifier	control-slash
Complete identifier (advanced)	control-space
Delete word backward	
Delete word forward	
Expand alias	
Insert TAB with spaces	
Jump to matching delimiter	
Move to next character	

Complete identifier

Complete current identifier based on the contents of the editor

Key shortcuts: control-slash
Declared in: built-in

Actions are referenced by their name, and are grouped into categories. These categories indicate when the action applies. For instance, the indentation command only applies in source editors, whereas the command to change the current window applies anywhere in GPS. The categories can be explicitly specified when you created your own actions through XML files (see Section 16.5.2 [Defining Actions], page 191).

Through the key manager, you can define key bindings similar to what Emacs uses (⟨control-x⟩ followed by ⟨control-k⟩ for instance). To register such key bindings, you need to press the `Grab` button as usual, and then type the shortcut. The recording of the key binding will stop a short while after the last key stroke.

If you define complex shortcuts for menus, they will not appear next to the menu name when you select it with the mouse. This is expected, and is due to technical limitations in the graphical toolkit that GPS uses.

When you assign a new shortcut to an action, the following happens:

- All actions and menus currently associated with the same key will no longer be executed when the key is pressed.
- All key shortcuts defined for this action are replaced by the new one. As a result, the action is only executable through this new shortcut.

16.4 The Plug-ins Editor

GPS can be extensively customized through external plug-ins. You can write your own plug-ins (see Section 16.5.1 [Customization files and plugins], page 187), but GPS also comes with its own collection of plug-ins.

Some of them are loaded by default when GPS starts (for instance the support for the CVS version management system or support for highlighting in various programming languages); others are available for any user but not loaded automatically by GPS, for instance an Emacs emulation mode.

Among the plug-ins that are provided with GPS, you will find:

- Emacs emulation Several plug-ins emulate some of the functions provided by Emacs, such as the interactive search, manipulation of rectangles, navigation in the editor, and of course the usual Emacs key shortcuts

  This emacs mode used to be activated in the preferences dialog, on the Themes page, but you should now activate it by loading the '`emacs.xml`' plug-in.
- Makefile support A plug-in is provided that parses a Makefile and creates menus for each of its possible targets, so that you can easily start a make command.
- Cross-references enhancements Various plug-ins take advantage of GPS's cross-references information to create additional menus to navigate (for instance to jump to the primitive operations of Ada tagged types, to the body of Ada separate entities, . . .)
- Text manipulation Several plug-ins provide support for advanced text manipulation in the editors, for instance to be able to align a set of lines based on various criteria, or to manipulate a rectangular selection of text.

You can chose graphically which plug-ins should or should not be loaded on startup. To do so, select the menu `/Tools/Plug-ins`. This brings up a new window, containing two parts:

- On the left is the list of all known plug-ins.

  As described in See Section 16.5.1 [Customization files and plugins], page 187, GPS will search for candidates in various directories, and based on these directories decide whether to automatically load the plug-in or not.

  This list indicates the name of the plug-in, and whether it has been loaded in this GPS session (when the toggle button is checked).
- On the right are the details for the selected plug-in

  This window is displayed as a notebook with two pages: on the first one you will see the exact location of the plug-in, the reason why it was loaded or not, and, more importantly, the source of the plug-in. By convention, each plug-in starts with a general comment that indicates the purpose of this plug-in, and some more detailed documentation on its usage.

For those interested, this also contains the plug-in itself, so that this can act as an example to create your own customization script.

The second page in the notebook can be used to edit the initialization commands. This commands will be executed after the module has been loaded (and never if the module is not loaded). This will typically be used to change some of the configuration variables for the plug-in (as documented in the plug-in itself).

Technically, the list of plug-in to load or not to load, and their initialization commands are stored in the file '`HOME/.gps/startup.xml`'. The list of initialization commands has the same format as used when creating GPS actions (see Section 16.5.2 [Defining Actions], page 191). The graphical editor in the Plug-Ins Editor makes it easier to edit the commands.

There are currently three kinds of commands that you can execute (you can have any number of them, in any order you wish): GPS shell commands, Python commands and external commands. External commands are spawned outside of GPS, and can be used for instance to launch a command such as `ls` or `gnatls -v`. In case the external command returns an exit status different from 0, you can specify a list of commands to execute (known as `on-failure` commands).

To add any of the three kinds of commands, click on the appropriate `Add` button. This adds the commands just after the currently selected one (or at the end if none is selected). If you have first selected a `on-failure` node, the new command will execute only when the command to which on-failure is attached fails. If you want to add another command to execute in case of failure, select that first command, and click `Add` again. If you then want to add a command to execute when the first external command succeeded, select that external command.

If you have modified anything through this dialog (the list of plug-ins to load or unload, or any of the initialization commands), you will need to restart GPS. GPS cannot unload a module, since it can have too many possible effects on GPS (adding menus, overriding key shortcuts, . . .). Likewise, re-executing initialization commands immediately might be too late, since once they are running some of the scripts might not take the changes into account.

A dialog is displayed asking you whether you would like to exit GPS now. This will properly save all your files.

16.5 Customizing through XML and Python files

16.5.1 Customization files and plugins

You can customize lots of capabilities in GPS using files that are loaded by GPS at start up.

For example, you can add items in the menu and tool bars, as well as defining new key bindings, new languages, new tools, . . .; Using Python as a programming language, you can also add brand new facilities and integrate your own tools in the GPS platform.

These customization files are searched for at startup in several different places. Depending on the location where they are found, these files will either be automatically loaded by GPS (and thus can immediately modify things in GPS), or will simply be made visible in the Plug-ins Editor (see Section 16.4 [The Plug-ins Editor], page 186).

These directories are searched for in the order given below. Any script loaded latter can override setups done by previously loaded scripts. For instance, they could override a key shortcut, remove a menu, redefining a GPS action, . . .

In the directory names below, '`INSTALL`' is the name of the directory in which you have installed GPS. '`HOME`' is the user's home directory, either by default or as overriden by the `GPS_HOME` environment variable. If none of these exist, GPS will use the `USERPROFILE` environment variable.

In all these directories, only the files with '`.xml`' or '`.py`' extensions are taken into account. Other files are ignored, although for compatibility with future versions of GPS it is recommended not to keep other files in the same directory.

- Automatically loaded system wide modules

  The '`INSTALL/share/gps/plug-ins`' directory should contain the files that GPS will automatically load by default (unless overriden by the user through the Plug-ins Editor). These plug-ins are visible to any user on the system that uses the same GPS installation. This directory should be reserved for critical plug-ins that almost every one should use.

- Not automatically loaded system wide modules

  The '`INSTALL/share/gps/library`' directory should contain the files that GPS should show in the Plug-ins Editor, but not load automatically. Typically, these would be files that add optional capabilities to GPS, for instance an emacs emulation mode, or additional editor capabilities that a lot of users would not generally use.

- `GPS_CUSTOM_PATH`

  This environment variable can be set before launching GPS. It should contain a list of directories, separated by semicolons (';') on Windows systems and colons (':') on Unix systems. All the files in these directories with the appropriate extensions will be automatically loaded by default by GPS, unless overriden by the user through the Plug-ins Editor.

This is a convenient way to have project-specific customization files. You can for instance create scripts, or icons, that set the appropriate value for the variable and then start GPS. Depending on your project, this allows you to load specific aliases which do not make sense for other projects.

- Automatically loaded user directory

  The directory '`HOME/.gps/plug-ins`' is searched last. Any script found in there will be automatically loaded unless overriden in the Plug-ins Editor.

  This is a convenient way for users to create their own plug-ins, or test them before they are made available to the whole system by copying them to one of the other directories.

Any script loaded by GPS can contain customization for various aspects of GPS, mixing aliases, new languages or menus, . . . in a single file. This is a convenient way to distribute your plug-ins to other users.

16.5.1.1 Python files

Although the format of the python plug-ins is free (as long as it can be executed by Python), the following organization is suggested. These plug-ins will be visible in the Plug-ins Editor, and therefore having a common format makes it easier for users to understand the goal of the plug-ins:

- Comment

  The first part of the script should be a general comment on the goal and usage of the script. This comment should use python's triple-quote convention, rather than start-of-line hash ('#') signs.

  The first line of the comment should be a one liner explaining the goal of the script. It is separated by a blank line from the rest of the comment.

  The rest of the comment is free-form.

- Customization variables

  If your script can be configured by the user by changing some global variables, they should be listed in their own section, and fully documented. The user can then, through the /Tools/Plug-ins editor change the value of these variables

- Implementation

  The implementation should be separated from the initial comment by a form-feed (control-L) character. The startup scripts editor will know not to display the rest of the script on the first page of the editor.

  Generally speaking, scripts should avoid executing code as soon as they are loaded. This gives a chance to the user to change the value of global variables or even override functions before the script is actually launched.

  The solution is to connect to the `"gps_started"` hook, as in

```
^L
###############################################################
## No user customization below this line
###############################################################

import GPS

def on_gps_started (hook_name):
   ... launch the script

GPS.Hook ("gps_started").add (on_gps_started)
```

16.5.1.2 XML files

XML files must be utf8-encoded by default. In addition, you can specify any specific encoding through the standard `<?xml encoding="..." ?>` declaration, as in the following example:

```
<?xml version="1.0" encoding="iso-8859-1"?>
<!--  general description -->
<submenu>
  <title>encoded text</title>
</submenu>
```

These files must be valid XML files, i.e. must start with the `<?xml?>` tag, and contain a single root XML node, the name of which is left to your consideration. The general format is therefore

```
<?xml version="1.0" ?>
<root_node>
   ...
</root_node>
```

It is also recommended that the first line after the `<?xml?>` tag contains a general comment describing the purpose and usage of the script. This comment will be made visible in the Plug-ins editor.

The list of valid XML nodes that can be specified under <root> is described in later sections. It includes:

`<action>` (see Section 16.5.2 [Defining Actions], page 191)

`<key>` (see Section 16.5.8 [Binding actions to keys], page 208)

`<submenu>`
(see Section 16.5.5 [Adding new menus], page 203)

`<pref>` (see Section 16.5.9 [Preferences support in custom files], page 209)

`<preference>`
(see Section 16.5.9 [Preferences support in custom files], page 209)

`<alias>` (see Section 16.5.13 [Defining text aliases], page 219)

`<language>`
: (see Section 16.5.12 [Adding support for new languages], page 214)

`<button>` (see Section 16.5.7 [Adding tool bar buttons], page 207)

`<entry>` (see Section 16.5.7 [Adding tool bar buttons], page 207)

`<vsearch-pattern>`
: (see Section 16.5.11 [Defining new search patterns], page 213)

`<tool>` (see Section 16.6 [Adding support for new tools], page 239)

`<filter>` (see Section 16.5.4 [Filtering actions], page 200)

`<contextual>`
: (see Section 16.5.6 [Adding contextual menus], page 206)

`<case_exceptions>`
: (see Section 16.5.16 [Adding casing exceptions], page 231)

`<documentation_file>`
: (see Section 16.5.17 [Adding documentation], page 231)

`<doc_path>`
: (see Section 16.5.17 [Adding documentation], page 231)

`<stock>` (see Section 16.5.18 [Adding stock icons], page 233)

`<project_attribute>`
: (see Section 16.5.15 [Defining project attributes], page 222)

`<remote_machine_descriptor>`
: (see Section 16.5.19.4 [Defining a remote server], page 237)

`<remote_path_config>`
: (see Section 16.5.19.5 [Defining a remote path translation], page 238)

`<remote_connection_config>`
: (see Section 16.5.19.1 [Defining a remote connection tool], page 234)

`<rsync_configuration>`
: (see Section 16.5.19.3 [Configuring rsync usage], page 237)

16.5.2 Defining Actions

This facility distinguishes the actions from their associated menus or key bindings. Actions can take several forms: external commands, shell commands and predefined commands, as will be explained in more details below.

The general form to define new actions is to use the `<action>` tag. This tag accepts the following attributes:

`name (mandatory)`
: This tag must be specified. It provides the name by which the action is referenced in other parts of the customization files, for instance when it is associated with a menu or a toolbar button. The name can contain any character, although it is recommended to avoid XML special characters. It mustn't start with a '/'.

`output (optional)`
: If specified, this attribute indicates where the output of the commands will be sent by default. This can be overridden by each command, using the same attribute for `<shell>` and `<external>` tags, See Section 16.6.4.5 [Redirecting the command output], page 251.

`show-command (optional, default true)`
: If specified, this attribute indicates whether the text of the command itself should be displayed at the same location as its output. Neither will be displayed if the output is hidden. The default is to show the command along with its output. This attribute can be overridden for each command.

`show-task-manager (optional, default false)`
: This attribute indicates whether an entry should be created in the task manager to show this command. Associated with this entry is the progress bar indicator, so if you hide the entry, no progress will be shown. On the other hand, several progress bars might be displayed for your action if you show the progress bar here, which might be an issue depending on the context. This attribute can be overriden for each external command.

`category (optional, default "General")`
: The category in the keybindings editor (menu `Edit/Key bindings`) in which the action should be shown to the user. If you specify an empty string, the action is considered as an implementation detail, and not displayed in the editor. The user will thus not be able to assign it a keybinding through the graphical user interface (although this is still doable through XML commands).

If you are defining the same action multiple times, the last definition will be kept. However, existing menus, buttons, . . . that already reference that action will keep their existing semantic. The new definition will only be used for all new menus created from that point on.

The `<action>` can have one or several children, all of which define a particular command to execute. All of these commands are executed one after the other, unless one of them fails in which case the following commands are not executed.

The following XML tags are valid children for `<action>`.

`<external>`

This defines a command to execute through the system (i.e. a standard Unix or Windows command)

Note for Windows users: like under UNIX, scripts can be called from custom menu. In order to do that, you need to write your script in a '`.bat`' or '`.cmd`' file, and call this file as usual. The `external` tag would e.g. look like:

```
<?xml version="1.0" ?>
<external_example>
  <action name="my_command">
    <external>c:\.gps\my_scripts\my_cmd.cmd</external>
  </action>
</external_example>
```

This tag accepts the following attributes:

`server (optional)`
: This attribute can be used to execute the external command on a remote server. The accepted values are `"gps_server"` (default), `"build_server"`, `"execution_server"` and `"debug_server"`. See Section 15.3.1 [Remote operations], page 163, for explanation of what these servers are.

`check-password (optional)`
: This attribute can be used to tell GPS to check and handle password prompts from the external command. The accepted values are `"false"` (default) and `"true"`.

`show-command (optional)`
: This attribute can be used to override the homonym attribute specified for the `<action>` tag.

`output (optional)`
: This attribute can be used to override the homonym attribute specified for the `<action>` tag.

`progress-regexp (optional)`
: This attribute specifies a regular expression that the output of the command will be checked against. Every time the regular expression matches, it should provide two numeric values that are used to display the usual progress indicators at the bottom-right corner of the GPS window, as happens during regular compilations.

  The name of the action is printed in the progress bar while the action is executing.

```
<?xml version="1.0" ?>
<progress_action>
  <action name="progress" >
    <external
      progress-regexp="(\d+) out of (\d+).*$"
      progress-current="1"
      progress-final="2"
      progress-hide="true">gnatmake foo.adb
    </external>
  </action>
</progress_action>
```

`progress-current` (optional, default is 1)
: This is the opening parenthesis count index in `progress-regexp` that contains the current step.

`progress-final` (optional, default is 2)
: This is the opening parenthesis count index in `progress-regexp` that contains the current last step. This last index can grow as needed. For example, gnatmake will output the number of the file it is currently examining, and the total number of files to be examined. However, that last number may grow up, since parsing a new file might generate a list of additional files to parse later on.

`progress-hide` (optional, default is true)
: If this attribute is set to the value "true", then all the lines that match `progress-regexp` and are used to compute the progress will not be displayed in the output console. For any other value of this attribute, these lines are displayed along will the rest of the output.

`show-task-manager` (optional, default inherited from `<action>`)
: This attribute indicates whether an entry should be created in the task manager to show this command. Associated with this entry is the progress bar indicator, so if you hide the entry, no progress will be shown. On the other hand, several progress bars might be displayed for your action if you show the progress bar here, which might be an issue depending on the context.

  If you have set a value for `progress-regexp`, this will automatically be set to true by default so that the progress bar is indeed displayed in the task manager. You can still override it explicitly for that `<external>` element to force hiding the progress bar.

`<on-failure>`

This tag specifies a group of command to be executed if the previous external command fails. Typically, this is used to parse the output of the command and fill the location window appropriately (see Section 16.6.4.6 [Processing the tool output], page 251).

For instance, the following action spawn an external tool, and parses its output to the location window and the automatic fixing tool if the external tool happens to fail.

In this group of commands the %... and $... macros can be used (see Section 16.5.3 [Macro arguments], page 196).

```
<?xml version="1.0" ?>
<action_launch_to_location>
  <action name="launch tool to location" >
    <external>tool-path</external>
    <on-failure>
      <shell>Locations.parse "%1" category<shell>
      <external>echo the error message is "%2"</external>
    </on-failure>
    <external>echo the tool succeeded with message %1</external>
  </action>
</action_launch_to_location>
```

`<shell>` As well as external commands, you can use custom menu items to invoke GPS commands using the `shell` tag. These are command written in one of the shell scripts supported by GPS.

This tag supports the same `show-command` and `output` attributes as the `<action>` tag.

The following example shows how to create two actions to invoke the `help` interactive command and to open the file ‘`main.c`’.

```
<?xml version="1.0" ?>
<help>
  <action name="help">
    <shell>help</shell>
  </action>
  <action name="edit">
    <shell>edit main.c</shell>
  </action>
</help>
```

By default, commands are expected to be written in the GPS shell language. However, you can specify the language through the `lang` attribute. Its default value is `"shell"`.

The value of this attribute could also be "python".

When programming with the GPS shell, you can execute multiple commands by separating them with semicolons. Therefore, the following example adds a menu which lists all the files used by the current file, in a project browser.

```
<?xml version="1.0" ?>
<current_file_uses>
  <action name="current file uses">
    <shell lang="shell">File %f</shell>
    <shell lang="shell">File.uses %1</shell>
  </action>
</current_file_uses>
```

`<description>`
: This tag contains a description for the command, which is used in the graphical editor for the key manager. See Section 16.3 [The Key Manager Dialog], page 184.

`<filter>`, `<filter_and>`, `<filter_or>`
: This is the context in which the action can be executed, See Section 16.5.4 [Filtering actions], page 200.

It is possible to mix both shell commands and external commands. For instance, the following command opens an xterm (on Unix systems only) in the current directory, which depends on the context.

```
<?xml version="1.0" ?>
<xterm_directory>
  <action "xterm in current directory">
    <shell lang="shell">cd %d</shell>
    <external>xterm</external>
  </action>
</xterm_directory>
```

As seen in some of the examples above, some special strings are expanded by GPS just prior to executing the command. These are the "%f", "%d",.. See below for a full list.

More information on chaining commands is provided in See Section 16.6.4.1 [Chaining commands], page 248.

Some actions are also predefined in GPS itself. This include for instance aliases expansion, manipulating MDI windows, . . . ; All known actions (predefined and the ones you have defined in your own customization files) can be discovered by opening the key shortcut editor (`Edit->Key shortcuts` menu).

16.5.3 Macro arguments

When an action is defined, you can use macro arguments to pass to your shell or external commands. Macro arguments are special parameters that are transformed every time the command is executed. The following macro arguments are provided.

The equivalent python command is given for all tests. These commands are useful when you are writing a full python script, and want to test for yourself whether the context is properly defined.

`%f` Base name of the currently selected file. Python equivalent:

```
import os.path
os.path.basename (GPS.current_context().file().name())
```

`%F` Absolute name of the currently opened file. Python equivalent:

```
GPS.current_context().file().name()
```

`%fk` Krunched base name of the currently selected file. This is the same as %f, except that long names are shortened, and their middle letters are replaced by "[...]". This should be used in particular in menu labels, to keep the menus narrow.

`%e` Name of the entity the user clicked on. Python equivalent:

```
GPS.current_context().entity().name()
```

`%ek` Krunched name of the entity the user clicked on. This is the same as `%e`, except long names are shorted as in `%fk`.

`%d` The current directory. Python equivalent:

```
GPS.current_context().directory()
```

`%dk` The krunched name of the current directory.

`%l` This is the line number on which the user clicked. Python equivalent:

```
GPS.current_context().line()
```

`%c` This is the column number on which the user clicked. Python equivalent:

```
GPS.current_context().column()
```

`%a` If the user clicked within the Locations Window, this is the name of the category to which the current line belongs

`%i` If the user clicked within the Project View, this is the name of the parent project, ie the one that is importing the one the user clicked on. Note that with this definition of parent project, a given project might have multiple parents. The one that is returned is read from the Project View itself.

`%s` This is the text selected by the user, if a single line was selected. When multiple lines were selected, this returns the empty string

`%p` The current project. This is the name of the project, not the project file, ie the '`.gpr`' extension is not included in this name, and the casing is the one found inside the project file, not the one of the file name itself. If the current context is an editor, this is the name of the project to which the source file belongs. Python equivalent:

```
GPS.current_context().project().name()
```

`%P` The root project. This is the name of the project, not the project file. Python equivalent:

```
GPS.Project.root().name()
```

`%pp` The current project file pathname. If a file is selected, this is the project file to which the source file belongs. Python equivalent:

```
GPS.current_context().project().file().name()
```

`%PP` The root project pathname. Python equivalent:

```
GPS.Project.root().file().name()
```

`%pps` This is similar to `%pp`, except it returns the project name prepended with `-P`, or an empty string if there is no project file selected and the current source file doesn't belong to any project. This is mostly for use with the GNAT command line tools. The project name is quoted if it contains spaces. Python equivalent:

```
if GPS.current_context().project():
   return "-P" & GPS.current_context().project().file().name()
```

`%PPs` This is similar to `%PP`, except it returns the project name prepended with `-P`, or an empty string if the root project is the default project. This is mostly for use with the GNAT command line tools.

