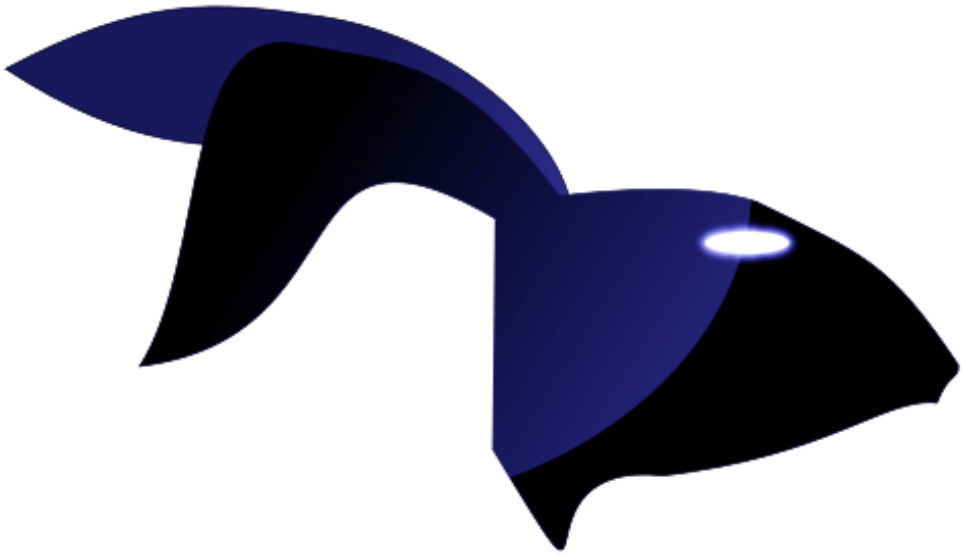
ViTE - Visual Trace Explorer

October 19, 2020



User Manual

Release 1.2

Contents

1 - Licence of *ViTE*

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2 - Overview

2.1 What is ViTE?

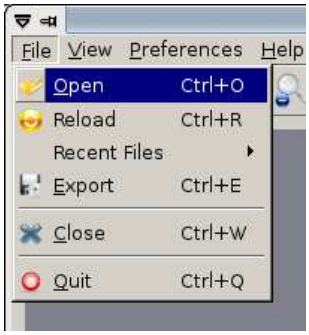
ViTE is a **powerful**, **portable** and **open-source** profiling tool designed to visualize traces produced by parallel applications.

It allows to **open** several and common trace formats (OTF, TAU, *Pajé* , etc.), **browse**, **export**, **filter**, **retrieve** information and **draw** graphical statistics from these trace files.

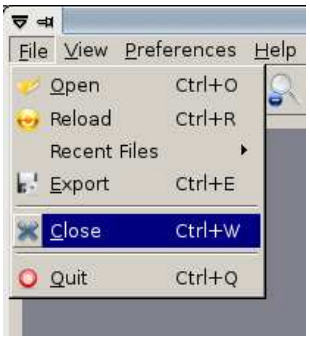
These traces can be generated using **Eztrace** or **GTG**. (cf chapter 6 p.13)

2.2 ViTE: As Easy As...

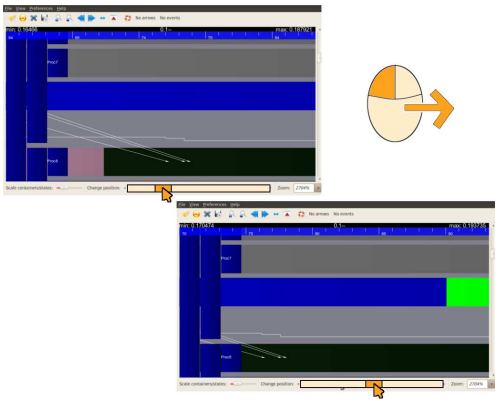
Open



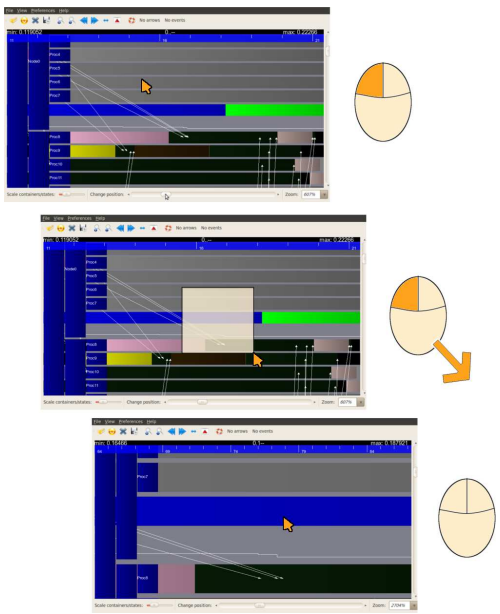
Close



Horizontal Scrolling



Zoom



3 - Introduction

With the ever increasing dissemination of multi-core architectures, parallel and/or distributed applications are becoming the norm, so as to use computer resources as efficiently as possible. Trace collection and visualization is useful for developers willing to debug and monitor the performance of their parallel applications. Yet, most existing trace visualization tools are proprietary or cannot handle large trace files.