`%(p|P)[r](d|s)[f]`
Substituted by the list of sources or directories of a given project. This list is a list of space-separated, quoted names (all names are surrounded by double quotes, for proper handling of spaces in directories or file names).

`P` the root project.

`p` the selected project, or the root project if there is no project selected.

`r` recurse through the projects: sub projects will be listed as well as their sub projects, etc...

`d` list the source directories.
Python equivalent:

```
GPS.current_context().project().source_dirs()
```

`s` list the source files.
Python equivalent:

```
GPS.current_context().project().sources()
```

`f` output the list into a file and substitute the parameter with the name of that file. This file is never deleted by GPS, it is your responsibility to do so.

Examples:

`%Ps` Replaced by a list of source files in the root project.

`%prs` Replaced by a list of files in the current project, and all imported sub projects, recursively.

`%prdf` Replaced by the name of a file that contains a list of source directories in the current project, and all imported sub projects, recursively.

`%%` Replaced by the % sign.

Another type of macros are expanded before commands are executed: These all start with the `$` character, and represent parameters passed to the action by its caller. Depending on the context, GPS will give zero, one or more arguments to the action. This is in particular used when you define your own VCS system. See also the shell function `execute_action`, which you can use yourself to execute an action and pass it some arguments.

These arguments are the following

`$1, $2, ... $n`
Where n is a number. These are each argument passed to the action

`$1-, $2-, ... $n-`
This represents a string concatenating the specified argument and all arguments after it

`$*` This represents a string concatenating all arguments passed to the action

`$repeat` This is the number of times the action has been repeated in a row. It will in general be 1 (ie this is the first execution of the action), unless the user has first executed the action `"Repeat Next"`, which allows automatic repetition of an action.

By default, when the action "Repeat Next" is invoked by the user, it will repeat the following action as many times as the user specified. However, in some cases, either for efficiency reasons or simply for technical reasons, you might want to handle yourself the repear. This can be done with the following action declaration:

```
<action name="my_action">
   <shell lang="python">if $repeat==1: my_function($remaining + 1)</shell>
</action>
```

```
def my_function (count):
   """Perform an action count times"""
   ...
```

Basically, the technics here is to only perform something the first time the action is called (hence the if statement), but pass your shell function the number of times that it should repeat (hence the `$remaining` parameter).

`$remaining`
: This is similar to $repeat, and indicates the number of times that the action remains to be executed. This will generally be 0, unless the user has chosen to automatically repeat the action a number of times.

16.5.4 Filtering actions

By default, an action will execute in any context in GPS. The user just selects the menu or key, and GPS tries to execute the action.

It is possible to restrict when an action should be considered as valid. If the current context is incorrect for the action, GPS will not attempt to run anything, and will display an error message for the user.

Actions can be restricted in several ways:

1. Using macro arguments (see Section 16.5.3 [Macro arguments], page 196). If you are using one of the macro arguments defined in the previous section, anywhere in the chain of commands for that action, GPS will first check that the information is available, and if not will not start running any of the shell commands or external commands for that action.

   For instance, if you have specified `%F` as a parameter to one of the commands, GPS will check prior to running the action that there is a current file. This can be either a currently selected file editor, or for instance that the project view is selected, and a file node inside it is also selected.

   You do not have to specify anything else, this filtering is automatic

   Note however that the current context might contain more information than you expect. For instance, if you click on a file name in the Project View, then the current context contains a file (thus satisfies `%F`), but also contains a project (and thus satisfies `%p` and similar macros).
2. Defining explicit filters Explicit restrictions can be specified in the customization files. These are specified through the `<filter>`, `<filter_and>` and `<filter_or>` tags, see below.

   These tags can be used to further restrict when the command is valid. For instance, you can use them to specify that the command only applies to Ada files, or only if a source editor is currently selected.

16.5.4.1 The filters tags

Such filters can be defined in one of two places in the customization files:

1. At the toplevel. At the same level as other tags such as `<action>`, `<menu>` or `<button>` tags, you can define named filters. These are general filters, that can be referenced elsewhere without requiring code duplication.
2. As a child of the `<action>` tag. Such filters are anonymous, although they provide exactly the same capabilities as the ones above. These are mostly meant for simple filters, or filters that you use only once.

There are three different kinds of tags:

`<filter>` This defines a simple filter. This tag takes no child tag.

`<filter_and>`
: All the children of this tag are composed together to form a compound filter. They are evaluated in turn, and as soon as one of them fails, the whole filter fails. Children of this tag can be of type `<filter>`, `<filter_and>` and `<filter_or>`.

`<filter_or>`
: All the children of this tag are composed together to form a compound filter. They are evaluated in turn, and as soon as one of them succeeds, the whole filter succeeds. Children of this tag can be of type `<filter>`, `<filter_and>` and `<filter_or>`.

If several such tags are found following one another under an `<action>` tag, they are combined through `"or"`, i.e. any of the filters may match for the action to be executed.

The `<filter>`, `<filter_and>` and `<filter_or>` tags accept the following set of common attributes:

`name (optional)`
: This attribute is used to create named filters, that can be reused elsewhere in actions or compound filters through the `id` attribute. The name can take any form.

`error (optional)`
: This is the error message printed in the GPS console if the filter doesn't match, and thus the action cannot be executed. If you are composing filters through `<filter_and>` and `<filter_or>`, only the error message of the top-level filter will be printed.

In addition, the `<filter>` has the following specific attributes:

`id (optional)`
: If this attribute is specified, all other attributes are ignored. This is used to reference a named filter previously defined. Here is for instance how you can make an action depend on a named filter:

```
<?xml version="1.0" ?>
<test_filter>
  <filter name="Test filter" language="ada" />
  <action name="Test action" >
     <filter id="Test filter" />
     <shell>pwd</shell>
  </action>
</test_filter>
```

A number of filters are predefined by GPS itself.

`Source editor`
: This filter will only match if the currently selected window in GPS is an editor.

`Explorer_Project_Node`
: Matches when clicking on a project node in the Project View

`Explorer_Directory_Node`
: Matches when clicking on a directory node in the Project View

`Explorer_File_Node`
: Matches when clicking on a file node in the Project View

`Explorer_Entity_Node`
: Matches when clicking on an entity node in the Project View

`language (optional)`
: This attribute specifies the name of the language that must be associated with the current file to match. For instance, if you specify `ada`, you must have an Ada file selected, or the action won't execute. The language for a file is found by GPS following several algorithms (file extensions, and via the naming scheme defined in the project files).

`shell_cmd (optional)`
: This attribute specifies a shell command to execute. The output value of this command is used to find whether the filter matches: if it returns `"1"` or `"true"`, the filter matches. In any other case, the filter fails.

  Macro arguments (%f, %p, . . .) are fully supported in the text of the command to execute.

`shell_lang (optional)`
: This attribute specifies in which language the shell command above is written. Its default value indicates that the command is written using the GPS shell.

`module (optional)`

This attribute specifies that the filter only matches if the current window was setup by this specific GPS module. For instance, if you specify "Source_Editor", this filter will only match when the active window is a source editor.

The list of module names can be obtained by typing `lsmod` in the shell console at the bottom of the GPS window.

This attribute is mostly useful when creating new contextual menus.

When several attributes are specified for a `<filter>` node (which is not possible with `id`), they must all match for the action to be executed.

```
<?xml version="1.0" ?>
<!-- The following filter will only match if the currently selected
     window is a text editor editing an Ada source file -->
<ada_editor>
  <filter_and name="Source editor in Ada" >
    <filter language="ada" />
    <filter id="Source editor" />
  </filter_and>

  <!-- The following action will only be executed for such an editor -->

  <action name="Test Ada action" >
     <filter id="Source editor in Ada" />
     <shell>pwd</shell>
  </action>

  <!--  An action with an anonymous filter. It will be executed if the
        selected file is in Ada, even if the file was selected through
        the project view  -->

  <action name="Test for Ada files" >
      <filter language="ada" />
      <shell>pwd</shell>
  </action>
</ada_editor>
```

16.5.5 Adding new menus

These commands can be associated with menus, tool bar buttons and keys. All of these use similar syntax.

Binding a menu to an action is done through the `<menu>` and `<submenu>` tags.

The `<menu>` tag takes the following attributes:

`action (mandatory)`

This attribute specifies which action to execute when the menu is selected by the user. If no action by this name was defined, no new menu is added. The action name can start with a '/', in which case it represents the absolute path to a menu to execute instead.

This attribute can be omitted only when no title is specified for the menu to make it a separator (see below).

If a filter is associated with the action through the `<filter>` tag, then the menu will be greyed out when the filter doesn't match. As a result, users will not be able to click on it.

`before (optional)`
: It specifies the name of another menu item before which the new menu should be inserted. The reference menu must have been created before, otherwise the new menu is inserted at the end. This attribute can be used to control where precisely the new menu should be made visible.

`after (optional)`
: This attribute is similar to `before`, but has a lower priority. If it is specified, and there is no `before` attribute, it specifies a reference menu after which the new menu should be inserted.

It should also have one XML child called `<title>` which specifies the label of the menu. This is really a path to a menu, and thus you can define submenus by specifying something like "/Parent1/Parent2/Menu" in the title to automatically create the parent menus if they don't exist yet.

You can define the accelerator keys for your menus, using underscores in the titles. Thus, if you want an accelerator on the first letter in a menu named `File`, set its title as `_File`.

The tag `<submenu>` accepts the following attributes:

`before (optional)`
: See description above, same as for `<menu>`

`after (optional)`
: See description above, same as for `<menu>`

It accepts several children, among `<title>` (which must be specified at most once), `<submenu>` (for nested menus), and `<menu>`.

Since `<submenu>` doesn't accept the `action` attribute, you should use `<menu>` for clickable items that should result in an action, and `<submenu>` if you want to define several menus with the same path.

You can specify which menu the new item is added to in one of two ways:

- Specify a path in the `title` attribute of `<menu>`
- Put the `<menu>` as a child of a `<submenu>` node This requires slightly more typing, but it allows you to specify the exact location, at each level, of the parent menu (before or after an existing menu).

For example, this adds an item named `mymenu` to the standard `Edit` menu.

```
<?xml version="1.0" ?>
<test>
  <submenu>
    <title>Edit</title>
    <menu action="current file uses">
       <title>mymenu</title>
    </menu>
  </submenu>
</test>
```

The following has exactly the same effect:

```
<?xml version="1.0" ?>
<test>
  <menu action="current file uses">
    <title>Edit/mymenu</title>
  </menu>
</test>
```

The following adds a new item "stats" to the "unit testing" submenu in "my_tools".

```
<?xml version="1.0" ?>
<test>
  <menu action="execute my stats">
     <title>/My_Tools/unit testing/stats</title>
  </menu>
</test>
```

The previous syntax is shorter, but less flexible than the following, where we also force the My_Tools menu, if it doesn't exist yet, to appear after the File menu. This is not doable by using only `<menu>` tags. We also insert several items in that new menu

```
<?xml version="1.0" ?>
<test>
  <submenu after="File">
    <title>My_Tools</title>
    <menu action="execute my stats">
       <title>unit testing/stats</title>
    </menu>
    <menu action="execute my stats2">
       <title>unit testing/stats2</title>
    </menu>
  </submenu>
</test>
```

Adding an item with an empty title or no title at all inserts a menu separator. For instance, the following example will insert a separator followed by a File/Custom menu:

```
<?xml version="1.0" ?>
<menus>
```

```
      <action name="execute my stats" />
      <submenu>
         <title>File</title>
         <menu><title/></menu>
         <menu action="execute my stats">
             <title>Custom</title>
         </menu>
      </submenu>
    </menus>
```

16.5.6 Adding contextual menus

The actions can also be used to contribute new entries in the contextual menus everywhere in GPS. These menus are displayed when the user presses the right mouse button, and should only show actions relevant to the current context.

Such contributions are done through the `<contextual>` tag, which takes the following attributes:

`"action" (mandatory)`
: Name of the action to execute, and must be defined elsewhere in one of the customization files.

  If this attribute is set to an empty string, a separator will be inserted in the contextual menu instead. If you specify a reference item with one of the "before" or "after" attribute, the separator will be visible only when the reference item is visible.

`"before" (optional, default="")`
: If it is specified, this attribute should be the name of another contextual, before which the new menu should appear. The name of predefined contextual menus can be found by looking at the output of "Contextual.list" in the shell console. The name of the contextual menus you define yourself is the value of the `<title>` child.

  There is no guarantee that the new menu will appear just before the referenced menu. In particular, it won't be the case if the new menu is created before the reference menu was created, or if another later contextual menu indicates that it must be displayed before the same reference item.

`"after" (optional, default="")`
: Same as "before", except it indicates the new menu should appear after the reference item.

  If both "after" and "before" are specified, only the latter is taken into account.

It accepts one child tag, `<Title>` which specifies the name of the menu entry. If this child is not specified, the menu entry will use the name of the action itself. The title is in fact the full path to the new menu entry. Therefore, you can create submenus by using a title of the form "Parent1/Parent2/Menu".

Special characters can be used in the title, and will be automatically expended based on the current context. These are exactly the ones described in the section for macros arguments, See Section 16.5.3 [Macro arguments], page 196.

The new contextual menu will only be shown if the filters associated with the action match the current context.

For instance, the following example inserts a new contextual menu which prints the name of the current file in the GPS console. This contextual menu is only displayed in source editors. This contextual menu entry is followed by a separator line, visible when the menu is visible

```
<?xml version="1.0" ?>
<print>
  <action name="print current file name" >
    <filter module="Source_Editor" />
    <shell>echo %f</shell>
  </action>

  <contextual action="print current file name" >
    <Title>Print Current File Name</Title>
  </contextual>
  <contextual action="" after="Print Current File Name" />
</print>
```

16.5.7 Adding tool bar buttons

As an alternative to creating new menu items, you can create new buttons on the tool bar, with a similar syntax, by using the `<button>` tag. As for the `<menu>` tag, it requires an `action` attribute which specifies what should be done when the button is pressed. The button is not created if no such action was created.

Within this tag, the tag `<pixmap>` can be used to indicate the location of an image file (of the type `jpeg`, `png`, `gif` or `xpm`) to be used as icon for the button. An empty `<button>` tag indicates a separator in the tool bar.

A title can also be specified with `<title>`. This will be visible only if the user choses to see both text and icons (or text only) in the tool bar. This title also acts as a tooltip (popup help message) when the button is displayed as an icon only.

The following example defines a new button:

```
<?xml version="1.0" ?>
<stats>
  <button action="execute my stats">
    <title>stats</title>
    <pixmap>/my_pixmaps/button.jpg</pixmap>
  </button>
  </stats>
```

The `<button>` tag allows you to create a simple button that the user can press to start an action. GPS also supports another type of button, a combo box, from which the user can choose among a list of choices. Such a combo box can be created with the `<entry>` tag.

This tag accepts the following arguments:

`id (mandatory)`
: This should be a unique id for this combo box, and will be used later on to refer it, in particular from the scripting languages. It can be any string

`label (default is "")`
: The text of a label to display on the left of the combo box. If this isn't specified, no text will be displayed

`on-changed (default is "")`
: The name of a GPS action to execute whenever the user selects a new value in the combo box. This action is called with two parameters, the unique id of the combo box and the newly selected text respectively.

It also accepts any number of `<choice>` tags, each of which defines one of the values the user can choose from. These tags accepts one optional attribute, "on-selected", which is the name of a GPS action to call when that particular value is selected.

```
<action name="animal_changed">
   <shell>echo A new animal was selected in combo $1: animal is $2</shell>
</action>
<action name="gnu-selected">
   <shell>echo Congratulations on choosing a Gnu</shell>
</action>
<entry id="foo" label="Animal" on-changed="animal_changed">
   <choice>Elephant</choice>
   <choice on-selected="gnu-selected">Gnu</choice>
</entry>
```

A more convenient interface exists for Python, the GPS.Toolbar class, which gives you the same flexibility as above, but also gives you dynamic control over the entry. See the python documentation.

16.5.8 Binding actions to keys

All the actions defined above can be bound to specific key shortcuts through the `<key>` attribute. As usual, it requires one `<action>` attribute to specify what to do when the key is pressed. The name of the action can start with a '/' to indicate that a menu should be executed instead of a user-defined action.

If the action is the empty string, then instead the key will no longer be bound to any action.

This tag doesn't contain any child tag. Instead, its text contents specified the keyboard shortcut. The name of the key can be prefixed by `control-`, `alt-`, `shift-` or any combination of these to specify the key modifiers to apply.

You can also define multiple key bindings similar to Emacs's by separating them by a space. For instance, `control-x control-k` means that the user should press ⟨control-x⟩, followed by a ⟨control-k⟩ to activate the corresponding action. This is only possible if the prefix key is not already bound to an action. If it is, you should first unbound it by passing an empty action to `<key>`.

Use an empty string to describe the key binding if you wish to deactivate a preexisting binding. The second example below deactivates the standard binding.

```
<?xml version="1.0" ?>
<keys>
  <key action="expand alias">control-o</key>
  <key action="Jump to matching delimiter" />

  <!--  Bind a key to a menu -->
  <key action="/Window/Close">control-x control-w</key>
</key>
```

Multiple actions can be bound to the same key binding. They will all be executed in turn, followed by any menu for which this key is an accelerator.

When GPS processes a `<key>` tag, it does the following:

- Removes all actions bound to that key. This ensures that if you press the key, any action associated with it by default in GPS or in some other XML file will no longer be executed, and only the last one will be executed.
- Adds the new key to the list of shortcuts that can execute the action. Any existing shortcut on the action is preserved, and therefore there are multiple possible shortcuts for this action.

16.5.9 Preferences support in custom files

16.5.9.1 Creating new preferences

GPS has a number of predefined preferences to configure its behavior and its appearance. They are all customizable through the Edit->Preferences menu.

However, you might wish to add your own kind of preferences for your extension modules. This can easily be done through the usual GPS customization files. Preferences are different from project attributes (see Section 16.5.15 [Defining project attributes], page 222), in that the latter will vary depending on which project is loaded by the user, whereas preferences are always set to the same value no matter what project is loaded.

Such preferences are created with the `<preference>` tag, which takes a number of attributes.

`name (mandatory)`
: This is the name of the preference, used when the preference is saved by GPS in the '`$HOME/.gps/preferences`' file, and to query the value of a preference interactively through the `GPS.Preference` class in the GPS shell or python. There are a few limitation to the form of these names: they cannot contain space or underscore characters. You should replace the latter with minus signs for instance.

`page (optional, default is "General")`
: The name of the page in the preferences editor where the preference can be edited. If this is the name of a non-existing page, GPS will automatically create it. If this is the empty string (`""`), the preference will not be editable interactively. This could be used to save a value from one session of GPS to the next, without allowing the user to alter it.

  Subpages are references by separating pages name with colons (':').

`default (optional, default depends on the type of the preference)`
: The default value of the preference, when not set by the user. This is 0 for integer preferences, the empty string for string preferences, True for boolean values, and the first possible choice for choice preferences.

`tip (optional, default is "")`
: This is the text of the tooltip that appears in the preferences editor dialog.

`label (mandatory)`
: This is the name of the preference as it appears in the preferences editor dialog

`type (mandatory)`
: This is the type of the preference, and should be one of:

  - `"boolean"`

    The preference can be True or False.
  - `"integer"`

    The preference is an integer. Two optional attributes can be specified for `<preference>`, `"minimum"` and `"maximum"`, which define the range of valid values for that integer. Default values are 0 and 10 respectively.
  - `"string"`

    The preference is a string, which might contain any value

- "color"

  The preference is a color name, in the format of a named color such as "yellow", or a string similar to "#RRGGBB", where RR is the red component, GG is the green component, and BB is the blue component
- "font"

  The preference is a font
- "choices"

  The preference is a string, whose value is chosen among a static list of possible values. Each possible value is defined in a `<choice>` child of the `<preference>` node.

Here is an example that defines a few new preferences:

```
<?xml version="1.0"?>
<custom>
   <preference name="my-int"
               page="Editor"
               label="My Integer"
               default="30"
               minimum="20"
               maximum="35"
               page="Manu"
               type="integer" />

   <preference name="my-enum"
               page="Editor:Fonts &amp; Colors"
               label="My Enum"
               default="1"
               type="choices" >
     <choice>Choice1</choice>
     <choice>Choice2</choice>  <!--  The default choice -->
     <choice>Choice3</choice>
   </preference>
</custom>
```

The values of the above preferences can be queries in the scripting languages:

- GPS shell

  ```
  Preference "my-enum"
  Preference.get %1
  ```
- Python

  ```
  val = GPS.Preference ("my-enum").get ()
  val2 = GPS.Preference ("my-int").get ()
  ```

16.5.9.2 Setting preferences values

You can force specific default values for the preferences in the customization files through the `<pref>` tag. This is the same tag that is used by GPS itself when it saves the preferences edited through the preferences dialog.

This tag requires on attribute:

`name` This is the name of the preference of which you are setting a default value. Such names are predefined when the preference is registered in GPS, and can be found by looking at the '`$HOME/.gps/preferences`' file for each user, or by looking at one of the predefined GPS themes.

It accepts no child tag, but the value of the `<pref>` tag defines the default value of the preference, which will be used unless the user has overridden it in his own preferences file.

Any setting that you have defined in the customization files will be overridden by the user's preferences file itself, unless the user was still using the default value of that preference.

This `<pref>` tag is mostly intended for use through the themes (see Section 16.5.10 [Creating themes], page 212).

16.5.10 Creating themes

In addition to the predefined themes that come with GPS, you can create your own themes and share them between users. You can then selectively chose which themes they want to activate through the preferences dialog (see Section 16.2 [GPS Themes], page 184).

Creating new themes is done in the customization files through the `<theme>` tag.

This tag accepts a number of attributes:

`name (mandatory)`
: This is the name of the theme, as it will appear in the preferences dialog

`description (optional)`
: This text should explain what the text does. It appears in the preferences dialog when the user selects that theme.

`category (optional, default is General)`
: This is the name of the category in which the theme should be presented in the preferences dialog. Categories are currently only used to organize themes graphically. New categories are created automatically if you chose one that doesn't exist yet.

This tag accepts any other customization tag that can be put in the customization files. This includes setting preferences (`<pref>`, defining key bindings (`<key>`), defining menus (`<menu>`), . . .

If the same theme is defined in multiple locations (multiple times in the same customization file or in different files), their effects will be cumulated. The first definition of the theme seen by GPS will set the description and category for this theme.

All the children tags of the theme will be executed when the theme is activated through the preferences dialog. Although there is no strict ordering in which order the children will be executed, the global order is the same as for the customization files themselves: first the predefined themes of GPS, then the ones defined in customization files found through the `GPS_CUSTOM_PATH` directories, and finally the ones defined in files found in the user's own GPS directory.

```
<?xml version="1.0" ?>
<my-plug-in>
   <theme name="my theme" description="Create a new menu">
      <menu action="my action"><title>/Edit/My Theme Menu</title></menu>
   </theme>
</my-plug-in>
```

16.5.11 Defining new search patterns

The search dialog contains a number of predefined search patterns for Ada, C and C++. These are generally complex regular expressions, presented in the dialog with a more descriptive name. This includes for instance "Ada assignment", which will match all such assignments.

You can define your own search patterns in the customization files. This is done through the `<vsearch-pattern>` tag. This tag can have a number of children tags:

`<name>`

This tag is the string that is displayed in the search dialog to represent the new pattern. This is the text that the user will effectively see, instead of the often hard to understand regular expression.

`<regexp>`

This tag provides the regular expression to use when the pattern has been selected by the user. Be careful that you must protect reserved XML characters such as '<' and replace them by their equivalent expansion ("&lt;" for this character).

This accepts one optional attribute, named `case-sensitive`. This attribute accepts one of two possible values ("true" or "false") which indicates whether the search should distinguish lower case and upper case letters. Its default value is "false".

`<string>`
: This tag provides a constant string that should be searched. Only one of `<regexp>` and `<string>` should be provided. If both exists, the first `<regexp>` child found is used. If there is none, the first `<string>` child is used.

  The tag accepts the same optional attribute `case-sensitive` as above

Here is a small example on how the "Ada assignment" pattern was defined.

```
<?xml version="1.0" ?>
<search>
  <vsearch-pattern>
    <name>Ada: assignment</name>
    <regexp case-sensitive="false">\b(\w+)\s*:=</regexp>
  </vsearch-pattern>
</search>
```

16.5.12 Adding support for new languages

You can define new languages in a custom file by using the `Language` tag. Defining languages gives GPS the ability to highlight the syntax of a file, explore a file (using e.g. the project view), find files associated with a given language, ...

As described previously for menu items, any file in the 'plug-ins' directory will be loaded by GPS at start up. Therefore, you can either define new languages in a separate file, or reuse a file where you already define actions and menus.

The following tags are available in a `Language` section:

`Name`
: A short string describing the name of the language.

`Parent`
: If set to the name of an existing language (e.g. `Ada`, `C++`) or another custom language, this language will inherit by default all its properties from this language. Any field explicitly defined for this language will override the inherited settings.

`Spec_Suffix`
: A string describing the suffix of spec/definition files for this language. If the language does not have the notion of spec or definition file, you can ignore this value, and consider using the `Extension` tag instead. This tag must be unique.

`Body_Suffix`
: A string describing the suffix of body/implementation files for this language. This tag works in coordination with the `Spec_Suffix`, so that the user can choose to easily go from one file to the other. This tag must be unique.

`Extension`
: A string describing one of the valid extensions for this language. There can be several such children. The extension must start with a '.' character

`Keywords`
: A V7 style regular expression for recognizing and highlighting keywords. Multiple `Keywords` tags can be specified, and will be concatenated into a single regular expression. If the regular expression needs to match characters other than letters and underscore, you must also edit the `Wordchars` node. If a parent language has been specified for the current language definition it is possible to append to the parent Keywords by setting the `mode` attribute to `append`, the default value is `override` meaning that the keywords definition will replace the parent's one.

  The full grammar of the regular expression can be found in the spec of the file '`g-regpat.ads`' in the GNAT run time.

`Wordchars`
: Most languages have keywords that only contain letters, digits and underscore characters. However, if you want to also include other special characters (for instance '<' and '>' in XML), you need to use this tag to let GPS know. The value of this node is a string made of all the special word characters. You do not need to include letters, digits or underscores.

`Engine`
: The name of a dynamic library providing one or several of the functions described below.

  The name can be a full pathname, or a short name. E.g. under most Unix systems if you specify `custom`, GPS will look for `libcustom.so` in the `LD_LIBRARY_PATH` run time search path. You can also specify explicitly e.g. `libcustom.so` or `/usr/lib/libcustom.so`.

  For each of the following five items, GPS will look for the corresponding symbol in `Engine` and if found, will call this symbol when needed. Otherwise, it will default to the static behavior, as defined by the other language-related items describing a language.

  You will find the required specification for the C and Ada languages to implement the following functions in the directory '`<prefix>/share/examples/gps/language`' of your GPS installation. ‘`language_custom.ads`’ is the Ada spec file; ‘`language_custom.h`’ is the C spec file; ‘`gpr_custom.ad?`’ are example files showing a possible Ada implementation of the function `Comment_Line` for the GPS project files (‘`.gpr`’ files), or any other Ada-like language; ‘`gprcustom.c`’ is the C version of gpr_custom.adb.

`Comment_Line`
: Name of a symbol in the specified shared library corresponding to a function that will comment or uncomment a line (used to implement the menu `Edit->Un/Comment Lines`).

`Parse_Constructs`
: Name of a symbol in the specified shared library corresponding to a function that will parse constructs of a given buffer.

  This procedure is used by GPS to implement several capabilities such as listing constructs in the project view, highlighting the current block of code, going to the next or previous procedure, . . .

`Format_Buffer`
: Name of a symbol in the specified shared library corresponding to a function that will indent and format a given buffer.

  This procedure is used to implement the auto indentation when hitting the ⟨enter⟩ key, or when using the format key on the current selection or the current line.

`Parse_Entities`
: Name of a symbol in the specified shared library corresponding to a function that will parse entities (e.g. comments, keywords, . . .) of a given buffer. This procedure is used to highlight the syntax of a file, and overrides the `Context` node described below.

`Context` Describes the context used to highlight the syntax of a file.

  `Comment_Start`
  : A string defining the beginning of a multiple-line comment.

  `Comment_End`
  : A string defining the end of a multiple-line comment.

  `New_Line_Comment_Start`
  : A regular expression defining the beginning of a single line comment (ended at the next end of line). This regular expression may contain multiple possible line starts, such as `;|#` for comments starting after a semicolon or

after the hash sign. If a parent language has been specified for the current language definition it is possible to append to the parent New_Line_Comment_Start by setting the `mode` attribute to `append`, the default value is `override` meaning that the New_Line_Comment_Start definition will replace the parent's one.

`String_Delimiter`
: A character defining the string delimiter.

`Quote_Character`
: A character defining the quote character, used for e.g. canceling the meaning of a string delimiter (\ in C).

`Constant_Character`
: A character defining the beginning of a character literal.

`Can_Indent`
: A boolean indicating whether indentation should be enabled for this language. The indentation mechanism used will be the same for all languages: the number of spaces at the beginning of the current line is used when indenting the next line.

`Syntax_Highlighting`
: A boolean indicating whether the syntax should be highlighted/colorized.

`Case_Sensitive`
: A boolean indicating whether the language (and in particular the identifiers and keywords) is case sensitive.

`Categories`
: Optional node to describe the categories supported by the project view for the current language. This node contains a list of `Category` nodes, each describing the characteristics of a given category, with the following nodes:

  `Name`
  : Name of the category, which can be either one of the following predefined categories: package, namespace, procedure, function, task, method, constructor, destructor, protected, entry, class, structure, union, type, subtype, variable, local_variable, representation_clause, with, use, include, loop_statement, case_statement, if_statement, select_statement, accept_statement, declare_block, simple_block, exception_handler, or any arbitrary name, which will create a new category.

`Pattern` Regular expression used to detect a language category. As for the `Keywords` node, multiple `Pattern` tags can be specified and will be concatenated into a single regular expression.

`Index` Index in the pattern used to extract the name of the entity contained in this category.

`End_Index`
Optional attribute that indicates the index in the pattern used to start the next search. Default value is the end of the pattern.

`Icon` Name of a stock icon that should be used for that category (see Section 16.5.18 [Adding stock icons], page 233). This attribute is currently ignored, and is reserved for future uses.

Here is an example of a possible language definition for the GPS project files:

```
<?xml version="1.0"?>
<Custom>
  <Language>
    <Name>Project File</Name>
    <Spec_Suffix>.gpr</Spec_Suffix>
    <Keywords>^(case|e(nd|xte(nds|rnal))|for|is|</Keywords>
    <Keywords>limited|null|others|</Keywords>
    <Keywords>p(ackage|roject)|renames|type|use|w(hen|ith))\b</Keywords>

    <Context>
      <New_Line_Comment_Start>--</New_Line_Comment_Start>
      <String_Delimiter>&quot;</String_Delimiter>
      <Constant_Character>&apos;</Constant_Character>
      <Can_Indent>True</Can_Indent>
      <Syntax_Highlighting>True</Syntax_Highlighting>
      <Case_Sensitive>False</Case_Sensitive>
    </Context>

    <Categories>
      <Category>
        <Name>package</Name>
        <Pattern>^[ \t]*package[ \t]+((\w|\.)+)</Pattern>
        <Index>1</Index>
      </Category>
      <Category>
        <Name>type</Name>
        <Pattern>^[ \t]*type[ \t]+(\w+)</Pattern>
        <Index>1</Index>
      </Category>
    </Categories>
```

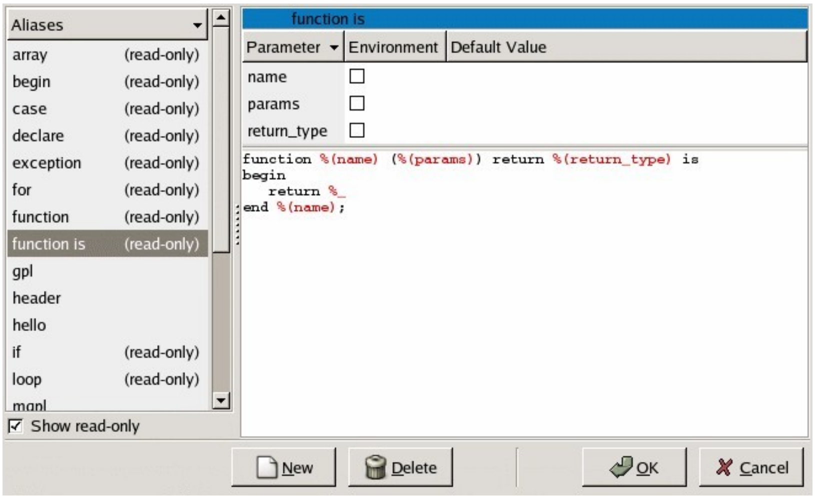
```
      <Engine>gpr</Engine>
      <Comment_Line>gpr_comment_line</Comment_Line>
    </Language>
  </Custom>
```

16.5.13 Defining text aliases

GPS provides a mechanism known as **aliases**. These are defined through the menu `Edit->Aliases`.

Each alias has a name, which is generally a short string of characters. When you type them in any textual entry in GPS (generally a source editor, but also entry fields for instance in the file selector), and then press the special activation key (by default ⟨control-o⟩, controlled by a preference), this name is removed from the source editor, and replaced by the text you have associated with it.

Alias names may be composed of any character except newlines, but must start with a letter. GPS will jump to the start of each word before the current cursor position, and if the characters between this word start and the cursor position is an alias name (the comparison is case insensitive), this alias is expanded.



Aliases	
array	(read-only)
begin	(read-only)
case	(read-only)
declare	(read-only)
exception	(read-only)
for	(read-only)
function	(read-only)
function is	(read-only)
gpl	
header	
hello	
if	(read-only)
loop	(read-only)
manl	

☑ Show read-only

function is

Parameter	Environment	Default Value
name	☐	
params	☐	
return_type	☐	

```
function %(name) (%(params)) return %(return_type) is
begin
   return %_
end %(name);
```

The alias editor is divided into three main parts: on the left side, the list of currently defined aliases is shown. Clicking on any of them will display the replacement text for this alias. If you click again the selected alias, GPS displays a text entry which you can use to rename an existing alias. Alias names must start with a letter. A check button at the bottom selects whether the read-only aliases (i.e. system-wide aliases) should be displayed.

The second part is the expansion text for the alias, at the bottom right corner. This replacement text can used multiple lines, and contain some special text that act as a special replacement. These special texts are highlighted in a different color. You can insert these special entities either by typing them, or by right-clicking in the editor, and select the entity in the contextual menu.

The following special entities are currently defined:

`%_`
: This is the position where the cursor should be put once the replacement text has been inserted in the editor.

`%(name)`
: This is the name of a parameter. *name* can be any string you want, excluding closing parenthesis. See below for more information on parameters.

`%D`
: This is the current date, in ISO format. The year is displayed first, then the month and the day

`%H`
: This is the current time (hour, minutes and seconds)

`%l`
: If the expansion of the alias is done in a source editor, this is the line on which the cursor is when pressing ⟨control-o⟩.

`%c`
: This is similar to *%l*, except it returns the current column.

`%f`
: If the expansion is done in a source editor, this is the name of the current file (its base name only, this doesn't include the directory)

`%d`
: If the expansion is done in a source editor, this is the directory in which the current file is

`%p`
: If the expansion is done in a source editor, this is the base name of the project file to which the file belongs.

`%P`
: If the expansion is done in a source editor, this is the full path name to the project file (directory and base name).

`%O`
: Used for recursive aliases expansion. This special character will expand the text seen before it in the current alias, after replacement of the parameters and possibly other recursive expansions. This is similar to pressing ⟨control-o⟩ (or any key you have defined for alias expansion) in the expanded form of the alias.

`%%`
: Inserts a percent sign as part of the expanded text

: You cannot expand an alias recursively when already expanding that alias. For instance, if the alias expansion for *procedure* contains *procedure%O*, the inner procedure will not be expanded.

The indentation as set in the expansion of the alias is preserved when the alias is expanded. All the lines will be indented the same amount to the right as the alias name. You can override this default behavior by selecting the check button `Indent source editor after expansion`. In this case, GPS will replace the name of the alias by its expansion, and then automatically recompute the position of each line with its internal indentation engine, as if the text had been inserted manually.

The third part of the aliases editor, at the top right corner, lists the parameters for the currently selected alias. Any time you insert a *%(name)* string in the expansion text, GPS automatically detects there is a new parameter reference (or an old reference has changed name or was removed); the list of parameters is automatically updated to show the current list.

Each parameters has three attributes:

name This is the name you use in the expansion text of the alias in the *%(name)* special entity.

Environment
This specifies whether the default value of the parameter comes from the list of environment variables set before GPS was started.

default value
Instead of getting the default value from the environment variable, you can also specify a fixed text. Clicking on the initial value of the currently selected variable opens a text entry which you can use to edit this default value.

When an alias that contains parameters is expanded, GPS will first display a dialog to ask for the value of the parameters. You can interactively enter this value, which replaces all the *%(name)* entities in the expansion text.

16.5.14 Aliases files

The customization files described earlier can also contain aliases definition. This can be used for instance to create project or system wide aliases. All the customization files will be parsed to look for aliases definition.

All these customization files are considered as read-only by GPS, and therefore cannot be edited through the graphical interface. It is possible to override some of the aliases in your own custom files.

There is one specific files, which must contain only aliases definition. This is the file '`$HOME/.gps/aliases`'. Whenever you edit aliases graphically, or create new ones, they are stored in this file, which is the only one that GPS will ever modify automatically.

The system files are loaded first, and aliases defined there can be overridden by the user-defined file.

These files are standard XML customization files. The specific XML tag to use is *<alias>*, one per new alias. The following example contains a standalone customization file, but you might wish to merge the <*alias*> tag in any other customization file.

The following tags are available:

`alias` This indicates the start of a new alias. It has one mandatory attribute, `name`, which the text to type in the source editor before pressing ⟨control-o⟩. It has one optional attribute, `indent`, which, if set to *true*, indicate that GPS should recompute the indentation of the newly inserted paragraph after the expansion.

`param` These are children of the `alias` node. There is one per parameter of the alias. They have one mandatory attribute, `name`, which is the name to type between *%(name)* in the alias expansion text.

They have one optional attribute, `environment`, which indicates the default value must be read from the environment variables if it is set to true.

These tags contain text, which is the default value for the parameter.

`text` This is a child of the `alias` node, whose value is the replacement text for the alias.

Here is an example of an alias file:

```
<?xml version="1.0"?>
<Aliases>
  <alias name="proc" >
    <param name="p" >Proc1</param>
    <param environment="true" name="env" />
    <text>procedure %(p) is
%(env)%_
end %(p);</text>
  </alias>
</Aliases>
```

16.5.15 Defining project attributes

The project files are required by GPS, and are used to store various pieces of information related to the current set of source files. This includes how to find the source files, how the files should be compiled, or manipulated through various tools, ...

However, the default set of attributes that are usable in a project file is limited to the attributes needed by the tool packaged with GPS or GNAT.

If you are delivering your own tools, you might want to store similar information in the project files themselves, since these are a very convenient place to associate some specific settings with a given set of source files.

GPS lets manipulate the contents of projects through XML customization files and script commands. You can therefore add you own typed attributes into the projects, so that they are saved automatically when the user saves the project, and reloaded automatically the next time GPS is started.

16.5.15.1 Declaring the new attributes

New project attributes can be declared in two ways: either using the advanced XML tags below, or using the `<tool>` tag (see Section 16.6.3 [Defining tool switches], page 241).

The customization files support the `<project_attribute>` tag, which is used to declare all the new attributes that GPS should expect in a project. Attributes that have not been declared explictly will not be accessible through the GPS scripting languagues, and will generate warnings in the Messages window.

Project attributes are typed: they can either have a single value, or have a set of such values (a list). The values can in turn be a free-form string, a file name, a directory name, or a value extracted from a list of preset values.

Attributes that have been declared in these customization files will also be graphically editable through the project properties dialog, or the project wizard. Therefore, you should specify when an attribute is defined how it should be presented to the GPS user.

The `<project_attribute>` tag accepts the following attributes:

- `package` (a string, default value: `""`)

  This is the package in the project file in which the attribute is stored. Common practice suggests that one such package should be used for each tool. These packages provide namespaces, so that attributes with the same name, but for different tools, do not conflict with each other.

- `name` (a string, mandatory)

  This is the name of the attribute. This should be a string with no space, and that represents a valid Ada identifier (typically, it should start with a letter and be followed by a set of letters, digits or underscore characters). This is an internal name that is used when saving the attribute in a project file.

- `editor_page` (a string, default value: `"`General`"`)

  This is the name of the page in the Project Properties editor dialog in which the attribute is presented. If no such page already exists, a new one will be created as needed. If the page already exists, the attribute will be appended at its bottom.

- `editor_section` (a string, default value: `""`)

  This is the name of the section, inside editor page, in which the attribute is displayed. These sections are surrounded by frames, the title of which is given by the `editor_section` attribute. If this attribute is not specified, the attribute is put in an untitled section.

- `label` (a string, default value: the name of the attribute)

  If this attribute is set to a value other than the empty string `""`, a textual label is displayed to the left of the attribute in the graphical editor. This should be used to identify the attribute. However, it can be left to the empty string if the attribute is in a named section of its own, since the title of the section might be a good enough indication.
- `description` (a string, default value: `""`)

  This is the help message that describes the role of the attribute. It is displayed in a tooltip if the user leaves the mouse on top of the attribute for a while.
- `list` (a boolean, default value: "false")

  If this is set to `"true"`, the project attribute will in fact contains a list of values, as opposed to a single value. This is used for instance for the list of source directories in standard projects.
- `ordered` (a boolean, default value: "false")

  This is only relevant if the project attribute contains a list of values. This indicates whether the order of the values is relevant. In most cases, it will not matter. However, for instance, the order of source directories matters, since this also indicates where the source files will be searched, stopping at the first match.
- `omit_if_default` (a boolean, default value: "true")

  This indicates whether the project attribute should be set explicitly in the project if the user has left it to its default value. This can be used to keep the project files a simple as possible, if all the tools that will use this project attribute know about the default value. If this isn't the case, set `omit_if_default` to "false" to force the generation of the project attribute.
- `base_name_only` (a boolean, default value: "false")

  If the attribute contains a file name or a directory name, this indicates whether the full path should be stored, or only the base name. In most cases, the full path should be used. However, since GPS automatically looks for source files in the list of directories, for instance, the list of source files should only contain base names. This also increases the portability of project files.
- `case_sensitive_index` (a boolean, default value: "false")

  This XML attribute is only relevant for project attributes that are indexed on another one (see below for more information on indexed attributes). It indicates whether two indexes that differ only by their casing should be considered the same. For instance, if the index is the name of one of the languages supported by GPS, the index is case insensitive since "Ada" is the same as "C". However, if the index is the name of a file on Windows, the index is case-insensitive.