ViTE is a powerful, portable and open-source profiling tool which visualizes the traces produced by parallel applications. Thanks to its scalable design, *ViTE* efficiently helps programmers to analyze the performance of potentially large applications running on many nodes, cores and communicating processes.

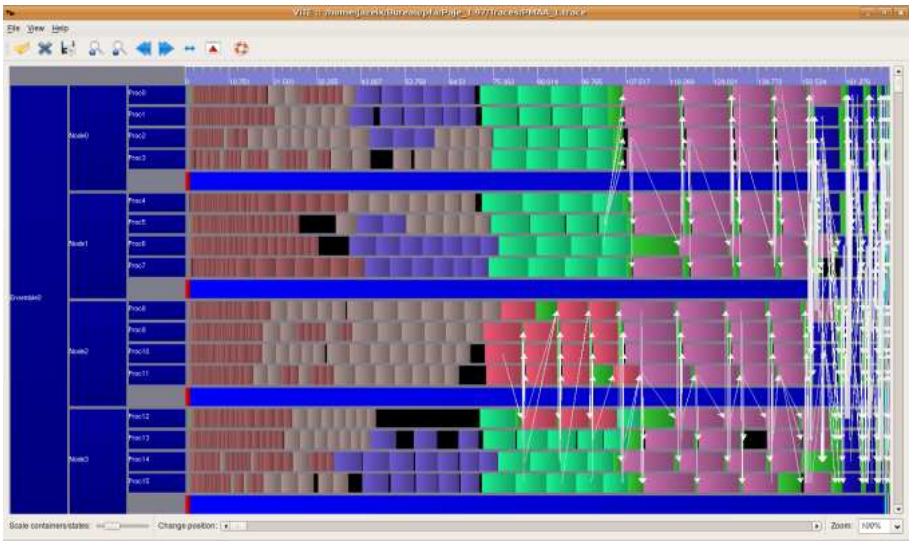
ViTE allows one to visualize traces written in the *Pajé* open format (see http://www-id.imag.fr/Logiciels/paje/) and the OTF. Its features include the ability to export views in the SVG format, so as to integrate them easily into reports, and the production of statistics.

The aim of *ViTE* is to have a free and open software able to display different traces format with a user-friendly interface. That is why it is under Cecill-A licence (you can see the content on chapter 1).

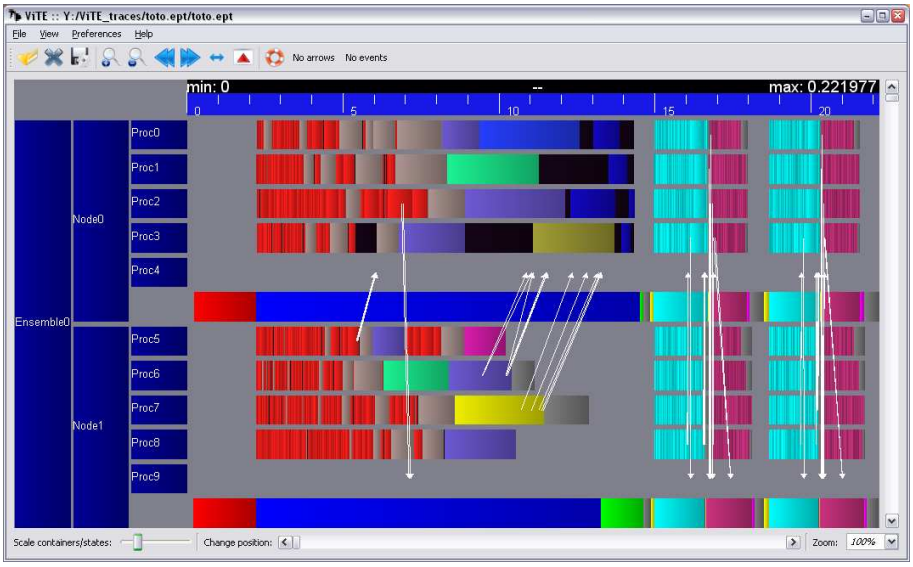
More information are available on the official website of
ViTE : http://vite.gforge.inria.fr/,
or on the forge itself : http://gforge.inria.fr/projects/vite/.

This document is a start guide for understanding how to use *ViTE* .

The figures 3.1a and 3.1b are examples of a trace you can watch with *ViTE* .