- `hide_in` (a string, default value: "")

  This XML attribute defines the various context in which this attribute should not be editable graphically. Currently, GPS provides two such contexts ("wizard" and "properties", corresponding to the project creation wizard and the project properties editor). If any of those context is specified in hide_in, then the widget to edit this attribute will not be shown. The goal is to keep the graphical interface simple.
- `disable_if_not_set` (a boolean, default value: "false")

  If this attribute is set to "true", the editor for this attribute will be greyed out if the attribute is not explicitly set in the project. In most cases, this is not needed, since the default value of the attribute can be used to leave the editor active at all time. However, when the value of the attribute is automatically computed depending on other attributes, the default value cannot be easily specified in the XML file, and in this case it might be easier to grey out the editor. An extra check box is displayed next to the attribute so that the user can choose to activate the editor and add the attribute to the project.
- `disable` (a space-separated list of attribute names, default: "")

  This is a list of attribute whose editor should be greyed out if the current attribute is specified. This only works if both the current attribute and the referenced attributes have their `disable_if_not_set` attribute set to "true". This can be used to have mutually exclusive attributes present in the editor

16.5.15.2 Declaring the type of the new attributes

The type of the project attribute is specified through one or several child tags of `<project_attribute>`. The following tags are recognized.

- `<string>`

  This tag indicates that the attribute is made of one (or more if it is a list) strings. This tag accepts the following XML attributes:
  - `default` (a string, default value: "")

    This gives the default value to be used for the string (and therefore the project attribute), in case the user hasn't overridden it.

    If the attribute's type is a file or a directory, the default value will be normalized (ie an absolute path will be generated from it, based on the project's location, where "." will represent the project's directory). As a special case, if default is surrounded by parenthesis, no normalization takes place, so that you can later on test whether the user is still using the default value or not).

A special case if when `default` is set to "project source files". In this case, this is automatically replaced by the known list of source files for the project. This doesn't work from the project wizard, since the list of source files hasn't been computed at that stage.

  - `type` (one of "", "file", "directory", default "")

    This indicates what the string represents. In the first case, any value can be used. In the second case, it should represent a file name, although no check is done to make sure the file actually exists on the disk. But GPS will be able to do some special marshalling with the file name. The third case indicates that GPS should expect a directory.

  - `filter` (one of "none", "project", "extending_project")

    This attribute is ignored for all types except "`file`". In this case, it further specifies what kind of files can be used in this attribute. If the filter is "`none`", then any file anywhere on the system is valid. If the filter is "`project`", then only files from the selected project can be specified. If the filter is "`extended_project`", then only the files from the project extended by the current project can be specified. The attribute will not be shown if the current project is not an extending project.

  - `allow_empty` (one of "True" or "False, default "True")

    This attribute indicates whether the value for this attribute can be an empty string. If not, the user must specify a value or an error message will be displayed in the project properties editor and project wizard.

- `<choice>`

  This tag can be repeated several times. It indicates one of the valid values for the attribute, and can be used to provide a static list of such values. If it is combined with a `<string>` tag, this indicates that the attribute can be any string, although a set of possible values is provided to the user for ease of use. This tag accepts one optional attribute, "`default`", which is a boolean. It indicates whether this value is the default to use for the project attribute.

  If several `<choice>` tags are used, it is possible that several of them are part of the default value if the project attribute is a list, as opposed to a single value.

- `<shell>`

  This tag is a GPS scripting command to execute to get a list of valid values for the attribute. The command should return a list. As for the `<choice>` tag, the `<shell>` tag can be combined with a `<string>` tag to indicate that the list of values returned by the scripting command is only a set of possible values, but that the project attribute can in fact take any value.

The `<shell>` tag accepts two attributes:

- `lang` (a string, default value: "shell")

  The scripting language in which the command is written. Currently, the only other possible value is "python".

- `default` (a string, default value: "")

  The default value that the project attribute takes if the user hasn't overridden it.

In some cases, the type of the project attribute, or at least its default value, depends on what the attribute applies to. The project file support this in the form of indexed project attribute. This is for instance used to specify what should be the name of the executable generated when compiling each of the main files in the project (ie the executable name for `gps.adb` should be `gps.exe`, the one for `main.c` should be `myapp.exe`, and so on).

Such attributes can also be declared through XML files. In such cases, the `<project_attribute>` tag should have one `<index>` child, and zero or more `<specialized_index>` children. Each of these two tags in turn take one of the already mentioned `<string>`, `<choice>` or `<shell>` tag.

The `<index>` tag indicates what other project attribute is used to index the current one. In the example given above for the executable names, the index is the attribute that contains the list of main files for the project.

It accepts the following XML attributes:

- `attribute` (a string, mandatory)

  The name of the other attribute. This other attribute must be declared elsewhere in the customization files, and must be a list of values, not a single value.

- `package` (a string, default value: "")

  The package in which the index project attribute is defined. This is used to uniquely identify homonym attributes.

The `<specialized_index>` is used to override the default type of the attribute for specific values of the index. For instance, the project files contains an attribute that specify what the name of the compiler is for each language. It is indexed on the project attribute that list the languages used for the source files of the project. Its default value depends on the language ("gnatmake" for Ada, "gcc" for C, and so on). This attribute accepts requires one XML attribute:

- `value` (a string, mandatory)

  This is the value of the attribute for which the type is overriden.

Note that almost all the standard project attributes are defined through an XML file, '`projects.xml`', which is part of the GPS installation. Check this file to get advanced examples on how to declare project attributes.

16.5.15.3 Examples

The following example declares three attributes, with a single string as their value. This string represents a file or a directory in the last two cases. You can simply copy this into a '.xml' file in your '$HOME/.gps/plug-ins' directory, as usual.

```
<?xml version="1.0"?>
<custom>
  <project_attribute
      name="Single1"
      package="Test"
      editor_page="Tests single"
      editor_section="Single"
      description="Any string">

     <string default="Default value" />
  </project_attribute>

  <project_attribute
      name="File1"
      package="Test"
      editor_page="Tests single"
      editor_section="Single"
      description="Any file" >

      <string type="file" default="/my/file" />
  </project_attribute>

  <project_attribute
      name="Directory1"
      package="Test"
      editor_page="Tests single"
      editor_section="Single"
      description="Any directory" >

      <string type="directory" default="/my/directory/" />
  </project_attribute>
</custom>
```

The following example declares an attribute whose value is a string. However, a list of predefined possible values is also provided, as an help for interactive edition for the user. If the `<string>` tag wasn't given, the attribute's value would have two be one of the three possible choices.

```
<?xml version="1.0" ?>
<custom>
  <project_attribute
      name="Static2"
      package="Test"
      editor_page="Tests single"
```

```
          editor_section="Single"
          description="Choice from static list (or any string)" >

          <choice>Choice1</choice>
          <choice default="true" >Choice2</choice>
          <choice>Choice3</choice>
          <string />
      </project_attribute>
    </custom>
```

The following example declares an attribute whose value is one of the languages currently supported by GPS. Since this list of languages is only know when GPS is executed, a script command is used to query this list.

```
    <?xml version="1.0" ?>
    <custom>
     <project_attribute
          name="Dynamic1"
          package="Test"
          editor_page="Tests single"
          editor_section="Single"
          description="Choice from dynamic list" >

          <shell default="C" >supported_languages</shell>
      </project_attribute>
    </custom>
```

The following example declares an attribute whose value is a set of file names. The order of files in this list matters to the tools that are using this project attribute.

```
    <?xml version="1.0" ?>
    <custom>
     <project_attribute
          name="File_List1"
          package="Test"
          editor_page="Tests list"
          editor_section="Lists"
          list="true"
          ordered="true"
          description="List of any file" >

          <string type="file" default="Default file" />
      </project_attribute>
    </custom>
```

The following example declares an attribute whose value is a set of predefined possible values. By default, two such values are selected, unless the user overrides this default setting.

```
    <?xml version="1.0" ?>
    <custom>
```

```
  <project_attribute
      name="Static_List1"
      package="Test"
      editor_page="Tests list"
      editor_section="Lists"
      list="true"
      description="Any set of values from a static list" >

      <choice>Choice1</choice>
      <choice default="true">Choice2</choice>
      <choice default="true">Choice3</choice>
  </project_attribute>
</custom>
```

The following example declares an attribute whose value is a string. However, the value is specific to each language (this could for instance be used for the name of the compiler to use for a given language). This is an indexed project attribute. It has two default values, one for Ada, one for C. All other languages have no default value.

```
<?xml version="1.0" ?>
<custom>
  <project_attribute
      name="Compiler_Name"
      package="Test"
      editor_page="Tests indexed"
      editor_section="Single"
      <index attribute="languages" package="">
         <string default="" />
      </index>
      <specialized_index value="Ada" >
         <string default="gnatmake" />
      </specialized_index>
      <specialized_index value="C" >
         <string default="gcc" />
      </specialized_index>
  </project_attribute>
</custom>
```

16.5.15.4 Accessing the project attributes

The new attributes that were defined are accessible from the GPS scripting languages, like all the standard attributes, see Section 16.6.4.3 [Querying project switches], page 249.

You can for instance access the Compiler_Name attribute we created above with a python command similar to:

```
GPS.Project.root().get_attribute_as_string ("Compiler_Name", "Test", "Ada")
```

You can also access the list of main files for the project, for instance, by calling

```
GPS.Project.root().get_attribute_as_list ("main")
```

16.5.16 Adding casing exceptions

A set of case exceptions can be declared in this file. Each case exception is put inside the tag `<word>` or `<substring>`. These exceptions are used by GPS to set identifiers or keywords case when editing case insensitive languages (except if corresponding case is set to Unchanged). see Section 16.1 [The Preferences Dialog], page 165.

```
<?xml version="1.0" ?>
<exceptions>
  <case_exceptions>
     <word>GNAT</word>
     <word>OS_Lib</word>
     <substring>IO</substring>
  </case_exceptions>
</exceptions>
```

16.5.17 Adding documentation

New documentation can be added in GPS in various ways. This is useful if you want to point to your own project documentation for instance.

The first possibility is to create a new menu, through a `<menu>` tag in an XML file, associated with an action that either spawn an external web browser or calls the internal `GPS.Help.browse()` shell command.

However, this will not show the documentation in the `Help->Contents` menu, which you also might want to do.

To have both results, you should use the `<documentation_file>` tag in an XML file. These tags are generally found in the '`gps_index.xml`' files, as documented in see Section 3.2 [Adding New Help Files], page 20, but you can in fact add them in any of your customization files.

The documentation files you display can contain the usual type of html links. In addition, GPS will treat specially links starting with '%', and consider them as script commands to execute instead of file to display. The following example show how to insert a link that will in effect open a file in GPS when clicked by the user

```
<a href="%shell:Editor.editor g-os_lib.ads">Open runtime file</a>
```

The first word after '%' is the name of the language, and the command to execute is found after the ':' character.

The `<documentation_file>` accepts a number of child nodes:

name This is the name of the file. It can be either an absolute file name, or a file name relative to one of the directories in `GPS_DOC_PATH`. If this child is omitted, you must specify a `<shell>` child.

This name can contain a reference to a specific anchor in the html file, using the standard HTML syntax.

```
<name>file#anchor</name>
```

shell This child specifies the name of a shell command to execute to get the name of the HTML file. This command can for instance create the HTML file dynamically, or download it locally using some special mechanism. This child accepts one attribute, `"lang"`, which is the name of the language in which the command is written

descr This is the description for this help file. It appears in a tool tip for the menu item.

category This is used in the `Help->Contents` menu to organize all the documentation files.

menu This is the full path to the menu. It behaves like a UNIX path, except it reference the various menus, starting from the menu bar itself. The first character of this path must be `"/"`. The last part of the path is the name of the new menu item. If not set, no menu is displayed for this file, although it will still appear in the `Help->Contents` menu

The `<menu>` child tag accepts two attributes.

before (optional, default=`""`)
The name of the menu before which the new entry should be inserted. If the new menu is inserted in some submenus, this tag controls the deeper nesting. Parent menus are created as needed, but if you wish to control their specific order, you should create them first with a `<menu>` tag.

after (optional, default=`""`)
The name of the menu after which the new entry should be inserted.

The following example shows how to create a new entry `"item"` in the Help menu, that will display ‘`file.html`’. The latter is searched in the `GPS_DOC_PATH` list of directories.

```
<?xml version="1.0"?>
<index>
   <documentation_file>
      <name>file.html</name>
      <descr>Tooltip text</descr>
```

```
        <category>name</category>
        <menu>/Help/item</menu>
      </documentation_file>
    </index>
```

As mentioned above, HTML files are looked for through the `GPS_DOC_PATH` environment variable. However, you can also use the `<doc_path>` XML node to defined additional directories to be searched.

Such a directory is relative to the installation directory of GPS.

```
<?xml version="1.0"?>
<GPS>
   <doc_path>doc/application/</doc_path>
</GPS>
```

will add the directory '`<prefix>/doc/application`' to the search path for the documentation.

Such a directory can also be added through Python, as in:

```
GPS.HTML.add_doc_directory ('doc/application')
```

16.5.18 Adding stock icons

XML files can be used to define "stock icons". Stock icons are pictures that are identified by their label, and which are used through GPS in various places, such as buttons, menus, toolbars, and so on.

The stock icons must be declared using the tag `<icon>`, within the global tag `<stock>`. The attribute `id` indicates the label used to identify the stock icon, and the attribute `file` points to the file which contains the actual picture, either in absolute format, or relative to the directory which contains the XML file.

If the stock icon is to be used in a toolbar, use the attribute `label` to specify the text to display in the toolbar, under the button, when the toolbar is configured to show text.

For icons that are intended to be displayed at multiple sizes, you can specify multiple files corresponding to these multiple sizes. This is done by adding children to the main icon node, with the tag `alternate`, containing a `file` attribute and a `size` attribute which correspond to the size for which this alternate source should be used.

Possible sizes are:

`1`	Menu item (ideal size: 16x16 pixels)
`2`	Button in a small toolbar (ideal size: 18x18 pixels)
`3`	Button in a large toolbar (ideal size: 24x24 pixels)
`4`	Image for a standard button (ideal size: 20x20 pixels)
`5`	Image used during drag-and-drop operation (ideal size: 32x32 pixels)

6 Main image in a dialog (ideal size: 48x48 pixels)

Here is an example:

```
<?xml version="1.0"?>
<my_visual_preferences>
  <stock>
    <icon id="myproject-my-picture" file="icons/my-picture.png" />

    <icon id="myproject-multipurpose-image"
           label="do something"
           file="icons/icon_default.png">
       <alternate file"icons/icon_16.png" size="menu" />
       <alternate file"icons/icon_24.png" size="large_toolbar" />
       <alternate file"icons/icon_20.png" size="button" />
    </icon>

  </stock>
</my_visual_preferences>
```

Note: as shown in the example above, it is a good practice to prefix the label by a unique name (e.g. `myproject-`), in order to make sure that predefined stock icons will not get overridden by your icons.

16.5.19 Remote programming customization

The configuration of the remote programming functionality has two separate parts: the tools configuration (remote connection tools, shells, and rsync parameters) and the servers configuration.

The first part (see Section 16.5.19.1 [Defining a remote connection tool], page 234, Section 16.5.19.2 [Defining a shell], page 236 and Section 16.5.19.3 [Configuring rsync usage], page 237) is handled by a pre-installed file in the plug-ins directory called '`protocols.xml`'.

The second part (see Section 16.5.19.4 [Defining a remote server], page 237 and Section 16.5.19.5 [Defining a remote path translation], page 238), when configured via the user interface (see Section 15.2 [Setup the remote servers], page 159), will create a remote.xml file in the user's gps directory. System-wide servers can be also installed.

16.5.19.1 Defining a remote connection tool

Several remote access tools are already defined in GPS: ssh, rsh, telnet and plink. It is possible to add other tools, using the node `remote_connection_config`.

The attributes for this node are:

`name (string) (mandatory)`
    The name of the tool. This name does not necessarily correspond to the command used to launch the tool.

The following children are defined:

`start_command (mandatory)`
: The command used to launch the tool. This tag supports the `use_pipes` attribute. This attribute selects on Windows the way GPS will launch the remote tools, and can take the following values:

  `true` use pipes to launch the tool.

  `false (default)`
  use a tty emulation, which is a bit slower but allow password prompts retrieval with some tools.

  Note that this argument has effects only on Windows platforms.

`start_command_common_args (optional)`
: The arguments that are provided to the tool. This string can contain the following replacement macros:

  `%C` is replaced by the command executed on the remote host (e.g. the shell command)

  `%h` is replaced by the remote host name

  `%U` is replaced by the start_command_user_args, if a user is specified

  `%u` is replaced by the user name

  Note that if neither %u nor %U is found, and a user is specified in the remote connection configuration, then the start_command_user_args is placed at the beginning of the arguments.

`start_command_user_args (optional)`
: The arguments used to define a specific user during connection. %u is replaced by the user name

`send_interrupt (optional)`
: The characters sequence to send to the remote tool to interrupt the remote application. If unset, then an Interrupt signal is sent directly to the remote tool.

`user_prompt_ptrn (optional)`
: A regular expression, used to catch user name prompts from the connection tool. If undefined, a default regular expression is used.

`password_prompt_ptrn (optional)`
: A regular expression, used to catch password prompts from the connection tool. If undefined, a default regular expression is used.

`passphrase_prompt_ptrn (optional)`
: A regular expression, used to catch passphrase prompts from the connection tool. If undefined, a default regular expression is used.

`use_cr_lf (optional)`
: Boolean value, used to tell GPS if the connection tool requires CR+LF characters to determine an end of line, or if LF is sufficient. Set to false by default.

`extra_ptrn (optional)`
: Complex child. Used to catch extra prompts from the connection tool, other than password, passphrase or usename prompts. This tag has an attribute `auto_answer` telling if GPS automatically answers to this prompt, or ask the user. If auto_answer is `true`, then this tag needs an `answer` child, whose value is used for the answer. If auto_answer is `false`, then this tag needs a `question` child, whose value is used as question to the end user.

16.5.19.2 Defining a shell

Several shells are already defined in GPS: sh, bash, csh, tcsh and cmd.exe (Windows). It is possible to add other shells, using the node `remote_shell_config`.

The attributes for this node are:

`name (string) (mandatory)`
: The name of the shell. This name does not necessarilly correspond to the command used to launch the shell.

The following children are defined:

`start_command (mandatory)`
: The command used to launch the shell. If arguments are required, they should be put here, separated with spaces.

`generic_prompt (optional)`
: The regular expression used to identify a prompt after the initial connection. If not set, a default value is used.

`gps_prompt (mandatory)`
: The regular expression used to identify a prompt after the initial setup is performed. If not set, a default value is used.

`filesystem (mandatory)`
: Takes the following values: `unix` or `windows`. This is the filesystem used by the shell.

`init_commands (optional)`
: Complex child. Each `cmd` child contains a command used to initialise a new session.

`exit_commands (optional)`
: Complex child. Each `cmd` child contains a command used to exit a session.

`no_echo_command (optional)`
: Command used to suppress the echo of the remote shell.

`cd_command (mandatory)`
: Command used to go to a directory. `%d` is replaced by the directory's full name.

`get_status_command (mandatory)`
: Command used to retrieve the status of the last command launched.

`get_status_ptrn (mandatory)`
: Regular expression used to retrieve the status returned by `get_status_command`. A pair of parenthesis is required, and identifies the status.

16.5.19.3 Configuring rsync usage

GPS has native support for the rsync tool, for paths synchronization during remote programming operations.

By default, GPS will use –rsh=ssh option if ssh is the main connection tool for the concerned server. It will also define the -L switch when transfering files to a Windows local host.

It is possible to define additional arguments to rsync using the `rsync_configuration` tag.

This tag accepts the child tagged `arguments`, and containing additional arguments to pass to rsync.

16.5.19.4 Defining a remote server

Remote servers can be defined via the user interface, as described in Section 15.2 [Setup the remote servers], page 159. This user interface will create a remote.xml file in the user's gps directory, which in turn can be installed in any plug-ins directory to set the values system-wide. This file will define for each server the node `remote_machine_descriptor`.

The attributes for this node are:

`nickname (mandatory)`
: Identifies uniquely the server in GPS.

`network_name (mandatory)`
: The server's network name or IP address.

`remote_access (mandatory)`
: The tool's name used to access the server. Shall point to one of the tools defined in Section 16.5.19.1 [Defining a remote connection tool], page 234.

`remote_shell (mandatory)`
: The shell's name used to access the server. Shall point to one of the shells defined in Section 16.5.19.2 [Defining a shell], page 236.

`remote_sync (mandatory)`
: The remote file synchronisation tool used to synchronize files between the local host and the server. Only `rsync` is recognized currently.

`debug_console (optional)`
: Can take the value `True` or `False`. Tells if a debug console should be displayed during connection with a remote host. False by default.

The children for this node are:

`extra_init_commands (optional)`
: Complex child. Can contain `cmd` children whose values are used to set server specific initialization commands.

`max_nb_connections (optional)`
: Positive number representing the maximum number of simultaneous connections GPS can launch.

`timeout (optional)`
: Positive number representing a timeout value (in ms) used for every action performed on the remote host.

16.5.19.5 Defining a remote path translation

Remote path translation can also be defined via the user interface, as described in Section 15.2 [Setup the remote servers], page 159. The remote paths translation are defined with the node `remote_path_config`.

The attributes for this node are:

`server_name (mandatory)`
: The server name concerned by the paths translation.

The `remote_path_config` node contains `mirror_path` children.

The attributes for the node `mirror_path` are:

`local_path (mandatory)`
: The absolute local path, expressed using the local filesystem standards.

`remote_path (mandatory)`
: The absolute remote path, expressed using the remote filesystem standards.

`sync (mandatory)`
: Specify the synchronization mechanism used for the paths (see Section 15.2.3 [Paths settings], page 162). Possible values are `NEVER`, `ONCE_TO_LOCAL`, `ONCE_TO_REMOTE` and `ALWAYS`.

16.6 Adding support for new tools

GPS has built-in support for external tools. This feature can be used to support a wide variety of tools (in particular, to specify different compilers). Regular enhancements are done in this area, so if you are planning to use the external tool support in GPS, check for the latest GPS version available.

Typically, the following things need to be achieved to successfully use a tool:

- Specify its command line switches
- Pass it the appropriate arguments depending on the current context, or on user input
- Spawn the tool
- Optionally parse its result and act accordingly

Each of these points is discussed in further sections. In all these cases, most of the work can be done statically through XML customization files. These files have the same format as other XML customization files (see Section 16.5 [Customizing through XML and Python files], page 187), and the tool descriptions are found in `<tool>` tags.

This tag accepts the following attributes:

`name (mandatory)`
: This is the name of the tool. This is purely descriptive, and will appear throughout the GPS interface whenever this tool is referenced. This includes for instances the tabs of the switches editor.

`package (Default value is ide)`
: This optional attribute specifies which package should be used in the project to store information about this tool, in particular its switches. Most of the time the default value should be used, unless you are working with one of the predefined packages.

  See also See Section 16.5.15 [Defining project attributes], page 222, for more information on defining your own project attributes. Using the "package", "attribute" or "index" XML attributes of <tool> will implicitly create new project attributes as needed.

If this attribute is set to "ide", then the switches cannot be set for a specific file, only at the project level. Support for file-specific switches currently requires modification of the GPS sources themselves.

`attribute (Default value is default_switches)`
: This optional attribute specifies the name of the attribute in the project which is used to store the switches for that tool.

`index (Default value is the tool name)`
: This optional attribute specifies what index is used in the project. This is mostly for internal use by GPS, and describes what index of the project attribute is used to store the switches for that tool.

`override (Default value is 'false')`
: This optional attribute specifies whether the tool definition can be redefined. The accepted values are 'true' or 'false'. If override is not set, and the tool is defined several times, then a Warning will be displayed.

This tag accepts the following children, described in separate sections:

`<switches>`
: (see Section 16.6.3 [Defining tool switches], page 241)

`<language>`
: (see Section 16.6.1 [Defining supported languages], page 240)

`<initial-cmd-line>`
: (see Section 16.6.2 [Defining default command line], page 241)

16.6.1 Defining supported languages

This is the language to which the tool applies. There can be from no to any number of such nodes for one `<tool>` tag.

If no language is specified, the tool applies to all languages. In particular, the switches editor page will be displayed for all languages, no matter what languages they support.

If at least one language is specified, the switches editor page will only be displayed if that language is supported by the project.

```
<?xml version="1.0" ?>
<my_tool>
  <tool name="My Tool" >
    <language>Ada</language>
    <language>C</language>
  </tool>
</my_tool>
```

16.6.2 Defining default command line

It is possible to define the command line that should be used for a tool when the user is using the default project, or hasn't overridden this command line in the project.

This is done through the `<initial-cmd-line>` tag, as a child of the `<tool>` tag. Its value is the command line that would be passed to the tool. This command line is parsed as usual, e.g. quotes are taken into account to avoid splitting switches each time a space is encountered.

```
<?xml version="1.0" ?>
<my_tool>
  <tool name="My tool" >
     <initial-cmd-line>-a -b -c</initial-cmd-line>
  </tool>
</my_tool>
```

16.6.3 Defining tool switches

The user has to be able to specify which switches to use with the tool. If the tool is simply called through custom menus, you might want to hard code some or all of the switches. However, in the general case it is better to use the project properties editor, so that project-specific switches can be specified.

This is what GPS does by default for Ada, C and C++. You can find in the GPS installation directory how the switches for these languages are defined in an XML file. These provide extended examples of the use of customization files.

The switches editor in the project properties editor provides a powerful interface to the command line, where the user can edit the command line both as text and through GUI widgets.

The switches are declared through the `<switches>` tag in the customization file, which must be a child of a `<tool>` tag as described above.

This `<switches>` tag accepts the following attributes:

`lines (default value is 1)`
: The switches in the project properties editor are organized into boxes, each surrounded by a frame, optionally with a title. This attribute specifies the number of rows of such frames.

`columns (default value is 1)`
: This attribute specifies the number of columns of frames in the project properties page.

`separator (default value is "")`
: This attribute specifies the default character that should go between a switch and its value, to distinguishes cases like "-a 1", "-a1" and "-a=1". This can be overridden separately for each switch. Note that if you want the separator to be a space, you must use the value `"&#32;"` rather than `" "`, since XML parser must normalize the latter to the empty string when reading the XML file.

`use_scrolled_window (Default value is false)`
: This optional attribute specifies if the boxes of the project editor are placed into scrolled window. This is particularily useful if the number of displayed switches if important.

`show_command_line (Default value is true)`
: If this attribute is set to "false", the command line will not be displayed in the project properties editor. This can be used for instance if you only want users to edit it through the buttons and other widgets, and not directly.

`switch_char (Default value is "-")`
: This is the leading character of command line arguments that indicate they are considered as switches. Arguments not starting with this character will be kept as is, and cannot have graphical widgets associated with them

`sections (Default value is empty)`
: This is a space separated list of switches delimiting a section (such as "-bargs -cargs -largs"). A section of switches is a set of switches that need to be grouped together and preceded by a specific switch. Sections are always placed at the end of the command line, after regular switches.

This `<switches>` tag can have any number of child tag, among the following. They can be repeated multiple times if you need several check boxes. For consistency, most of these child tags accept attributes among the following:

`line (default value is 1)`
: This indicates the row of the frame that should contain the switch. See the description of `lines` above.

`column (default value is 1)`
: This indicates the column of the frame that should contain the switch. See the description of `columns` above.

`label (mandatory)`
: This is the label which is displayed in the graphical interface

`switch (mandatory)`
: This is the text that should be put on the command line if that switch is selected. Depending on its type, a variant of the text might be put instead, see the description of `combo` and `spin` below. This switch shouldn't contain any space.

`switch-off (default value is empty)`
: This attribute is used for `<check>` tags, and indicates the switch used for deactivating the concerned feature. This is useful for features that are on by default on certain occasions, but can be individually deactivated.

`section (default value is empty)`
: This is the switch section delimiter (such as "-cargs"). See the 'sections' attribute of the tag 'switches' for more information.

`tip (default value is empty)`
: This is the tooltip which describes that switch more extensively. It is displayed in a small popup window if the user leaves the mouse on top of the widget. Note that tags accepting the tip attribute also accept a single child `<tip>` whose value will contain the text to be displayed. The advantage of the latter is that the text formatting is then kept.

`before (default value is "false")`
: This attribute is used to indicate that a switch needs to be always inserted at the begining of the command line.

`min (default value is 1)`
: This attribute is used for `<spin>` tags, and indicates the minimum value authorized for that switch.

`max (default value is 1)`
: This attribute is used for `<spin>` tags, and indicates the maximum value authorized for that switch.

`default (default value is 1)`
: This attribute is used for `<check>` and `<spin>` tags. See the description below.

`noswitch (default is empty)`
: This attribute is only valid for `<combo>` tags, and described below.

`nodigit (default is empty)`
: This attribute is only valid for `<combo>` tags, and described below.

`value (mandatory)`
: This attribute is only valid for `<combo-entry>` tags.

`separator (default is the value given to <switches>`
: This attribute specifies the separator to use between the switch and its value. See the description of this attribute for `<switches>`.

Here are the valid children for `<switches>`:

`<title>`
: This tag, which accepts the `line` and `column` attributes, is used to give a name to a specific frame. The value of the tag is the title itself. You do not have to specify a name, and this can be left to an empty value.

  Extra attributes for `<title>` are:

  `line-span (default value is 1)`
  : This indicates how many rows the frame should span. If this is set to 0, then the frame is hidden from the user. See for instance the Ada or C switches editor.

  `column-span (default value is 1)`
  : This indicates how many columns the frame should span. If this is set to 0, then the frame is hidden from the user. See for instance the Ada or C switches editor.

`<check>`
: This tag accepts the `line`, `column`, `label`, `switch`, `switch-off`, `section`, `default`, `before` and `tip` attributes.

  This tag doesn't have any value. An optional `<tip>` child can be present.

  It creates a toggle button. When the latter is active, the text defined in the switch attribute is added as is to the command line. The switch can be also activated by default (`default` attribute is `"on"` or `"true"`). In this case, deactivating the switch will add `switch-off` to the command line.

`<spin>`
: This tag accepts the `line`, `column`, `label`, `switch`, `section`, `tip`, `min`, `max`, `separator` and `default` attributes.

  This tag doesn't have any value. An optional `<tip>` child can be present.

  This switch will add the contents of the `switch` attribute followed by the current numeric value of the widget to the command line. This is typically used to indicate indentation length for instance. If the current value of the widget is equal to the `default` attribute, then nothing is added to the command line.

`<radio>`
: This tag accepts the `line` and `column` attributes. It groups any number of children, each of which is associated with its own switch. However, only one of the children can be selected at any given time.

The children must have the tag `radio-entry`. This tag accepts the attributes `label`, `switch`, `section`, `before` and `tip`. As a special case, the switch attribute can have an empty value (`""`) to indicate this is the default switch to use in this group of radio buttons.

This tag doesn't have any value. An optional `<tip>` child can also be present.

`<field>` This tag accepts the `line`, `column`, `label`, `switch`, `section`, `separator`, `before` and `tip` attributes.

This tag doesn't have any value. An optional `<tip>` child can be present.

This tag describes a text edition field, which can contain any text the user types. This text will be prefixed by the value of the `switch` attribute, and the separator (by default nothing). If no text is entered in the field by the user, nothing is put on the command line.

This tag accepts two extra attributes:

`as-directory (optional)`
: If this attribute is specified and set to `"true"`, then an extra `"Browse"` button is displayed, so that the user can easily select a directory.

`as-file (optional)`
: This attribute is similar to `as-directory`, but opens a dialog to select a file instead of a directory. If both attributes are set to `"true"`, the user will select a file.

`<combo>` This tag accepts the `line`, `column`, `label`, `switch`, `section`, `before`, `tip`, `noswitch`, `separator` and `nodigit` attributes.

The tag `<combo>` accepts any number of `combo-entry` children tags, each of which accepts the `label` and `value` attribute. An optional `<tip>` child can also be present.

The text inserted in the command line is the text from the `switch` attribute, concatenated with the text of the `value` attribute for the currently selected entry. If the value of the current entry is the same as that of the `nodigit` attribute, then only the text of the `switch` attribute is put on the command line. This is in fact necessary to interpret the gcc switch `"-O"` as `"-O1"`.

If the value of the current entry is that of the `noswitch` attribute, then nothing is put in the command line.

`<popup>` This tag accepts the `line`, `column`, `label`, `lines` and `columns` attributes. This displays a simply button that, when clicked, displays a dialog with some extra switches. This dialog, just as the switches editor itself, is organizes into lines and columns of frames, the number of which is provided by the `lines` and `columns` attributes.

This tag accepts any number of children, which are the same as the `<switches>` attribute itself.

`<dependency>`
: This tag is used to describe a relationship between two switches. It is used for instance when the "Debug Information" switch is selected for "Make", which forces it for the Ada compiler as well.

  It has its own set of attributes:

  `master-page` `master-switch` `master-section`
  : These two attributes define the switch that possibly forces a specific setting on the slave switch. In our example, they would have the values "Make" and "-g". The switch referenced by these attributes must be of type `<check>` or `<field>`. If it is part of a section, then 'master-section' needs to be defined. If the check button is selected, it forces the selection of the slave check button. Likewise, if the field is set to any value, it forces the selection of the slave.

  `slave-page` `slave-switch` `slave-section`
  : These two attributes define the switch which is acted upon by the master switch. In our example, they would have the values "Ada" and "-g". The switch referenced by these attributes must be of type `<check>`.

  `master-status` `slave-status`
  : These two switches indicate which state of the master switch forces which state of the slave-status. In our example, they would have the values "on" and "on", so that when the make debug information is activated, the compiler debug information is also activated. However, if the make debug information is not activated, no specific setup is forced for the compiler debug information. if master-status is "off" and the master switch is a field, then the status of the slave will be changed when no value is set in the field.

`<default-value-dependency>`
: This tag is used to describe a relationship between two switches. It is slightly different from the <dependency> tag in that the relationship concerns only the default activation states. It is used for instance when the "-gnatwa" switch is selected for the "Ada" Compiler, which

imply that the default values for "-gnatwc", "-gnatwd", etc. become activated by default. They can however still be deactivated with respectively "-gnatwC" and "-gnatwD".

It has its own set of attributes:

`master-switch`
: This is the switch that triggers the dependency. If `master-switch` is present in the command line, then the switch's default status of `slave-switch` is modified accordingly.

`slave-switch`
: This is the switch whose default value depends on `master-switch`. This needs to be a switch already defined in a `<switch>` tag. It can match its 'switch' or 'switch-off' attributes. In the latter case, the slave-switch default value is deactivated if master-switch is present.

`<expansion>`
: This tag is used to describe how switches can be grouped together on the command line to keep it shorter. It is also used to define aliases between switches.

  It is easier to explain it through an example. Specifying the GNAT switch "-gnatyy" is equivalent to specifying "-gnaty3abcefhiklmnprst". This is in fact a style check switch, with a number of default values. But it is also equivalent to decomposing it into several switches, as in "-gnatya", "-gnatyb", . . .; With this information, GPS will try to keep the command line length as short as possible, to keep it readable.

  Both these aspects are defined in a unique `<expansion>` tag, which accepts two attributes: `switch` is mandatory, and `alias` is optional. Alias contains the text "-gnatyabcefhiklmnprst" in our example.

  There are two possible uses for this tag:

  - If the "alias" attribute is not specified, then the "switch" attribute indicates that all switches starting with that prefix should be grouped. For instance, if you pass "-gnatw" as the value for the "switch" attribute, then a command line with "-gnatwa -gnatw.b" will in fact result in "-gnatwa.b".
  - If the "alias" attribute is specified, then the "switch" attribute is considered as a shorter way of writting "alias". For instance, if "switch" is "-gnatyy" and "alias" is "-gnaty3abcefhiklmnprst", then the user can simply type "-gnatyy" to mean the whole set of options.

The same "switch" attribute can be used in two expansion nodes if you want to combine the behavior.

For historical reasons, this tag accepts `<entry>` children, but these are no longer used.

16.6.4 Executing external tools

The user has now specified the default switches he wants to use for the external tool. Spawning the external tool can be done either from a menu item, or as a result of a key press.

Both cases are described in an XML customization file, as described previously, and both are setup to execute what GPS calls an action, i.e. a set of commands defined by the `<action>` tag.

16.6.4.1 Chaining commands

This action tag, as described previously, executes one or more commands, which can either be internal GPS commands (written in any of the scripting language supported by GPS), or external commands provided by executables found on the PATH.

The command line for each of these commands can either be hard-coded in the customization file, or be the result of previous commands executed as part of the same action. As GPS executes each command from the action in turn, it saves its output on a stack as needed. If a command line contains a special construct `%1`, `%2`... then these constructs will be replaced by the result of respectively the last command executed, the previous from last command, and so on. They are replaced by the returned value of the command, not by any output it might have done to some of the consoles in GPS.

Every time you execute a new command, it pushes the previous %1, %2... parameters one step further on the stack, so that they become respectively %2, %3... and the output of that command becomes %1.

The result value of the previous commands is substituted exactly as is. However, if the output is surrounded by quotes, they are ignored when a substitution takes place, so you need to put them back if they are needed. The reason for this behavior is so that for scripting languages that systematically protect their output with quotes (simple or double), these quotes are sometimes in the way when calling external commands.

```
<?xml version="1.0" ?>
<quotes>
  <action name="test quotes">
    <shell lang="python">'-a -b -c'</shell>
    <external> echo with quotes: "%1"</external>
    <external> echo without quotes: %2</external/>
  </action>
```

```
</quotes>
```

If one of the commands in the action raises an error, the execution of the action is stopped immediately, and no further command is performed.

16.6.4.2 Saving open windows

Before launching the external tool, you might want to force GPS to save all open files, the project...; This is done using the same command GPS itself uses before starting a compilation. This command is called `MDI.save_all`, and takes one optional boolean argument which specifies whether an interactive dialog should be displayed for the user.

Since this command aborts when the user presses cancel, you can simply put it in its own `<shell>` command, as in:

```
<?xml version="1.0" ?>
<save_children>
  <action name="test save children">
    <shell>MDI.save_all 0</shell>
    <external>echo Run unless Cancel was pressed</external>
  </action>
</save_children>
```

16.6.4.3 Querying project switches

Some GPS shell commands can be used to query the default switches set by the user in the project file. These are `get_tool_switches_as_string`, `get_tool_switches_as_list`, or, more generally, `get_attribute_as_string` and `get_attribute_as_list`. The first two require a unique parameter which is the name of the tool as specified in the `<tool>` tag. This name is case-sensitive. The last two commands are more general and can be used to query the status of any attribute from the project. See their description by typing the following in the GPS shell console window:

```
help Project.get_attribute_as_string
help Project.get_attribute_as_list
```

The following is a short example on how to query the switches for the tool "Find" from the project, See Section 16.7.2 [Tool example], page 253. It first creates an object representing the current project, then passes this object as the first argument of the `get_tool_switches_as_string` command. The last external command is a simple output of these switches

```
<?xml version="1.0" ?>
<find_switches>
  <action name="Get switches for Find">
    <shell>Project %p</shell>
    <shell>Project.get_tool_switches_as_string %1 Find </shell>
    <external>echo %1</external>
  </action>
```

```
</find_switches>
```

The following example shows how something similar can be done from Python, in a simpler manner. For a change, this function queries the Ada compiler switches for the current project, and prints them out in the messages window. The

```
<?xml version="1.0" ?>
<query_switches>
  <action name="Query compiler switches">
    <shell lang="python">GPS.Project("%p").get_attribute_as_list
      (package="compiler",
       attribute="default_switches",
       index="ada")</shell>
    <external>echo compiler switches= %1</external>
  </action>
</query_switches>
```

16.6.4.4 Querying switches interactively

Another solution to query the arguments for the tool is to ask the user interactively. The scripting languages provides a number of solutions for these.

They generally have their own native way to read input, possibly by creating a dialog.

In addition, the simplest solution is to use the predefined GPS commands for this. These are the two functions:

`yes_no_dialog`
: This function takes a single argument, which is a question to display. Two buttons are then available to the user, "Yes" and "No". The result of this function is the button the user has selected, as a boolean value.

`input_dialog`
: This function is more general. It takes a minimum of two arguments, with no upper limit. The first argument is a message describing what input is expected from the user. The second, third and following arguments each correspond to an entry line in the dialog, to query one specific value (as a string). The result of this function is a list of strings, each corresponding to these arguments.

  From the GPS shell, it is only convenient to query one value at a time, since it doesn't have support for lists, and would return a concatenation of the values. However, this function is especially useful with other scripting languages.

The following is a short example that queries the name of a directory and a file name, and displays each in the Messages window.

```
<?xml version="1.0" ?>
<query_file>
  <action name="query file and dir">
    <shell lang="python">list=GPS.MDI.input_dialog \
      ("Please enter directory and file name", "Directory", "File")</shell>
    <shell lang="python">print ("Dir=" + list[0], "File=" + list[1])</shell>
    </shell>
  </action>
</query_file>
```

16.6.4.5 Redirecting the command output

The output of external commands is send by default to the GPS console window. In addition, finer control can be exercised using the `output` attribute of the `<external>` and `<shell>` tags.

This attribute is a string that may take any value. Two values have specific meanings:

`"none"` The output of the command, as well as the text of the command itself, will not be shown to the user at all.

`""` The output of the command is sent to the GPS console window, entitled `"`Messages`"`.

`other values`
: A new window is created, with the title given by the attribute. If such a window already exists, it is cleared up before any of the command in the chain is executed. The output of the command, as well as the text of the command itself, are sent to this new window.

This attribute can also be specified at the `<action>` tag level, in which case it defines the default value for all `<shell>` and `<external>` tags underneath. If it isn't specified for the action itself, its default value will always be the empty string, i.e. output is sent to the GPS console.

```
<?xml version="1.0" ?>
<ls>
  <action name="ls current directory" output="default output" >
     <shell output="Current directory" >pwd</shell>
     <external output="Current directory contents" >/bin/ls</external>
  </action>
</ls>
```

16.6.4.6 Processing the tool output

The output of the tool has now either been hidden or made visible to the user in one or more windows.