(a) Example of a trace on linux (ubuntu 8.04)



(b) Example of a trace on windows XP

Figure 3.1: Example of traces

4 - How to use

Software/Libraries requirements *ViTE* uses the Qt library for its graphic window and OpenGL library for the trace graphic render. You need to have the following version at least to run *ViTE* :

- Qt 4.4 or greater.
- opengl 1.5 or greater.

A list of operating system (not exhaustive) where *ViTE* runs :

- Ubuntu 8.04, 8.10, 9.04.
- MacOS X.
- Windows XP/Vista.

It also run in a lot of Linux systems like Mandriva, Fedora...

4.1 First use

4.1.1 Launching ViTE

After getting *ViTE* (by compiling or executables), you can go to the vite directory. The executable is in `bin/vite` if you have just compiled from the source directory with configure or `src/vite` with *cmake*.

When you launch *ViTE* without any options (these will be described in the section 9), you will have a window like the one in the figure 4.1 :

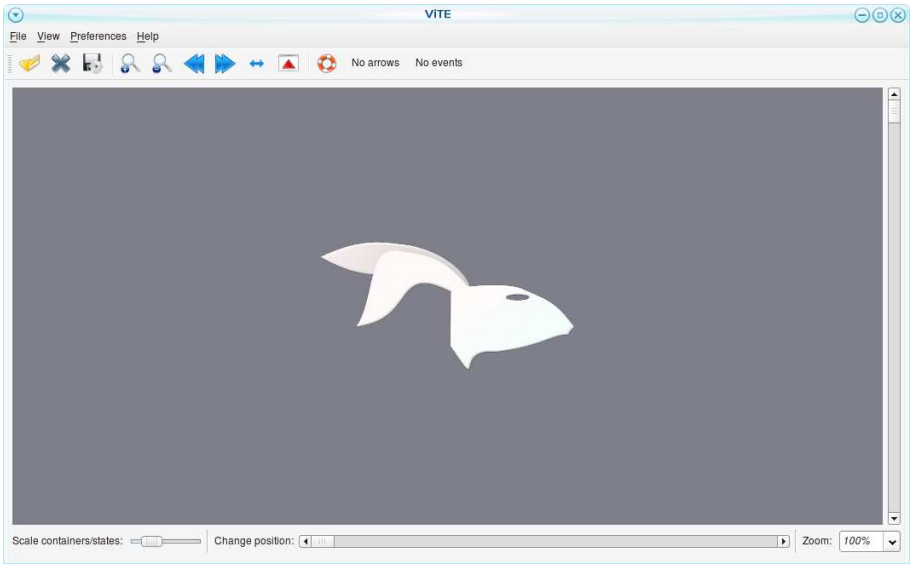


Figure 4.1: Launching of Vite

4.1.2 Open a file

Go to the `File` menu and click on `Open`. A dialog box will appear and you will have to choose the file you want to open.

After choosing it, you must click on `Open` to open the file or `Cancel` if you do not want to open the selected file.

The other option to open a trace is to use drag and drop. Select your trace in a file manager and drop it on the *ViTE* window.

Moreover, a recent file list has been done in order to easily open the recent traces. It keeps in memory the last ten traces opened.

You can also reload the current trace. This is useful when you visualize a trace, do some modifications on the file and do not want to launch *ViTE* again.

If you try to open a file which is not recognised by *ViTE* , error messages will be displayed.

4.1.3 Navigation under the trace

You can change the position and the scale by moving the horizontal and vertical scroll bars.

You can also zoom in or out by clicking in the zoom button. You can select an area with the mouse to zoom in. You can also directly set a zoom level by selecting a zoom level in the bottom right. It is also possible to select an area to zoom by clicking, and keeping the clic while moving, the zoom will be in the rectangle defined by the beginning and the end of the clic. The use of the right clic undo the previous zoom.

You can go to the beginning or the end of the trace by clicking on the left and rigth arrow button and view the whole trace by clicking on the `Show all` button.

You can see the trace in fullscreen going on the `View` menu and picking `fullscreen`.

Moreover, it is possible to hide the links and/or the events using the *No arrow* and *No Event* buttons of the toolbar. An other option is to get informations about an event, a state, a communication in the trace by clicking over this element on the screen. If a lot of elements are grouped, you may be forced to zoom to be able to get the right information about the element.

5 - Installation

5.1 Direct installation from packages

ViTE can be downloaded from its website : http://vite.gforge.inria.fr/. Go into the *download* section where you will find the different packages (for Linux, Windows...) and its sources. If you want to compile the source code, please read the instructions on the paragraph 5.2.

Quick install for Debian/Ubuntu users: Since ViTE is already available on Debian repository, you can install it with the following:

```
$ apt-get install vite
or
$ aptitude install vite
```

The available version for these packages is the 1.1. These commands should also install the needed package.

Otherwise, in order to install *ViTE* , you need to have the following libraries on your computer :

- libqt4-dev.
- libqt4-opengl-dev.

5.2 Compilation

The compilation of *ViTE* can be useful to customize it. *ViTE* can be compiled using the cmake software or the configure script provided.

Currently, there are optional features that can be enabled or disabled :

- OTF trace files support ;
- Tau trace files support (experimental) ;
- Spinning rabbit (which is fun 5 minutes but no more).

5.2.1 Using CMake

The first way is to use *cmake* (http://www.cmake.org/), a portable way to compile. On Windows system, a GUI is provided in order to compile. The rules to follow are the same as for Linux. For Linux users, the easiest way is to build a directory at the root of ViTE sources :

```
mkdir obj && cd obj
ccmake ..
```

Then type 'C' to configure the CMake cache. You will see the windows 5.1. After that, you can check if the options set are good (additional directories and libraries). Then, type 'C' then 'G' to generate the Makefile. If libraries or directories are not found, you will get errors warning you to check the paths (like in the figure 5.2). To finish, type `make` and it will compile.

For Windows users, the easiest way is to create a visual C++ project if you have it and compile with it. You can also create create a mingw Makefile, however, the OTF library is only supported with visual c++ compiler so it could not compile/work with mingw.

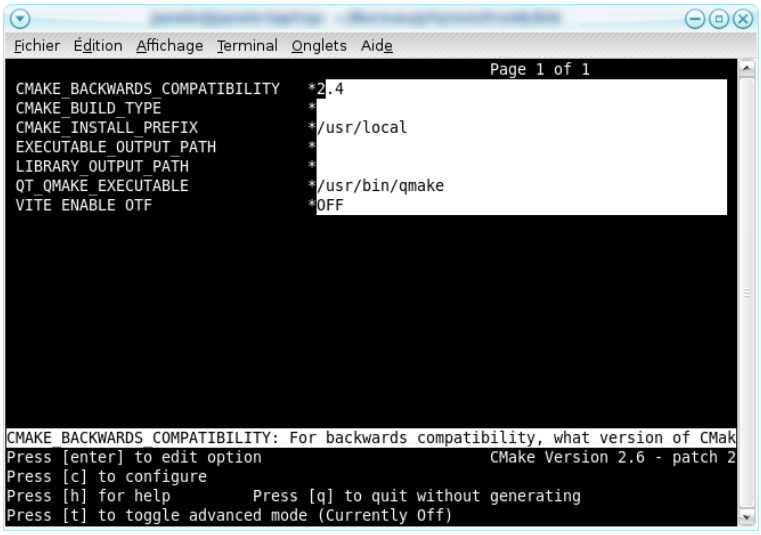


Figure 5.1: CMake window

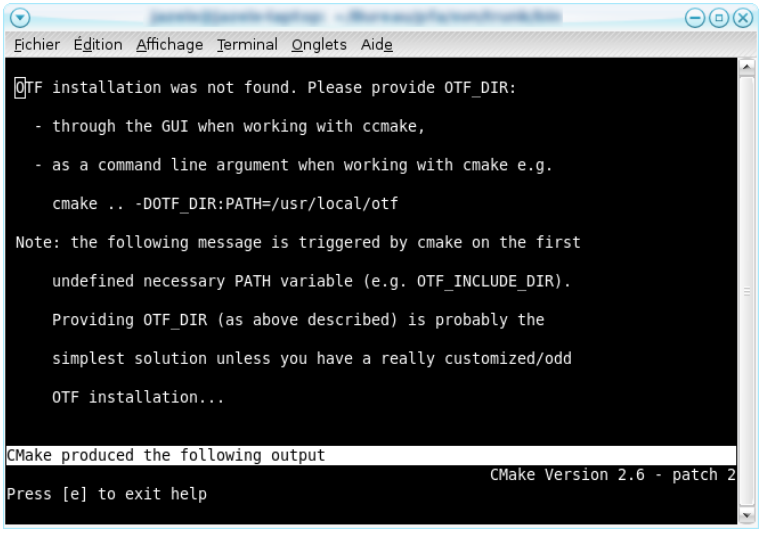


Figure 5.2: CMake error

5.2.2 Using the configure script

The second way is to use the configure script. It works on Linux and MacOS. Go to the source directory and type `./configure` and then `make` on the console.

The configure script is useful because on some implementation, in order to compile Qt sources, you have qmake or qmake-qt4. Also, options are available to customise your compilation. See `./configure -h` (figure 5.1) for more informations.

For example, if the directory of *ViTE* is in your home, hit :

```
cd ~/vite/src && ./configure && make
```

The binary will be in the `bin/` directory under the name of `vite`.