There are several additional things that can be done with this output, for further integration of the tool in GPS.

1. Parsing error messages

   External tools can usually display error messages for the user that are associated with specific files and locations in these files. This is for instance the way the GPS builder itself analyzes the output of `make`.

   This can be done for your own tools using the shell command `Locations.parse`. This command takes several arguments, so that you can specify your own regular expression to find the file name, line number and so on in the error message. By default, it is configured to work seamlessly with error message of the forms:

   ```
   file:line: message
   file:line:column: message
   ```

   Please refer to the online help for this command to get more information (by e.g. typing `help Locations.parse` in the GPS Shell).

   Here is a small example on how to run a make command and send the errors to the location window afterward.

   For languages that support it, it is also recommended that you quote the argument with triple quotes, so that any special character (newlines, quotes, ...) in the output of the tool are not specially interpreted by GPS. Note also that you should leave a space at the end, in case the output itself ends with a quote.

   ```
   <?xml version="1.0" ?>
   <make>
     <action name="make example" >
        <external>make</external>
        <on-failure>
           <shell>Locations.parse """%1 """ make_example</shell>
        </on-failure>
     </action>
   </make>
   ```

2. Auto-correcting errors

   GPS has support for automatically correcting errors for some of the languages. You can get access to this auto-fixing feature through the `Codefix.parse` shell command, which takes the same arguments as for `Locations.parse`.

   This will automatically add pixmaps to the relevant entries in the location window, and therefore `Locations.parse` should be called first prior to calling this command.

   Errors can also be fixed automatically by calling the methods of the `Codefix` class. Several codefix sessions can be active at the same time, each of which is associated with a specific category. The list of currently active sessions can be retrieved through the `Codefix.sessions()` command.

If support for python is enabled, you can also manipulate the fixable errors for a given session. To do so, you must first get a handle on that section, as shown in the example below. You can then get the list of fixable errors through the `errors` command.

Each error is of the class `CodefixError`, which has one important method `fix` which allows you to perform an automatic fixing for that error. The list of possible fixes is retrieved through `possible_fixes`.

```
print GPS.Codefix.sessions ()
session = GPS.Codefix ("category")
errors  = session.errors ()
print errors [0].possible_fixes ()
errors [0].fix ()
```

16.7 Customization examples

16.7.1 Menu example

This section provides a full example of a customization file. It creates a top-level menu named `custom menu`. This menu contains a menu item named `item 1`, which is associated to the external command `external-command 1`, a sub menu named `other menu`, etc. . .

```
<?xml version="1.0"?>
<menu-example>
  <action name="action1">
    <external>external-command 1</external>
  </action>

  <action name="action2">
    <shell>edit %f</shell>
  </action>

  <submenu>
    <title>custom menu</title>
    <menu action="action1">
      <title>item 1</title>
    </menu>

    <submenu>
      <title>other menu</title>
      <menu action="action2">
        <title>item 2</title>
      </menu>
    </submenu>
  </submenu>
</menu-example>
```

16.7.2 Tool example

This section provides an example that defines a new tool. This is only a short example, since Ada, C and C++ support themselves are provided through such a file, available in the GPS installation.

This example adds support for the "find" Unix utility, with a few switches. All these switches are editable through the project properties editor.

It also adds a new action and menu. The action associated with this menu gets the default switches from the currently selected project, and then ask the user interactively for the name of the file to search.

```
<?xml version="1.0" ?>
<toolexample>
  <tool name="Find" >
    <switches columns="2" >
      <title column="1" >Filters</title>
      <title column="2" >Actions</title>

      <spin label="Modified less than n days ago" switch="-mtime-"
            min="0" max="365" default="0" />
      <check label="Follow symbolic links" switch="-follow" />

      <check label="Print matching files" switch="-print" column="2" />
    </switches>
  </tool>

  <action name="action find">
    <shell>Project %p</shell>
    <shell>Project.get_tool_switches_as_string %1 Find </shell>
    <shell>MDI.input_dialog "Name of file to search" Filename</shell>
    <external>find . -name %1 %2</external>
  </action>

  <Submenu>
    <Title>External</Title>
     <menu action="action find">
       <Title>Launch find</Title>
    </menu>
  </Submenu>
</toolexample>
```

16.8 Scripting GPS

16.8.1 Scripts

Scripts are small programs that interact with GPS and allow you to perform complex tasks repetitively and easily. GPS includes support for two scripting languages currently, although additional languages might be added in the future. These two languages are described in the following section.

Support for scripting is currently work in progress in GPS. As a result, not many commands are currently exported by GPS, although their number is increasing daily. These commands are similar to what is available to people who extend GPS directly in Ada, but with a strong advantage: they do not require any recompilation of the GPS core, and can be tested and executed interactively.

The goal of such scripts is to be able to help automate processes such as builds, automatic generation of graphs, . . .

These languages all have a separate console associated with them, which you can open from the `Tools` menu. In each of these console, GPS will display a prompt, at which you can type interactive commands. These console provide completion of the command names through the ⟨tab⟩ key.

For instance, in the GPS shell console you can start typing

```
GPS> File
```

then press the ⟨tab⟩ key, which will list all the functions whose name starts with "File".

A similar feature is available in the python console, which also provides completion for all the standard python commands and modules.

All the scripting languages share the same set of commands exported by GPS, thanks to a abstract interface defined in the GPS core. As a result, GPS modules do not have to be modified when new scripting languages are added.

Scripts can be executed immediately upon startup of GPS by using the command line switch `--load`. Specifying the following command line:

```
gps --load=shell:mytest.gps
```

will force the gps script '`mytest.gps`' to be executed immediately, before GPS starts reacting to user's requests. This is useful if you want to do some special initializations of the environment. It can also be used as a command line interface to GPS, if you script's last command is to exit GPS.

In-line commands can also be given directly on the command line through `--eval` command line switch.

For instance, if you want to analyze an entity in the entity browser from the command line, you would pass the following command switches:

```
gps --eval=shell:'Entity entity_name file_name; Entity.show %1'
```

See the section Section 16.5 [Customizing through XML and Python files], page 187 on how to bind key shortcuts to shell commands.

16.8.2 Scripts and GPS actions

There is a strong relationship between GPS actions, as defined in the customization files (see Section 16.5.2 [Defining Actions], page 191), and scripting languages

Actions can be bound to menus and keys through the customization files or the `Edit->Key shortcuts` dialog.

These actions can execute any script command, See Section 16.5.2 [Defining Actions], page 191. This is done through the `<shell>` XML tag.

But the opposite is also true. From a script, you can execute any action registered in GPS. This can for instance be used to split windows, highlight lines in the editor, ... when no equivalent shell function exists. This can also be used to execute external commands, if the scripting language doesn't support this in an easy manner.

Such calls are made through a call to `execute_action`, as in the following example:

```
execute_action "Split horizontally"
GPS.execute_action (action="Split horizontally")
```

The list of actions known to GPS can be found through the `Edit->Key shortcuts` dialog. Action names are case sensitive.

Some of the shell commands take subprograms as parameters. If you are using the GPS shell, this means you have to pass the name of a GPS action. If you are using Python, this means that you pass a subprogram, See Section 16.8.6 [Subprogram parameters], page 260.

16.8.3 The GPS Shell

The GPS shell is a very simple-minded, line-oriented language. It is accessible through the `Shell` window at the bottom of the GPS window. It is similar to a Unix shell, or a command window on Windows systems.

Type `help` at the prompt to get the list of available commands, or `help` followed by the name of a command to get more information on that specific command.

The following example shows how to get some information on a source entity, and find all references to this entity in the application. It searches for the entity "entity_name", which has at least one reference anywhere in the file "file_name.adb". After the first command, GPS returns an identifier for this entity, which can be used for all commands that need an entity as a parameter, as is the case for the second command. When run, the second command will automatically display all matching references in the location window.

```
GPS> Entity my_entity file_name.adb
<Entity_0x09055790>
GPS> Entity.find_all_refs <Entity_0x09055790>
```

Since the GPS shell is very simple, it doesn't provide any reference counting for the result types. As a result, all the values returned by a command, such as `<Entity_0x09055790>` in the example above, are kept in memory.

The GPS shell provides the command `clear_cache` which removes all such values from the memory. After this command is run, you can no longer use references obtained from previous commands, although of course you can run these commands again to get a new reference.

The return value of the 9 previous commands can easily be recalled by passing `%1`, `%2`, ... on the command line. For instance, the previous example could be rewritten as

```
GPS> Entity my_entity file_name.adb
<Entity_0x09055790>
GPS> Entity.find_all_refs %1
```

These return values will be modified also for internal commands sent by GPS, so you should really only use this when you emit multiple commands at the same time, and don't do any other action in GPS. This is mostly useful when used for command-line scripts (see `--eval` and `--load`), or for custom files, See Section 16.5 [Customizing through XML and Python files], page 187.

Arguments to commands can, but need not, be quoted. If they don't contain any space, double-quote ('`"`') or newline characters, you do not need to quote them. Otherwise, you should surround them with double-quotes, and protect any double-quote part of the argument by preceding it with a backslash.

There is another way to quote a command: use three double-quotes characters in a row. Any character loses its special meaning until the next three double-quotes characters set. This is useful if you do not know in advance the contents of the string you are quoting.

```
Locations.parse """%1 """ category_name
```

16.8.4 The Python Interpreter

Python is an interpreted object-oriented language, created by Guido Van Rossum. It is similar in its capabilities to languages such as Perl, Tcl or Lisp. This section is not a tutorial on python programming. See `http://www.python.org/doc/current/` to access the documentation for the current version of python.

If python support has been enabled, the python shell is accessible through the `Python` window at the bottom of the GPS window. You can also display it by using the menu '`Tools->Consoles->Python`'.

You can type `help(GPS)` in the python console to see the list of functions exported by GPS to python. If you want to save the output of this (or any) command to a file, you can do:

```
>>> e=file("/tmp/gps-help.txt", "w")
>>> sys.stdout=e
>>> help(GPS)
>>> e.flush()
>>> sys.stdout=sys.__stdout__
```

The same example that was used to show the GPS shell follows, now using python. As you can notice, the name of the commands is similar, although they are not run exactly in the same way. Specifically, GPS benefits from the object-oriented aspects of python to create classes and instances of these classes.

In the first line, a new instance of the class Entity is created through the `create_entity` function. Various methods can then be applied to that instance, including `find_all_refs`, which lists all references to that entity in the location window:

```
>>> e=GPS.Entity ("entity_name", "file_name.adb")
>>> e.find_all_refs()
```

The screen representation of the classes exported by GPS to python has been modified, so that most GPS functions will return an instance of a class, but still display their output in a user-readable manner.

Python has extensive introspection capabilities. Continuing the previous example, you can find what class `e` is an instance of with the following command:

```
>>> help(e)
Help on instance of Entity:

<GPS.Entity instance>
```

It is also possible to find all attributes and methods that can be applied to `e`, as in the following example:

```
>>> dir (e)
['__doc__', '__gps_data__', '__module__', 'called_by', 'calls',
'find_all_refs']
```

Note that the list of methods may vary depending on what modules were loaded in GPS, since each module can add its own methods to any class.

In addition, the list of all existing modules and objects currently known in the interpreter can be found with the following command:

```
>>> dir ()
['GPS', 'GPSStdout', '__builtins__', '__doc__', '__name__', 'e', 'sys']
```

You can also load and execute python scripts with the `execfile` command, as in the following example:

```
>>> execfile ("test.py")
```

Python supports named parameters. Most functions exported by GPS define names for their parameters, so that you can use this Python feature, and make your scripts more readable. A notable exception to this rule are the functions that take a variable number of parameters. Using named parameters allows you to specify the parameters in any order you wish, e.g:

```
>>> e=GPS.Entity (name="foo", file="file.adb")
```

16.8.5 Python modules

On startup, GPS will automatically import (with python's `import` command) all the files with the extension '`.py`' found in the directory '`$HOME/.gps/plug-ins`', the directory '`$prefix/share/gps/plug-ins`' or in the directories pointed to by '`GPS_CUSTOM_PATH`'. These files are loaded only after all standard GPS modules have been loaded, as well as the custom files, and before the script file or batch commands specified on the command lines with the `--eval` or `--load` switches.

As a result, one can use the usual GPS functions exported to python in these startup scripts. Likewise, the script run from the command line can use functions defined in the startup files.

Since the `import` command is used, the functions defined in this modules will only be accessible by prefixing their name by the name of the file in which they are defined. For instance if a file '`mystartup.py`' is copied to the startup directory, and defines the function `func`, then the latter will be accessible in GPS through `mystartup.func`.

Python's own mechanism for loading files at startup (the environment variable `PYTHONSTARTUP`) is not suitable for use within the context of GPS. When python is loaded by GPS, the GPS module itself is not yet available, and thus any script that depends on that module will fail to load correctly. Instead, copy your script to one of the plug-ins directories, as documented above.

If you are writing a set of python scripts that other people will use, you need to provide several things:

- The python files themselves. This is a set of '`.py`' files, which the user should install in the '`plug-ins`' directory.
- An XML file with the format described in the customization section of this documentation. This XML file should create a set of actions, through the `<action>` tag, exported to the user. This allows him to either create menus to execute these commands or to bind them to special key shortcuts

Alternatively, your python script can call the command `GPS.parse_xml` to specify some inline XML tags to interpret. These tags can directly create the new menus or key bindings associated with your command.

The following example defines a python command that inserts a line full of dashes ('-') at the current cursor location. This command is associated with the key binding ⟨control-c n⟩, and can be distributed as a single XML file.

```
# This code can be stored in a file test.py in $HOME/.gps/plug-ins
from GPS import *

def add_dashes_line():
   Editor.replace_text (current_context().file().name(),
                        current_context().location().line(),
                        current_context().location().column(),
                        "--------------------------------", 0, 0)
GPS.parse_xml ("""
   <action name="dashes line">
      <shell lang="python">test.add_dashes_line()</shell>
      <context>Source editor</context>
   </action>
   <key action="dashes line">control-c n</key>
""")
```

Several complex examples are provided in the GPS distribution, in the directory 'examples/python'. These are modules that you might want to use for your own GPS, but more important that will show how GPS can be extended from Python.

If your script doesn't do what you expect it to do, there are several ways to debug it, among which the easiest is probably to add some "print" statements. Since some output of the scripts is sometimes hidden by GPS (for instance for interactive commands), you might not see this output.

In this case, you can reuse the tracing facility embedded in GPS itself. Modify the file '$HOME/.gps/traces.cfg', and add the following line:

```
PYTHON.OUT=yes
```

This will include the python traces as part of the general traces available in the file '$HOME/.gps/log'. Note that it may slow down GPS if there is a lot of output to process.

16.8.6 Subprogram parameters

A few of the functions exported by GPS in the GPS shell or in python expect a subprogram as a parameter.

This is handled in different ways depending on what language your are using:

- GPS shell

  It isn't possible to define new functions in the GPS shell. However, this concept is similar to the GPS actions (see Section 16.5.2 [Defining Actions], page 191), which allow you to execute a set of commands and launch external processes.

  Therefore, a subprogram parameter in the GPS shell is a string, which is the name of the action to execute.

  For instance, the following code defines the action "on_edition", which is called every time a new file is edited. The action is defined in the shell itself, although this could be more conveniently done in a separate customization file.

  ```
  parse_xml """<action name="on_edition">
  ```

```
             <shell>echo "File edited"</shell></action>"""
Hook "file_edited"
Hook.add %1 "on_edition"
```

- Python

  Python of course has its own notion of subprogram, and GPS is fully compatible with it. As a result, the syntax is much more natural than in the GPS shell. The following example has the same result as above:

  ```
  import GPS
  def on_edition(self, *arg):
    print "File edited"
  GPS.Hook ("file_edited").add (on_edition)
  ```

  Things are in fact slightly more complex if you want to pass methods are arguments. Python has basically three notions of callable subprograms, detailed below. The following examples all create a combo box in the toolbar, which calls a subprogram whenever its value is changed. The documentation for the combo box indicates that the callback in this case takes two parameters:

  - The instance of the combo
  - The current selection in the combo box

  The first parameter is the instance of the combo box associated with the toolbar widget, and, as always in python, you can store your own data in the instance, as shown in the examples below.

  Here is the description of the various subprograms:

  - Global subprograms

    These are standard subprograms, found outside class definitions. There is no implicit parameter in this case. However, if you need to pass data to such a subprogram, you need to use global variables

    ```
    import GPS

    my_var = "global data"

    def on_changed (combo, choice):
       global my_var
       print "on_changed called: " + \
          my_var + " " + combo.data + " " + choice

    combo = GPS.Combo \
      ("name", label="name", on_changed=on_changed)
    GPS.Toolbar().append (combo)
    combo.data = "My own data"
    ```

  - Unbound methods

These are methods of a class. You do not specify, when you pass the method in parameter to the combo box, what instance should be passed as its first parameter. Therefore, there is no extra parameter either.

Note however than whatever class the method is defined in, the first parameter is always an instance of the class documented in the GPS documentation (in this case a GPS.Combo instance), not an instance of the current class.

In this first example, since we do not have access to the instance of MyClass, we also need to store the global data as a class component. This is a problem if multiple instances of the class can be created.

```
import GPS
class MyClass:
   my_var = "global data"
   def __init__ (self):
      self.combo = GPS.Combo \
         ("name", label="name", on_changed=MyClass.on_changed)
      GPS.Toolbar().append (self.combo)
      self.combo.data = "My own data"

   def on_changed (combo, choice):
      ## No direct access to the instance of MyClass.
      print "on_changed called: " + \
         MyClass.my_var + " " + combo.data + " " + choice

MyClass()
```

As the example above explains, there is no direct access to MyClass when executing on_changed. An easy workaround is the following, in which the global data can be stored in the instance of MyClass, and thus be different for each instance of MyClass.

```
import GPS
class MyClass:
   def __init__ (self):
      self.combo = GPS.Combo \
         ("name", label="name", on_changed=MyClass.on_changed)
      GPS.Toolbar().append (self.combo)
      self.combo.data = "My own data"
      self.combo.myclass = self   ## Save the instance
      self.my_var = "global data"

   def on_changed (combo, choice):
      print "on_changed called: " + \
         combo.myclass.my_var + " " + combo.data + " " + choice

MyClass()
```

- Bound methods

The last example works as expected, but is not convenient to use. The solution here is to use a bound method, which is a method for a specific instance of a class. Such a method always has an extra first parameter, set implicitly by Python or GPS, which is the instance of the class the method is defined in.

Notice the way we pass the method in parameter to append(), and the extra third argument to on_changed in the example below.

```
import GPS
class MyClass:
   def __init__ (self):
      self.combo = GPS.Combo \
         ("name", label="name", on_changed=self.on_changed)
      GPS.Toolbar().append (self.combo)
      self.combo.data = "My own data"
      self.my_var = "global data"

   def on_changed (self, combo, choice):
      # self is the instance of MyClass specified in call to append()
      print "on_changed called: " + \
         self.my_var + " " + combo.data + " " + choice

MyClass()
```

16.8.7 Python FAQ

This section lists some of the problems that have been encountered while using Python inside GPS. This is not a general Python discussion.

16.8.7.1 Spawning external processes

There exist various solutions to spawn external processes from a script:

- Use the functionalities provided by the `GPS.Process` class
- Execute a GPS action through `GPS.execute_action`.

  This action should have an `<external>` XML node indicating how to launch the process
- Create a pipe and execute the process with `os.popen()` calls

  This solution doesn't provide a full interaction with the process, though.
- Use a standard expect library of Python

  The use of an expect library may be a good solution. There are various python expect libraries that already exist.

  These libraries generally try to copy the parameters of the standard `file` class. They may fail doing so, as GPS's consoles do not fully emulate all the primitive functions of that class (there is no file descriptor for instance).

  When possible, it is recommended to use one of the methods above instead.

16.8.7.2 Redirecting the output of spawned processes

In general, it is possible to redirect the output of any Python script to any GPS window (either an already existing one, or creating one automatically), through the "`output`" attribute of XML configuration files.

However, there is a limitation in python that the output of processes spawned through os.exec() or os.spawn() is redirected to the standard output, and not to the usual python output that GPS has overriden.

There are two solutions for this:

- Execute the external process through a pipe

  The output of the pipe is then redirected to Python's output, as in:

  ```
  import os, sys
  def my_external():
     f = os.popen ('ls')
     console = GPS.Console ("ls")
     for l in f.readlines():
        console.write ('   ' + l)
  ```

  This solution allows you, at the same time, to modify the output, for instance to indent it as in the example above.

- Execute the process through GPS

  You can go through the process of defining an XML customization string for GPS, and execute your process this way, as in:

  ```
  GPS.parse_xml ("""
     <action name="ls">
       <external output="output of ls">ls</external>
     </action>""")

  def my_external():
     GPS.execute_action ("ls")
  ```

  This solution also allows you to send the output to a different window than the rest of your script. But you cannot filter or modify the output as in the first solution.

16.8.7.3 Contextual menus on object directories only

The following filter can be used for actions that can only execute in the Project View, and only when the user clicks on an object directory. The contextual menu entry will not be visible in other contexts

```
<?xml version="1.0" ?>
<root>
   <filter name="object directory"
           shell_cmd="import os.path; os.path.samefile (GPS.current_context().project().object_dirs()
           shell_lang="python"
           module="Explorer" />
```

```
      <action name="Test on object directory">
         <filter id="object directory" />
         <shell>echo "Success"</shell>
      </action>

      <contextual action="Test on object directory" >
         <Title>Test on object directory</Title>
      </contextual>
   </root>
```

Another example would be to have a filter so that the contextual menu only appears when on a project node in the Project View. Using `%P` in your command is not enough, since the current context when you click on a file or directory also contain information about the project this file or directory belongs to. Thus this implicit filter will not be enough to hide your contextual menu.

As a result, you need to do a slightly more complex test, where you check that the current context doesn't contains information on directories (which will disable the contextual menu for directories, files and entities). Since the command uses `%P`, GPS garantees that a project is available.

We'll implement this contextual menu in a Python file, called '`filters.py`'.

```
import GPS
def on_project():
try:
GPS.current_context().directory()
return False
except:
return True

GPS.parse_xml ("""
<action name="test_filter">
<filter module="Explorer"
     shell_lang="python"
     shell_cmd="filters.on_project()" />
<shell>echo current project is %P</shell>
</action>
<contextual action="test_filter">
<title>Print current project</title>
</contextual>""")
```

The example above shows the flexibility of filters, since you can pretty much do anything you wish through the shell commands. However, it is complex to write for such a simple filter. Luckily, GPS provides a predefined filter just for that purpose, so that you can write instead, in an XML file:

```
<action name="test_filter" >
<filter id="Explorer_Project_Node" />
<shell>echo current project is %P</shell>
</action>
```

16.8.7.4 Redirecting the output to specific windows

By default, the output of all python commands is displayed in the Python console. However, you might want in some cases to create other windows in GPS for this output. This can be done in one of two ways:

- Define a new action

  If the whole output of your script should be redirected to the same window, or if the script will only be used interactively through a menu or a key binding, the easiest way is to create a new XML action, and redirect the output, as in

  ```
  <?xml version="1.0" ?>
  <root>
    <action name="redirect output" output="New Window">
       <shell lang="python">print "a"</shell>
    </action>
  </root>
  ```

  All the various shell commands in your action can be output in a different window, and this also applies for the output of external commands.

- Explicit redirection

  If, however, you want to control in your script where the output should be sent, for instance if you can't know that statically when you write your commands, you can use the following code:

  ```
  sys.stdin = sys.stdout = GPS.Console ("New window")
  print "foo"
  print (sys.stdin.read ())
  sys.stdin = sys.stdout = GPS.Console ("Python")
  ```

  The first line redirect all input and output to a new window, which is created if it doesn't exist yet. Note however that the output of stderr is not redirected, and you need to explicitely do it for `sys.stderr`.

  The last line restore the default Python console. You must do this at the end of your script, or all scripts will continue to use the new consoles.

  You can alternatively create separate objects for the output, and use them in turn:

  ```
  my_out  = GPS.Console ("New Window")
  my_out2 = GPS.Console ("New Window2")

  sys.stdout=my_out
  print "a"
  sys.stdout=my_out2
  print "b"
  sys.stdout=GPS.Console ("Python")
  ```

  The parameter to the constructor `GPS.Console` indicates whether any output sent to that console should be saved by GPS, and reused for the `%1`, `%2`,

. . . parameters if the command is executed in a GPS action. That should generally be 1, except for stderr where it should be 0.

16.8.7.5 Reloading a python file in GPS

After you have made modification to a python file, you might want to reload it in GPS. This requires careful use of python commands.

Here is an example. Lets assume you have a python file ('"mymod.py"') which contains the following:

```
GPS.parse_xml ("""
   <action name="my_action">
      <shell lang="python">mymod.myfunc()</shell>
   </action>""")

def myfunc():
   print "In myfunc\n"
```

As you can guess from this file, it defines an action "my_action", that you can for instance associate with a keybinding through the Edit->Key shortcuts menu.

If this file has been copied in one of the 'plug-ins' directories, it will be automatically loaded at startup.

Notice that the function myfunc is thus found in a separate namespace, with the name mymod, same as the file.

If you decide, during your GPS session, to edit this file and have the function print "In myfunc2" instead, you then have to reload the file by typing the following command in the Python console:

```
> execfile ("HOME/.gps/plug-ins/mymod.py", mymod.__dict__)
```

The first parameter is the full path to the file that you want to reload. The second argument is less obvious, but indicates that the file should be reloaded in the namespace mymod.

If you omit the optional second parameter, Python will load the file, but the function myfunc will be defined in the global namespace, and thus the new definition is accessible through

```
> myfunc()
```

Thus, the key shortcut you had set, which still executes mymod.myfunc() will keep executing the old definition.

By default, GPS provides a contextual menu when you are editing a Python file. This contextual menu (Python->Reload module) will take care of all the above details.

16.8.7.6 Printing the GPS Python documentation

The python extension provided by GPS is fully documentation in this manual and a separate manual accessible through the Help menu in GPS.

However, this documentation is provided in HTML, and might not be the best suitable for printing, if you wish to do so.

The following paragraph explains how you can generate your own documentation for any python module, including GPS, and print the result.

```
import pydoc
pydoc.writedoc (GPS)
```

In the last comamnd, `GPS` is the name of the module that you want to print the documentation for.

These commands generate a '`.html`' file in the current directory.

Alternatively, you can generate a simple text file with

```
e=file("./python_doc", "w")
e.write (pydoc.text.document (GPS))
e.flush()
```

This text file includes bold characters by default. Such bold characters are correctly interpreted by tools such as '`a2ps`' which can be used to convert the text file into a postscript document.

16.8.7.7 Automatically loading python files at startup

At startup, GPS will automatically load all python files found in the directories '`share/gps/plug-ins`' and '`$HOME/.gps/plug-ins`'.

In addition, python files located under '`<prefix>/share/gps/python`' can be imported (using the `import` command) by any python script.

You can also set the `PYTHONPATH` environment variable to add other directories to the python search path.

16.8.7.8 Hiding contextual menus

GPS provides most of its tools through contextual menus, accessed by right clicking in various parts of GPS. Due to the number of tools provided by GPS, these contextual menus tend to be big, and you might want to control what should be displayed in them. There are several ways to control this:

- Define appropriate filters for your actions

  If you are creating your own contextual menus through customization files and XML, these menus are associated with actions (`<action>`) that you have created yourself most of the time. In this case, you need to define filters appropriately, through the `<filter>` tag, to decide when the action is relevant, and therefore when the contextual menu should be displayed.

- Use shell commands to hide the menus

  If you want to control the visibility of predefined contextual menus, or for menus where you cannot easily modify the associated filter, you can use shell and python commands to hide the menu entry. For this, you will need to find out the name of the menu, which can be done by checking the list returned by `GPS.Contextual.list()` and using the most likely entry. This name is also the value of the `<title>` tag for contextual menus that you have created yourself. Using this name, you can then disable the contextual menu by executing:

  ```
  GPS.Contextual ("name").hide()
  ```

  in the python console

16.8.7.9 Creating custom graphical interfaces

GPS is based on the Gtk+ graphical toolkit, which is available under many platforms and for many programming languages.

You can install an third party package, downloadable from http://www.pygtk.org, which is a python binding to Gtk+. Using pygtk, you will be able to create your own dialogs and graphical windows using the python capabilities provided by GPS.

See the menu `Help->Python Extensions`, in particular the `GPS.MDI` documentation, for a sample of code on how to create your own graphical interfaces and integrate them in GPS.

16.8.8 Hooks

A **hook** is a named set of commands to be executed on particular occasions as a result of user actions in GPS.

GPS and its various modules define a number of standard hooks, which are called for instance when a new project is loaded, when a file is edited, and so on. You can define your own commands to be executed in such cases.

You can find out the list of hooks that GPS currently knows about by calling the **Hook.list** function, which takes no argument, and returns a list of hook names that you can use. More advanced description for each hook is available through the `Help->Python Extensions`.

```
GPS> Hook.list
project_changed
open_file_action_hook
preferences_changed
[...]

Python> GPS.Hook.list()
```

The description of each hooks includes a pointer to the type of the hook, that is what parameters the subprograms in this hook will receive. For instance:

The list of all known hook types can be found through the **Hook.list_types** command. This takes no argument and returns a list of all known types of hooks. As before, you can more information for each of these type through a call to **Hook.describe_type**.

16.8.8.1 Adding commands to hooks

You can add your own command to existing hooks through a call to the **Hook.add** command. Whenever the hook is executed by GPS or another script, your command will also be executed, and will be given the parameters that were specified when the hook is run. The first parameter is always the name of the hook being executed.

This **Hook.add** applies to an instance of the hook class, and takes one parameter, the command to be executed. This is a subprogram parameter (see Section 16.8.6 [Subprogram parameters], page 260).

- GPS shell

  The command can be any GPS action (see Section 16.5.2 [Defining Actions], page 191). The arguments for the hook will be passed to the action, and are available as $1, $2, ...; In the following example, the message "Just executed the hook: project_changed" will be printed in the Shell console. Note that we are defining the action to be executed inline, but this could in fact be defined in a separate XML customization file for convenience.

  ```
  GPS> parse_xml """<action name="my_action"><shell>echo "Just executed the hook"</shell></action_
  GPS> Hook project_changed
  GPS> Hook.add %1 "my_action"
  ```

- Python

  The command must be a subprogram to execute. The arguments for the hook will be passed to this subprogram. In the following example, the message "The hook project_changed was executed by GPS" will be displayed in the Python console whenever the project changes.

  ```
  def my_callback (name):
      print "The hook " + name + " was executed by GPS"
  GPS.Hook ("project_changed").add (my_callback)
  ```

The example above shows the simplest type of hook, which doesn't take any argument. However, most hooks receive several parameters. For instance, the hook "file_edited" receives the file name as a parameter.

- GPS shell

  The following code will print the name of the hook ("file_edited") and the name of the file in the shell console every time a file is open by GPS.

  ```
  GPS> parse_xml """<action name="my_action"><shell>echo name=$1 file=$2</shell></action>"""
  GPS> Hook "file_edited"
  GPS> Hook.add %1 "my_action"
  ```

- Python

  The following code prints the name of the file being edited by GPS in the python console whenever a new editor is opened. The second argument is of type GPS.File.

  ```
  def my_file_callback (name, file):
      print "Editing " + file.name()
  GPS.Hook ("file_edited").add (my_file_callback)
  ```

16.8.8.2 Action hooks

Some hooks have a special use in GPS. Their name always ends with "_action_hook".

As opposed to the standard hooks described in the previous section, the execution of the action hooks stops as soon as one of the subprograms returns a True value ("1" or "true"). The subprograms associated with that hook are executed one after the other. If any such subprogram knows how to act for that hook, it should do the appropriate action and return "1".

Other action hooks expect a string as a return value instead of a boolean. The execution will stop when a subprogram returns a non-empty string.

This mechanism is used extensively by GPS internally. For instance, whenever a file needs to be opened in an editor, GPS executes the "open_file_action_hook" hook to request its editing. Several modules are connected to that hook.

One of the first modules to be executed is the external editor module. If the user has chosen to use an external editor, this module will simply spawn Emacs or the external editor that the user has selected, and return 1. This immediately stops the execution of the "open_file_action_hook".

However, if the user doesn't want to use external editors, this module will return 0. This will keep executing the hook, and in particular will execute the source editor module, which will always act and open an editor internally in GPS.

This is a very flexible mechanism. In your own script, you could choose to have some special handling for files with a ".foo" extension for instance. If the user wants to open such a file, you would spawn for instance an external command (say "my_editor") on this file, instead of opening it in GPS.

This is done with a code similar to the following

```
from os.path import *
import os
def my_foo_handler (name, file, line, column, \
                    column_end, enable_nav, new_file, reload):
    if splitext (file.name())[1] == ".foo":
        os.spawnv \
           (os.P_NOWAIT, "/usr/bin/emacs", ("emacs", file.name()))
```

```
          return 1   ## Prevent further execution of the hook
       return 0  ## Let other subprograms in the hook do their job

   GPS.Hook ("open_file_action_hook").add (my_foo_handler)
```

16.8.8.3 Running hooks

Any module in GPS is responsible for running the hooks when appropriate. Most of the time, the subprograms exported by GPS to the scripting languages will properly run the hook. But you might also need to run them in your own scripts.

As usual, this will result in the execution of all the functions bound to that hook, whether they are defined in Ada or in any of the scripting languages.

This is done through the **Hook.run** command. This applies to an instance of the Hook class, and a variable number of arguments These must be in the right order and of the right type for that specific type of hook.

If you are running an action hook, the execution will stop as usual as soon as one of the subprograms return a True value.

The following example shows how to run a simple hook with no parameter, and a more complex hook with several parameters. The latter will in fact request the opening of an editor for the file in GPS, and thus has an immediately visible effect on the interface. The file is opened at line 100. See the description of the hook for more information on the other parameters.

```
GPS.Hook ("project_changed").run()
GPS.Hook ("open_file_action_hook").run \
            (GPS.File ("test.adb"), 100, 1, 0, 1, 1, 1)
```

16.8.8.4 Creating new hooks

The list of hooks known to GPS is fully dynamic. GPS itself declares a number of hooks, mostly for its internal use although of course you can also connect to them.

But you can also create your own hooks to report events happening in your own modules and programs. This way, any other script or GPS module can react to these events.

Such hooks can either be of a type exported by GPS, which constraints the list of parameters for the callbacks, but make such hooks more portable and secure; or they can be of a general type, which allows basically any kind of parameters. In the latter case, checks are done at runtime to ensure that the subprogram that is called as a result of running the hook has the right number of parameters. If this isn't the case, GPS will complain and display error messages. Such general hooks will also not pass their parameters to other scripting languages.

Creating new hooks is done through a call to **Hook.register**. This function takes two arguments: the name of the hook you are creating, and the type of the hook.

The name of the hook is left to you. Any character is allowed in that name, although using only alphanumerical characters is recommended.

The type of the hook must be one of the following:

- `""` (the empty string)

  This indicates that the hook doesn't take any argument. None should be given to **Hook.run**, and none should be expected by the various commands connected to that hook, apart from the hook name itself.
- one of the values returned by **Hook.list_types**

  This indicates that the hook is of one of the types exported by GPS itself. The advantage of using such explicit types as opposed to `"general"` is that GPS is able to make more tests for the validity of the parameters. Such hooks can also be connected to from other scripting languages.
- `"general"`

  This indicates that the hook is of the general type that allows any number of parameter, of any type. Other scripts will be able to connect to it, but will not be executed when the hook is run if they do not expect the same number of parameters that was given to **Hook.run**. Other scripts in other language will only receive the hook name in parameter, not the full list of parameters.

A small trick worth noting: if the command bound to a hook doesn't have the right number of parameters that this hook provide, the command will not be executed and GPS will report an error. You can make sure that your command will always be executed by either giving default values for its parameter, or by using python's syntax to indicate a variable number of arguments.

This is especially useful if you are connecting to a `"general"` hook, since you do not really know in advance how many parameters the call of **Hook.run** will provide.

```
## This callback can be connected to any type of hook
def trace (name, *args):
   print "hook=" + name

## This callback can be connected to hooks with one or two parameters
def trace2 (name, arg1, arg2=100):
   print "hook=" + str (arg1) + str (arg2)

Hook.register ("my_custom_hook", "general")
Hook ("my_custom_hook").add (trace2)
Hook ("my_custom_hook").run (1, 2) ## Prints 1 2
Hook ("my_custom_hook").run (1)    ## Prints 1 100
```

16.9 Adding support for new Version Control Systems

16.9.1 Custom VCS interfaces

The Version Control interface in GPS can be customized, either to refine the behavior of the existing system and adapt it to specific needs, or to add support for other Version Control systems.

Custom VCS interfaces are defined entirely through XML files. Those files are read in the same location as all the other XML customizations that GPS offers. See Section 16.5 [Customizing through XML and Python files], page 187 for a complete description.

There are two steps to follow when creating a custom VCS interface. The first step is to describe the VCS itself, and the second step is to implement actions corresponding to all the operations that this VCS can perform. The following two sections (Section 16.9.2 [Describing a VCS], page 274 and Section 16.9.3 [Implementing VCS actions], page 279) describe those steps.

GPS is distributed with XML files describing the interfaces to ClearCase, CVS and Subversion. These XML files are located in the directory `share/gps/plug-ins` in the GPS installation, and can be used as a reference for implementing new custom VCS interfaces.

16.9.2 Describing a VCS

16.9.2.1 The VCS node

The `vcs` node is the toplevel node which contains the description of the general behavior expected from the VCS. It has the following attributes:

`name`
: The attribute `name` indicates the identifier of the VCS. The casing of this name is important, and the same casing must be used in the project files.

`absolute_names`
: The attribute `absolute_names` indicates the behavior of the VCS relative to file names, and can take the values `TRUE` or `FALSE`. If it is set to `TRUE`, it means that all commands in the VCS will work on absolute file names. If it set to `FALSE`, it means that all actions work on base file names, and that GPS will move to the appropriate directory before executing an action.

`group_queries_by_directory`
: The attribute `group_queries_by_directory` indicates that, when querying status for all the source files in a directory, a query for the directory should be launched, instead of launching a query for

multiple files. This operation is faster on some Version Control systems. By default, this is set to `FALSE`.

`ignore_file`
: The attribute `ignore_file` specifies the name of the file used by the VCS Explorer to get the list of files to ignore. By default for the CVS mode this is set to '`.cvsignore`'.

`atomic_commands`
: The attribute `atomic_commands` specifies if the VCS supports atomicity and can take the values `TRUE` or `FALSE`. If it is set to `TRUE` it means that the VCS supports atomic commands. It is `FALSE` by default. This attribute is important to trigger the activities group commit feature. See See Section 12.2 [The VCS Activities], page 136.

`path_style`
: The attribute `path_style` specifies which kind of directory separator is supported by the VCS and can take the values `UNIX`, `DOS`, `Cygwin` or `System_Default`. The later value is the default value. With this attribute it is possible to control the directory separator to use when specifying files to the VCS. For the `Cygwin` case the drive is specified as `/cygdrive/<drive>`.

`dir_sep`
: Alias for `path_style`, obsolescent.

`commit_directory`
: The attribute `commit_directory` specifies if the VCS supports commit on directories and can take the values `TRUE` or `FALSE`. If it is set to `TRUE` it means that the VCS supports commit on directories this is the case for `Subversion` for example.

Note that to support group commit with shared log on GPS both `absolute_name` and `atomic_commands` must be true. This is the case for the Subversion VCS for example.

Here is an example, adapted to the use of CVS:

```
<vcs name="Custom CVS" absolute_names="FALSE">

   (... description of action associations ...)
   (... description of supported status ...)
   (... description of output parsers ...)

</vcs>
```

16.9.2.2 Associating actions to operations

GPS knows about a certain set of predefined "operations" that a VCS can perform. The user can decide to implement some of them - not necessarily all of them - in this section.

The following node is used to associate a predefined operation to an action:

```
<OPERATION  action="ACTION_LABEL" label="NAME OF OPERATION" />
```

Where:

'OPERATION'
: is the name of the predefined action. The list of predefined actions is described in Section 16.9.3 [Implementing VCS actions], page 279,

'ACTION_LABEL'
: is the name of the corresponding gps Action that will be launched when GPS wants to ask the VCS to perform OPERATION,

'NAME OF OPERATION'
: is the name that will appear in the GPS menus when working on a file under the control of the defined VCS.

16.9.2.3 Defining revision information

Some VCS reports revisions number from which it is possible to deduce the related branches. This is the case in CVS for example where a revision number for a branch uses as prefix the branch point revision number. For such VCS it is possible to specify two regular expressions:

`parent_revision`
: Parse the revision number and report as first match the parent revision.

```
<parent_revision regexp="..." />
```

For CVS on **1.2.4.5** it must match **1.2**.

`branch_root_revision`
: Parse the revision number and report as first match the branch root revision.

```
<branch_root_revision regexp="..." />
```

For CVS on **1.2.4.5** it must match **1.2.4**.

16.9.2.4 Defining status

All VCS have the notion of "status" or "state" to describe the relationship between the local file and the repository. The XML node `status` is used to describe the status that are known to a custom VCS, and the icons associated to it:

```
<status label="STATUS_LABEL" stock="STOCK_LABEL" />
```

Where:

'STATUS_LABEL'
: is the name of the status, for example "Up to date" or "Needs update" in the context of CVS.

'`STOCK_LABEL`'
: is the stock identifier of the icon associated to this status, that will be used, for example, in the VCS Explorer. See section Section 16.5.18 [Adding stock icons], page 233 for more details on how to define stock icons.

Note that the order in which status are defined in the XML file is important: the first status to be displayed must correspond to the status "Up-to-date" or equivalent.

16.9.2.5 Output parsers

There are cases in which GPS needs to parse the output of the VCS commands: when querying the status, or when "annotating" a file.

The following parsers can be implemented in the `vcs` node.

`<status_parser>` **and** `<local_status_parser>`
: These parsers are used by the command VCS.status_parse, to parse a string for the status of files controlled by a VCS.

  They accept the following child nodes:

  `<regexp>` **(mandatory)**
  : Indicates the regular expression to match.

  `<file_index>`
  : An index of a parenthesized expression in `regexp` that contains the name of a file.

  `<status_index>`
  : An index of a parenthesized expression in `regexp` that contains the file status. This status is passed through the regular expressions defined in the `status_matcher` nodes, see below.

  `<local_revision_index>`
  : An index of a parenthesized expression in `regexp` that contains the name of the local revision (the version of the file that was checked out).

  `<repository_revision_index>`
  : An index of a parenthesized expression in `regexp` that contains the name of the repository revision (the latest version of the file in the VCS).

  `<status_matcher>`
  : A regular expression which, when matching an expressions, identifies the status passed in the node attribute `label`.