Listing 5.1: ./configure -h

```
ViTE configuration shell-script
Usage:
 ./configure [ options ]
Options:
  -h, --help
        print this page

  --release
        compiles in release mode (by default)

  --debug
        compiles in debug mode

  --enable_spinning_logo
        makes the rabbit to turn when no trace is loaded

  --enable_otf
        enables the otf support (An OTF release is provided
        in the externals/otf directory)

  --otf_dir=<path>
        path to the OTF library

  --otf_incdir=<path>
        include path to the OTF headers

  --otf_libdir=<path>
        library path to the OTF libraries

  --enable_tau
        enables the tau support

  --tau_dir=<path>
        path to the TAU library

  --tau_incdir=<path>
        include path to the TAU headers

  --tau_libdir=<path>
        library path to the TAU libraries
```

6 - Generate traces

Important : Remember that *ViTE* does **NOT** generate traces. To generate traces, there are various ways, depending on the format. In this section, we are going to present two easy ways.

Dynamically It is possible to generate traces without modifying the source code using *EzTrace* . *EzTrace* is an INRIA project that enables the creation of traces in the *Pajé* format. For more information on this project, you can visit their website at http://www.gforge.inria.fr/projects/eztrace.

Intrusive method An other way is to insert functions in your code to generate traces. To easily adapt to *ViTE* and easily change the generated format, we recommend you to use the *GTG* (Generic Trace Generator) library. This library offers a generic interface to generate traces in various format (only *Pajé* is currently available, OTF is being written, TAU is the next step). There is a C and also a Fortran interface. For more information on this project, you can visit the project webpage http://www.gforge.inria.fr/projects/gtg.

7 - Supported formats

ViTE can draw traces obtained from four main formats : *Pajé* , *Pajé extented*, *OTF* and *TAU*.

7.1 *Pajé*

The *Pajé* format is the first format supported by *ViTE* . The main reason is *ViTE* was designed to display *Pajé* traces. *Pajé* [**?**, **?**, **?**] is originally an other trace viewer with its own format. The *Pajé* format[**?**] is a self-explained format including the declaration of each event, state, communication, ... present in the trace.
ViTE supports most of the *Pajé* features: forest of containers, events, communications, states, variables, color of states. These files are recognize by the `.trace` extension.
Warning: for now, *ViTE* doesn't support:

- the push/pop function allowing to stack several states to one container,
- several state lines per container,
- color on events and communications

These functionnalities will be included as soon as possible.

7.2 Pajé extented

This format is an extension of the *Pajé* format to allow the user to have one file per container instead of only one sorted for the *Pajé* format. One main file contains the definitions item and the name (relative to the directory of the main file, not absolute) of the extra files. To follow the *Pajé* format, you just need to add the following field to the definition of the `PajeCreateContainer` event:

```
FileName string
```

So each creation of container using a filename different form `''` will include the specified file. For example, if there are n MPI processes running, you can make each process open and fill a different file (*filename.rank*. The same features as for the *Pajé* format are supported. You can include files in an include file to create the same tree as your architecture (program, node, thread for example) but FileName are only supported for `PajeCreateContainer` event.

To read theis format with *ViTE* , the main file has to have the `.ept` extension. The included ffiles can have any extension you want as soon as their name are correctly spelled in the first one.

7.3 OTF

OTF or Open Trace Format[**?**] was developed by TU Dresden. It is a free format available created to replace VampirTrace and used by Vampir[**?**]. *ViTE* does not bear some OTF features such as snapshots. *ViTE* only stands states, communications and eventlike actions. Althought some functionnalities are missing, *ViTE* generate random colors for the OTF format the first time you open a file because they are note stored in the file, and you can use the color settings to change for a better choice of color.

7.4 TAU

TAU[**?**] is the latest format added. *ViTE* possibilities on this format have not been fully tested and any bug report is welcome. The basic features are supported: states, events, communications.

Any bug report or suggestion about what format should be included in *ViTE* is welcome and can be posted on *ViTE* gforge website: https://gforge.inria.fr/projects/vite/.

8 - Features

ViTE comes with some features helping the use.

8.1 Recent files/Reload traces

When the user does modifications on the current trace he would like to be able to reload the trace without launching *ViTE* . The reload button (or menu) is here to solve this problem.

The user could also be working with the same traces for a long time. The recent files menu helps him to store the most recent opened traces in order to load them fastly.

8.2 Trace export

Go to `File` and choose `export`.
A dialog box will open. You can select the type of the file among svg, jpeg, png or txt. Then type the name of the file with or without the extension (it will be added if it is not).

The svg, png and jpeg selections export the trace in the current displayed interval (zoom and/or translation will be taken in account).

The txt option exports the counter chosen in the next windows (figure 8.1).

The format of the text file is readable with third part software such as *gnuplot* to easily have use some data concerning the counters.

Figure 8.1: Selection of the counter to export

8.3 Minimap

The minimap is a thumbnail of the current trace view. It is helpful to situate where you are looking in the trace when you have zoomed a lot.

8.4 Preferences menu

This menu contains the settings you can modify to customize *ViTE* .

8.4.1 The settings

It is where the user can customize its *ViTE* . You can modify global informations as for the use of palette for looking the trace. Also there are more specific options for configuring the palettes, the directories where to look for plugins and informations about the minimap.

8.4.2 The plugins

Plugins are created by users in order to interact with *ViTE* . They do not need a recompilation of *ViTE* when you want to add one. For now, they are two main plugins : one giving the distribution and the other one showing some statistics on the trace. The existing ones are explained in the paragraph 10.

8.4.3 Other options

You can show or hide the information window by choosing `Show infos window` in the `View` menu.

You can hide the warning messages shown in the information window by chosing `No warning` in the `View` menu.

9 - Shortcuts

9.1 Launching by command line

There are useful shortcuts for launching *ViTE* or functionalities of *ViTE* . For example, the export of a file in a svg format can be done without launching the graphical interface, in one line.

Shortcut	Action	Example
-f [file path]	Open a file.[1]	./vite -f example.trace
-h	Display the help	./vite -h
-a [file path]	Open the file and display all of it.	./vite -a example.trace
[file path] -t ([start]):([end])	Open the trace file and display it in the interval (in seconds). [2]	./vite file -t [0]:[10]
-f [path-source] -e [path-dest]	export the trace file in the svg format.	./vite -f in.trace -e out.svg
-f [source] -e [dest] -t ([start]):([end])	export the trace file in the svg format in the interval given.	./vite -f in.trace -e out.svg -t [1]:

[1] The -f is facultative : ./vite filename works too.

[2] There could be no time_init or time_end : ./vite file -t :[1]

9.2 In the graphical interface

Here is a list of all the shortcuts implemented in *ViTE* that you can find in the menu bar :

Shortcut	Action
CTRL+O	Open the open file dialog box.
CTRL+W	Close the file.
CTRL+E	Open the export file dialog box.
CTRL+S	Save the current configuration for the file opened.[3]
CTRL+Q or ALT+F4	Quit *ViTE* .
CTRL+SHIFT+A	Show all the trace.
Mouse wheel or + or -	Horizontal zoom in or out.
CTRL + Mouse wheel or + or -	Quick horizontal zoom in or out.
ALT + Mouse wheel	Quick vertical zoom in or out.
HOME	Show the start of the trace.
END	Show the end of the trace.
PAGE UP (resp. PAGE DOWN)	Move the visualisation to the left (resp. right).
UP, DOWN, RIGHT, LEFT	Move the trace.
CTRL + UP, DOWN, RIGHT, LEFT	Quickly move the trace.
SELECT AN AREA WITH LEFT CLIC	Select a square area of the view and display it.
RIGHT CLIC	Backup the previous square area selection view.

[3]Not yet implemented

10 - Plugins

The plugins are libraries made by users that can be integrated in *ViTE* to get information which is not given immediately by the software. It is distributed under the form of a dynamic library and should be placed in the right directory in order to be loaded. To set these directory, read the paragraph .

If you want to create plugins, please refer to the technical manual.

Some plugins are integrated directly in *ViTE* (because there were developed by developers or other dark reasons) like the statistic one.

The windows is separated by tabs, one for each plugin as you can see in figure 10.3.

10.1 Statistic plugin

Inside it, you can have important informations from the trace file. You can choose the containers you want (check the box beside the node in order to have all the children of it). Then, you can watch the percentage of each states for these containers by two ways like in figures 10.1 and 10.2.

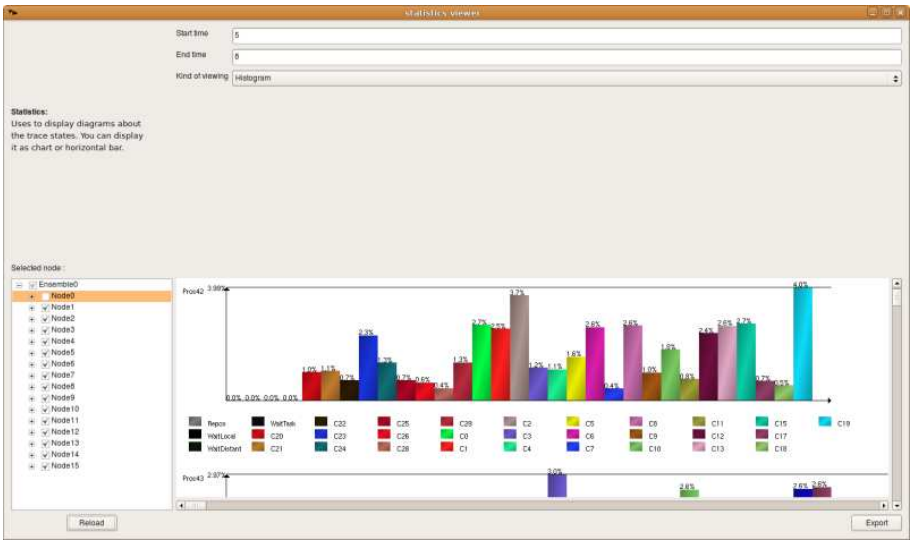


Figure 10.1: Vertical diagram

Moreover, you can export them in a svg file.