`<annotations_parser>`
: This parser is used by the command VCS.annotations_parse, to parse a string for annotations in a file controlled by a VCS.

  It accepts the following child nodes:

  `<regexp>` **(mandatory)**
  : Indicates the regular expression to match.

  `<repository_revision_index>` **(mandatory)**
  : An index of a parenthesized expression in `regexp` that contains the repository revision of the line.

  `<author_index>`
  : An index of a parenthesized expression in `regexp` that contains the author of the line.

  `<date_index>`
  : An index of a parenthesized expression in `regexp` that contains the date of the line.

  `<file_index>`
  : An index of a parenthesized expression in `regexp` that indicates the part of the line that belongs to the file.

  `<tooltip_pattern>`
  : A template pattern that will be used to format the tooltip information. It can contain text and reference parenthesized expressions in `regexp` using `\n` (where `n` represents the nth expression in `regexp`).

`<log_parser>`
: This parser is used by the command VCS.log_parse, to parse a string for revision histories in a file controlled by a VCS.

  It accepts the following child nodes:

  `<regexp>` **(mandatory)**
  : Indicates the regular expression to match.

  `<repository_revision_index>` **(mandatory)**
  : An index of a parenthesized expression in `regexp` that contains the repository revision of the log.

  `<author_index>`
  : An index of a parenthesized expression in `regexp` that contains the author of the log.

  `<date_index>`
  : An index of a parenthesized expression in `regexp` that contains the date of the log.

`<log_index>`
: An index of a parenthesized expression in `regexp` that contains the actual text of the log.

`<revision_parser>`
: This parser is used by the command VCS.revision_parse, to parse a string for revision tags and branches in a file controlled by a VCS.

  It accepts the following child nodes:

  `<regexp>` **(mandatory)**
  : Indicates the regular expression to match.

  `<sym_index>` **(mandatory)**
  : An index of a parenthesized expression in `regexp` that contains the tags or branches symbolic name of the revision.

  `<repository_revision_index>` **(mandatory)**
  : An index of a parenthesized expression in `regexp` that contains the repository revision number of the revision.

16.9.3 Implementing VCS actions

A number of "standard" VCS operations are known to GPS. Each of these operations can be implemented, using Actions. See Section 16.5.2 [Defining Actions], page 191) for a complete description of how to implement actions.

Here is a list of all the defined VCS operations, and their parameters:

`status_files`

```
$1 = whether the log files should be cleared when obtaining
up-to-date status
$2- = the list of files to query status for.
```

Query the status for a list of files. This should perform a complete VCS query and return results as complete as possible.

`status_dir`

```
$1 = the directory.
```

Same as above, but works on all the files in one directory.

`status_dir_recursive`

```
$1 = the directory.
```

Same as above, but works on all the files in one directory and all subdirectories, recursively.

`local_status_files`

`$* = list of files`

Query the local status for specified files. This query should be as fast as possible, not connecting to any remote VCS. The results need not be complete, but it is not useful to implement this command if the output does not contain at least the working revision.

`open`

`$* = list of files`

Open files or directories for editing. This command should be implemented on any VCS that require an explicit check-out/open/edit action before being able to edit a file.

`update`

`$* = list of files`

Bring the specified files in sync with the latest repository revision.

`resolved`

`$* = list of files`

Mark files' merge conflics as resolved. Some version control systems (like Subversion) will block any commit until this action is called.

`commit`

`$1 = log file`
`$2- = list of files`

Commit/submit/check-in files or directories with provided log. The log is passed in a file.

`commit_dir`

`$1 = log`

`$2 = directory`

Commit/submit one directory with provided log. The log is passed in a file.

`history_text`

`$1 = file`

Query the entire changelog history for the specified file. The result is expected to be placed into an editor as plain text.

`history`

`$1 = file`

Query the entire changelog history for the specified file. The result is expected to be placed into a Revision View.

`history_revision`

`$1 = revision`
`$2 = file`

Query the history for corresponding revision of the specified file.

`annotate`

`$1 = file`

Query the annotations for a file.

`add`

`$1 = log`

`$2- = list of files or dirs`

Add files/dirs to the repository, with the provided revision log. The added files/dirs are commited.

`add_no_commit`

`$1 = log`

`$2- = list of files or dirs`

Add files/dirs to the repository, with the provided revision log. The added files/dirs are not commited.

`remove`

`$1 = log`

`$2 = file or dir`

Remove file/dir from the repository, with the provided revision log.

`remove_no_commit`

`$1 = log`

`$2 = file or dir`

Remove file/dir from the repository, with the provided revision log. The removed files/dirs are not commited.

`revert`

`$* = files`

Revert the local file to repository revision, cancelling all local changes, and close the file for editing if it was open.

`diff_patch`

`$1 = file`

Create a textual diff for the given file. This command is used to build the activity patch file.

`diff_head`

`$1 = file`

Display a visual comparison between the local file and the latest repository revision. The diff command must report a *normal* diff as opposed to *context* or *unified* ones.

`diff_base_head`

`$1 = file`

Display a visual comparison between the revision from which the file has been checked-out and the latest revision. The diff command must report a *normal* diff as opposed to *context* or *unified* ones.

`diff_working`

`$1 = file`

Display a visual comparison between the local file and the revision from which it was obtained. The diff command must report a *normal* diff as opposed to *context* or *unified* ones.

`diff`

`$1 = rev`

`$2 = file`

Display a visual comparison between the local file and the specified revision. The diff command must report a *normal* diff as opposed to *context* or *unified* ones.

`diff2`

```
$1 = revision 1
$2 = revision 2
$3 = file
```

Display a visual comparison between the two specified revisions of the file. The diff command must report a *normal* diff as opposed to *context* or *unified* ones.

16.10 The Server Mode

In order to give access to the GPS capabilities from external processes (e.g. `Emacs`), GPS can be launched in *server mode*.

The two relevant command line switches are `--server` and `--hide`.

`--server` will open a socket on the given port, allowing multiple clients to connect to a running GPS, and sending GPS shell or python commands.

`--hide` tells GPS not to display its main window when starting. note that under unix systems, you still need to have access to the current screen (as determined by the `DISPLAY` environment variable) in this mode.

Using the two switches together provides a way to launch GPS as a background process with no initial user interface.

Clients connecting through a standard socket have access to a simple shell using `GPS>>` as the separating prompt between each command. This is needed in order to determine when the output (result) of a command is terminated.

All the GPS shell commands (as defined in Section 16.8.3 [The GPS Shell], page 256) are available from this shell. In addition, the python interpreter, if enabled, is also available through the use of the `python` prefix before a python command.

For example, sending `pwd` through the socket will send the `pwd` command through the GPS shell and display the result on the socket; similarly, sending `python GPS.pwd()` will send the `GPS.help()` command through the python interpreter (see Section 16.8.4 [The Python Interpreter], page 257 for more details).

The socket shell provides also additional commands:

- logout This command will inform the GPS server that the connection should now be closed.
- id <string> This command will register the current session with a given string. This string can then be used within GPS itself (for example via a .xml or python plug-in) to display extra information to the client via the socket, using the command GPS.Socket().send.

For example, let suppose that we start gps with the `--server=1234` command: this will bring up GPS as usual.

Now, on a separate terminal, create a simple client by typing the following:

```
telnet localhost 1234
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
GPS>> id test-1
id set to 'test-1'
GPS>> pwd
c:\working-dir\
GPS>>
```

Then in the GPS Python Console:

```
>>> GPS.Socket ("test-1").send ("hello, it’s time to logout\n");
```

At this point, the following is received on the client (telnet) side:

```
GPS>> hello, it’s time to logout
```

We can then close the client:

```
logout
Connection closed by foreign host.
```

17 Environment

17.1 Command Line Options

```
Usage:
   gps [options] [-Pproject-file] [[+line] source1] [[+line] source2] ...
Options:
   --help              Show this help message and exit
   --version           Show the GPS version and exit
   --debug[=program]   Start a debug session and optionally load the
                       program with the given arguments
   --debugger debugger Specify the debugger's command line
   --hide              Hide GPS main window
   --host=tools_host   Use tools_host to launch tools (e.g. gdb)
   --target=TARG:PRO   Load program on machine TARG using protocol PRO
   --load=lang:file    Execute an external file written in the
                       language lang
   --eval=lang:file    Execute an in-line script written in the
                       language lang
   --readonly          Open all files in read-only mode
   --server=port       Start GPS in server mode, opening a socket on the
                       given port
   --tracelist         Output the current configuration for logs
   --traceon=name      Activate the logs for a given module
   --traceoff=name     Deactivate the logs for a given module
   --tracefile=file    Parse an alternate configuration file for the logs

Source files can be absolute or relative pathnames.
If you prepend a file name with '=', this file will be
searched anywhere on the project's source path

To open a file at a given line, use the '+line' prefix, e.g.
gps +40 source.adb

tools_host corresponds to a remote host's nickname as defined in
Section 15.2 [Setup the remote servers], page 159.
```

17.2 Environment Variables

The following environment variables can be set to override some default settings in GPS:

'GPS_ROOT'
: Override the default root directory specified when GPS is built (during the *configure* process, see the file INSTALL in the GPS sources for more details) to access information such as the location of the translation files.

'GPS_HOME'
: Override the variable HOME if present. All the configuration files and directories used by GPS are either relative to $HOME/.gps (%HOME%\.gps under Windows) if GPS_HOME is not set, or to $GPS_HOME/.gps (respectively %GPS_HOME%\.gps) if set.

'GPS_DOC_PATH'
: Set the search path for the documentation. See Section 3.2 [Adding New Help Files], page 20.

'GPS_CUSTOM_PATH'
: Contains a list of directories to search for custom files. See Section 16.5 [Customizing through XML and Python files], page 187 for more details.

'GPS_CHANGELOG_USER'
: Contains the user and e-mail to use in the global ChangeLog files. Note that the common usage is to have two spaces between the name and the e-mail. Ex: "John Does <john.doe@home.com>"

'GPS_STARTUP_PATH'
: Contains the value of the `PATH` environment variable just before GPS was started. This is used by GPS to restore the proper environment before spawning applications, no matter what particular directories it needed to set for its own purpose.

'GPS_STARTUP_LD_LIBRARY_PATH'
: Same as `GPS_STARTUP_LD_LIBRARY_PATH` but for the `LD_LIBRARY_PATH` variable.

17.3 Running GPS on Mac OS X

The current version of GPS on Mac OS X requires an X11 server. Such a server is distributed with Mac OS X Panther and Mac OS X Tiger.

Additionally, if you are launching GPS from a standard Terminal, you need to specify the display on which to launch GPS, by typing:

```
export DISPLAY=:0
```

before launching GPS.

Note: GPS does not support files with line endings in CR.

17.4 Files

'$HOME/.gps'
: GPS state directory. Defaults to C:\.gps under Windows systems if HOME or USERPROFILE environment variables are not defined.

'$HOME/.gps/log'
: Log file created automatically by GPS. When GPS is running, it will create a file named 'log.<pid>', where '<pid>' is the GPS process id, so that multiple GPS sessions do not clobber each other's log. In case of a successful session, this file is renamed 'log' when exiting; in case of an unexpected exit (a bug box will be displayed), the log file is kept under its original name.

  Note that the name of the log file is configured by the 'traces.cfg' file.

'$HOME/.gps/aliases'
: File containing the user-defined aliases (see Section 16.5.13 [Defining text aliases], page 219).

'$HOME/.gps/plug-ins'
: Directory containing files with user-defined plug-ins. All xml and python files found under this directory are loaded by GPS during start up. You can create/edit these files to add your own menu/toolbar entries in GPS, or define support for new languages. see Section 16.5 [Customizing through XML and Python files], page 187 and see Section 16.5.12 [Adding support for new languages], page 214.

'$HOME/.gps/keys.xml'
: Contains all the key bindings for the actions defined in GPS or in the custom files. This only contains the key bindings overridden through the key shortcuts editor (see Section 16.3 [The Key Manager Dialog], page 184).

'$HOME/.gps/gtkrc'
: Configuration and theme file for gtkrc. This file can be edited to activate gtk+ specific aspects, or change the look of GPS in some measure. Mostly, everything can be done through the standard GPS preferences, but this file can be used to get access to the old GPS preference "Dynamic Key Binding". This preference activated a gtk+ behavior were key shortcuts for menu can be changed by simply pressing the appropriate key combination when the mouse is over that menu. It has various dangereous aspects and is not fully supported by GPS, so was removed as a preference, but you can add the following line in 'gtkrc' to get this back:

```
gtk-can-change-accels=1
```

'$HOME/.gps/actions.xml'
: Contains the definition of all the actions that were defined through the graphical interface. This is loaded last, and overrides all actions defined elsewhere.

'`$HOME/.gps/desktop.xml`'
: Desktop file in XML format (using the menu `File->Save More->Desktop`), loaded automatically if found.

'`$HOME/.gps/locations.xml`'
: This file contains the list of locations that GPS has previously edited. It corresponds to the history navigation (`Navigate->Back` and `Navigate->Forward`)

'`$HOME/.gps/properties.xml`'
: This file is used to store file-specific properties across GPS sessions. In particular, it contains the encoding to use for various files when the default encoding isn't appropriate.

'`$HOME/.gps/histories.xml`'
: Contains the state and history of combo boxes (e.g. the `Run->Custom...` dialog).

'`$HOME/.gps/preferences`'
: Contains all the preferences in XML format, as specified in the preferences menu.

'`$HOME/.gps/traces.cfg`'
: Default configuration for the system traces. These traces are used to analyze problems with GPS. By default, they are sent to the file '`$HOME/.gps/log.<pid>`'.

  This file is created automatically when the '`$HOME/.gps/`' directory is created. If you remove it manually, it won't be recreated the next time you start GPS.

'`$HOME/.gps/startup.xml`'
: This file contains the list of scripts to load at startup, as well as additional code that need to be executed to setup the script.

'`$HOME/.gpe/activity_log.tmplt`'
: Template file used to generate activities' group commit-log and patch file's header. If not present the system wide template (see below) is used. The set of configurable tags are described into this template.

'*prefix*'
: The prefix directory where GPS is installed, e.g '`/opt/gps`'.

'*prefix*`/bin`'
: The directory containing the GPS executables.

'*prefix*`/etc/gps`'
: The directory containing global configuration files for GPS.

'*prefix*`/lib`'
: This directory contains the shared libraries used by GPS.

‘*prefix*/share/doc/gps/html’
GPS will look for all the documentation files under this directory.

‘*prefix*/share/examples/gps’
This directory contains source code examples.

‘*prefix*/share/examples/gps/language’
This directory contains sources showing how to provide a shared library to dynamically define a new language. See Section 16.5.12 [Adding support for new languages], page 214.

‘*prefix*/share/examples/gps/tutorial’
This directory contains the sources used by the GPS tutorial.

‘*prefix*/share/gps/plug-ins’
Directory containing files with system-wide plug-ins (xml and python files) loaded automatically at start-up.

‘*prefix*/share/gps/library’
Directory containing files with system-wide plug-ins (xml and python files) that are not loaded automatically at startup, but can be selected in the Plug-ins editor.

‘*prefix*/share/gps/gps-animation.png’
Default image displayed in the top right corner of GPS when GPS is idle.

‘*prefix*/share/gps/gps-animation.gif’
Animated image displayed in the top right corner of GPS to indicate that actions (e.g compilation) are on going. If you remove this file, the idle image (‘gps-animation.png’) will always be displayed.

‘*prefix*/share/gps/gps-splash.png’
Splash screen displayed by default when GPS is started.

‘*prefix*/share/gps/desktop.xml’
This is the description of the default desktop that GPS uses when the user hasn’t defined his own default desktop and no project specific desktop exists. You can modify this file if you want, knowing that this will impact all users of GPS sharing this installation. The format of this file is the same as $HOME/.gps/desktop.xml, which can be copied from your own directory if you wish.

‘*prefix*/share/gps/default.gpr’
Default project used by GPS. Can be modified after installation time to provide useful default for a given system or project.

‘*prefix*/share/gps/readonly.gpr’
Project used by GPS as the default project when working in a read-only directory.

'*prefix*/share/gps/activity_log.tmplt'
: Template file used by default to generate activities' group commit-log and patch file's header. This file can be copied into user home directory and customized (see above).

'*prefix*/share/locale'
: Directory used to retrieve the translation files, when relevant.

17.5 Reporting Suggestions and Bugs

If you would like to make suggestions about GPS, or if you encountered a bug, please report it to mailto:report@gnat.com if you are a supported user, and to mailto:gps-devel@lists.act-europe.fr otherwise.

Please try to include a detailed description of the problem, including sources to reproduce it if possible/needed, and/or a scenario describing the actions performed to reproduce the problem, as well as the tools (e.g *debugger*, *compiler*, *call graph*) involved.

The files '$HOME/.gps/log' may also bring some useful information when reporting a bug.

In case GPS generates a bug box, the log file will be kept under a separate name ('$HOME/.gps/log.<pid>' so that it does not get erased by further sessions. Be sure to include the right log file when reporting a bug box.

17.6 Solving Problems

This section addresses some common problems that may arise when using or installing GPS.

'Non-privileged users cannot start GPS'
: Q: I have installed GPS originally as super user, and ran GPS successfully, but normal users can't.

: A: You should check the permissions of the directory $HOME/.gps and its subdirectories, they should be owned by the user.

'GPS crashes whenever I open a source editor'
: This is usually due to font problems. Editing the file '$HOME/.gps/preferences' and changing the name of the fonts, e.g changing *Courier* by *Courier Medium*, and *Helvetica* by *Sans* should solve the problem.

'GPS refuses to start the debugger'
: If GPS cannot properly initialize the debugger (using the menu Debug->Initialize), it is usually because the underlying debugger (gdb) cannot be launched properly. To verify this, try to launch the 'gdb' command from a shell (i.e outside GPS). If gdb cannot be

launched from a shell, it usually means that you are using a wrong version of gdb (e.g a version of gdb built for Solaris 8, but run on Solaris 2.6).

'`GPS is frozen during a debugging session`'
: If GPS is no longer responding while debugging an application you should first wait a little bit, since some communications between GPS and gdb can take a long time to finish. If GPS is still not responding after a few minutes, you can usually get the control back in GPS by either typing ⟨Ctrl-C⟩ in the shell where you've started GPS: this should unblock it; if it does not work, you can kill the gdb process launched by GPS using the `ps` and `kill`, or the `top` command under Unix, and the `Task Manager` under Windows: this will terminate your debugging session, and will unblock GPS.

'`My Ada program fails during elaboration. How can I debug it ?`'
: If your program was compiled with GNAT, the main program is generated by the binder. This program is an ordinary Ada (or C if the '`-C`' switch was used) program, compiled in the usual manner, and fully debuggable provided that the '`-g`' switch is used on the `gnatlink` command (or '`-g`' is used in the `gnatmake` command itself).

  The name of this package containing the main program is '`b~xxx.ads/adb`' where xxx is the name of the Ada main unit given in the gnatbind command, and you can edit and debug this file in the normal manner. You will see a series of calls to the elaboration routines of the packages, and you can debug these in the usual manner, just as if you were debugging code in your application.

'`How can I debug the Ada run-time library ?`'
: The run time distributed in binary versions of GNAT hasn't been compiled with debug information. Thus, it needs to be recompiled before you can actually debug it.

  The simplest is to recompile your application by adding the switches '`-a`' and '`-f`' to the `gnatmake` command line. This extra step is then no longer required, assuming that you keep the generated object and ali files corresponding to the GNAT run time available.

  Another possibility on Unix systems is to use the file '`Makefile.adalib`' that can be found in the adalib directory of your GNAT installation and specify e.g '`-g -O2`' for the '`CFLAGS`' switches.

'`The GPS main window is not displayed`'
: If when launching GPS, nothing happens, you can try to rename the '`.gps`' directory (see Section 17.4 [Files], page 286) to start from a fresh set up.

'`My project have several files with the same name. How can I import it in GPS?`'

GPS's projects do not allow implicit overriding of sources file, i.e. you cannot have multiple times the same file name in the project hierarchy. The reason is that GPS needs to know exactly where the file is, and cannot reliably guess which occurrence to use.

There are several solutions to handle this issue:

- Put all duplicate files in the same project

  There is one specific case where a project is allowed to have duplicate source files: if the list of source directories is specified explicitly. All duplicate files must be in the same project. With these conditions, there is no ambiguity for GPS and the GNAT tools which file to use, and the first file found on the source path is the one hiding all the others. GPS only shows the first file.

  You can then have a scenario variable that changes the order of source directories to give visibility on one of the other duplicate files.

- Use scenario variables in the project

  The idea is that you define various scenarios in your project (For instance compiling in `"debug"` mode or `"production"` mode), and change the source directories depending on this setup. Such projects can be edited directly from GPS (in the project properties editor, this is the right part of the window, as described in this documentation). On top of the project view (left part of the GPS main window), you have a combo box displayed for each of the variable, allowing a simple switch between scenarios depending on what you want to build.

- Use extending projects

  These projects cannot currently be created through GPS, so you will need to edit them by hand. See the GNAT user's guide for more information on extending projects.

  The idea behind this approach is that you can have a local overriding of some source files from the common build/source setup (if you are working on a small part of the whole system, you may not want to have a complete copy of the code on your local machine).

'`GPS is very slow compared to previous versions under unix (GPS < 4.0.0)`'

GPS 4.0.0 and above need the X RENDER extension when running under unix systems to perform at a reasonable speed, so you need to make sure you X server properly supports this extension.

Index