10.2 Distribution

See figure 10.3.

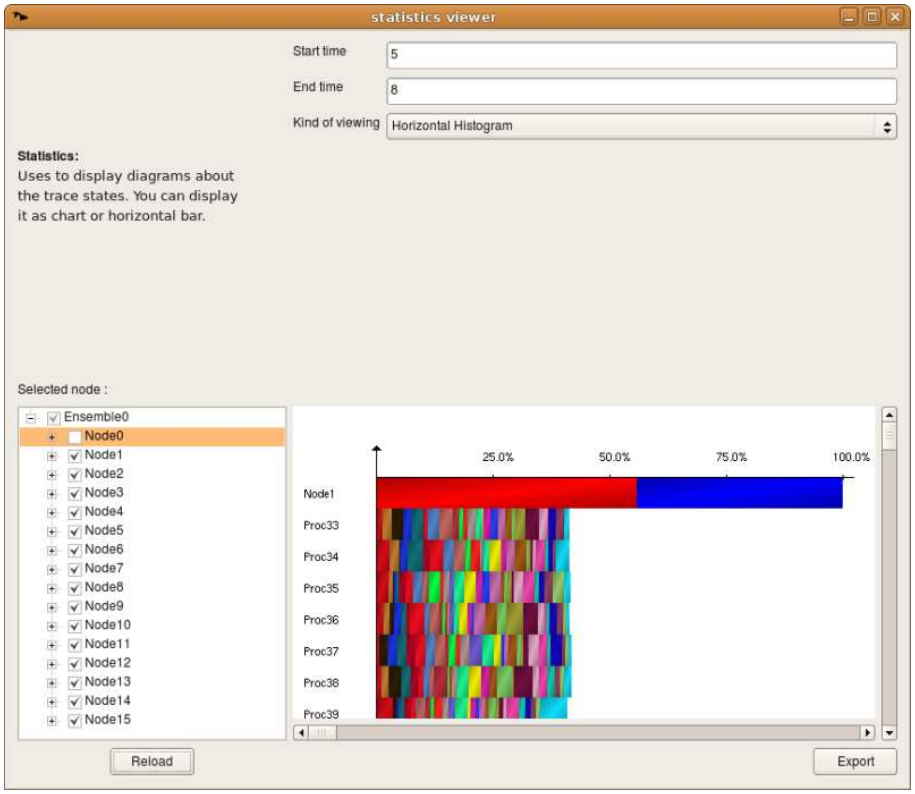


Figure 10.2: Horizontal diagram

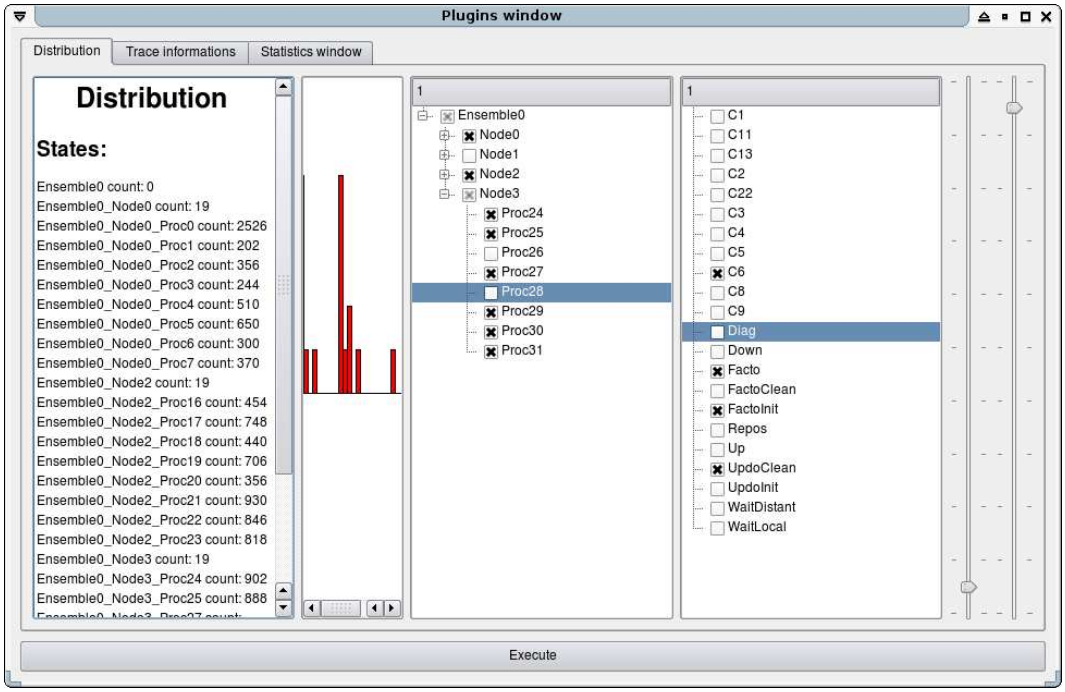


Figure 10.3: Distribution plugin

11 - Authors

ViTE authors and developers are :

- Kevin COULOMB.
- Mathieu FAVERGE.
- Johnny JAZEIX.
- Olivier LAGRASSE.
- Jule MARCOUEILLE.
- Pascal NOISETTE.
- Arthur REDONDY.
- Clément VUCHENER.

The documentations were also written by them.
We thank François Broquedis for the help for the MacOS compilation.
We thank Samuel Thibault for the time he spends to make the debian package available.
We thank Cédric Augonnet for making the *Distribution* plugin.
We thank the rabbit for being.

The website was designed by :

- Olivier LAGRASSE.
- Pascal NOISETTE.
- Clément VUCHENER.

12 - FAQ

Question : **How can I help improving this beautiful software ?**

Answer : ViTE *is not perfect yet. Some features that could be implemented are written in the technical manual but it is just a start and a lot of other things can be done.*

Question : **I have some problems when I want to see a trace because the window glitters ?**

Answer : *If you use Compiz, you have to disable it while using* ViTE .

Question : **Why do I only have a black screen when I try to open a trace ?**

Answer : *Are you sure the trace is right ? Some errors of meaning may have not been detected in the data structure.*

Question : **Why does a new window open when I open a trace?**

Answer : *Make sure you close the current trace before opening the following. Or it will open it in another window in order to let the user visualize both traces.*

Question : **Why can't I open my svg export?**

Answer : *The export of a trace in svg format can be more than three times bigger than the trace file. So if the trace you want to export is big the svg reader can be slow. You can try using another software to open it (inkscape, mozilla, ...) or convert the svg in a png file (this feature is not include in* ViTE *) or export only a part of the trace.*

Question : **While compiling the sources, I have a uic error (too old Qt Designer version) and/or qformlayout.h can not be found?**

Answer : *Check your Qt version by "qmake –version" and be sure that it is at least the Qt4.4 one.*

Question : **I just installed the rpm package and when I type vite on the console, it returns me the following error : GLIBCXX_3.4.9 is missing?**

Answer : *Try to update the package of the lib c++. Else install the software from the sources (instructions are given in the README in order to help you).*

Question : **I got Qt errors when I compile or launch *ViTE* like : /bin/vite: symbol lookup error: /usr/lib/libQtOpenGL.so.4: undefined symbol : _ZN14QWidgetPrivate15checkWindowRoleEv or symbol lookup error: vite: undefined symbol: _ZN9QHashData13detach_helperEPFvPNS_4NodeEPvEPFvS1_Ei**

Answer : *It is a Qt problem. Check if your qt version is the same for all Qt libraries like libQtOpenGL and libQtCore.*

Question : **I am on Windows and I double click on the executable and an error tell me that a dll is not found?**

Answer : *If you launch* ViTE *by the Qt prompt, the path to find dll libraries is changed and these dll missing are found. A solution is to find (there are on your computer) the dll missing and to copy them in the bin/ folder of* ViTE .

Question : **Why does not *ViTE* run well?**

Answer : *Check if* ViTE *is runnable on your computer (cf configuration).*

Bibliography

[1] ID-IMAG. Paje. http://www-id.imag.fr/Logiciels/paje/index.html.

[2] B. de Oliveira Stein J. Chassin de Kergommeaux. Flexible performance visualization of parallel and distributed applications. pages 735–747, 2003.

[3] B. de Oliveira Stein J. Chassin de Kergommeaux. Pajé: an extensible environment for visualizing multi-threaded programs executions. In *Proceedings of the 6th International EuroPar Conference, LNCS*, pages 133–140, Munich, Germany, 2000. Springer.

[4] G. Mounié J. Chassin de Kergommeaux, B. de Oliveira Stein. Paje input data format. Technical report, 2003.

[5] TU Dresden. Open trace format. http://www.paratools.com/otf.php.

[6] Vampir - performance optimization. http://www.vampir.eu/.

[7] University of Oregon. Tuning and analysis utilities. http://www.cs.uoregon.edu/research/tau/home.php.