

Opari 2
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Chapter 1

Opari2

Opari2 is a tool to automatically instrument C, C++ and Fortran source code files in which OpenMP is used. Function calls to a [POMP2 API](#) are inserted around OpenMP directives. By implementing this API, detailed measurements regarding the runtime behavior of an OpenMP application can be made. A conforming POMP2 implementation needs to implement all POMP2 functions, see [pomp2_lib.h](#) for a list of those.

OpenMP 3.0 introduced tasking to OpenMP. To support this feature the POMP2 adapter needs to do some bookkeeping in regard to specific task IDs. The `pomp2_lib.c` provided with this package includes the necessary code so it is strongly advised to use it as a basis for writing an adapter to your own tool.

A detailed description of the first Opari version has been published by Mohr et al. in "Design and prototype of a performance tool interface for OpenMP" (Journal of supercomputing, 23, 2002).

1.1 INSTALLATION

Opari2 was developed with Autotools. After downloading and unpacking, change into your build directory and perform the following steps:

1. `./configure`
`[--prefix=<installation directory>]`
`[--with-compiler-suite=<gcc|ibm|intel|pathscale|pgi|studio>]`
2. `make`
3. `make install`

See the file `INSTALL` for further information.

1.2 USAGE

To create an instrumented version of an OpenMP application, each file of interest is transformed by the OPARI2 tool. The application is then linked against the POMP2 runtime measurement library and optionally to a special initialization file (see section [LINKING \(startup initialization only\)](#) and [SUMMARY](#) for further details).

A call to Opari2 has the following syntax:

```
Usage: opari2 [OPTION] ... infile [outfile]
```

with following options and parameters:

<code>[--f77 --f90 --c --c++]</code>	[OPTIONAL] Specifies the programming language of the input source file. This option is only necessary if the automatic language detection based on the input file suffix fails.
<code>[--nosrc]</code>	[OPTIONAL] If specified, OPARI2 does not generate <code>#line</code> constructs, which allow to preserve the original source file and line number information, in the transformation process. This option might be necessary if the OpenMP compiler does not understand <code>#line</code> constructs. The default is to generate <code>#line</code> constructs.
<code>[--nodecl]</code>	[OPTIONAL] Disables the generation of <code>POMP2_DLISTXXXXX</code> macros. These are used in the parallel directives of the instrumentation to make the region handles shared. By using this option the shared clause is used directly on the parallel directive with the respective region handles.
<code>[--tpd]</code>	[OPTIONAL] Adds the clause <code>'copyin(<pomp_tpd>')</code> to any parallel construct. This allows to pass data from the creating thread to its children. The variable is declared externally in all files, so it needs to be defined by the pomp library.
<code>[--disable=<constructs>]</code>	[OPTIONAL] Disable the instrumentation of manually-annotated POMP regions or the more fine-grained OpenMP constructs such as <code>!\$OMP ATOMIC</code> . <code><constructs></code> is a comma separated list of the constructs for which the instrumentation should be disabled. Accepted tokens are <code>atomic</code> , <code>critical</code> , <code>master</code> , <code>flush</code> , <code>single</code> , <code>ordered</code> or <code>locks</code> (as well as <code>sync</code> to disable all of them) or <code>regions</code> .
<code>[--task=abort warn remove]</code>	Special treatment for the task directive <code>abort</code> : Stop instrumentation with an error message when encountering a task directive. <code>warn</code> : Resume but print a warning. <code>remove</code> : Remove all task directives.
<code>[--untied=abort keep no-warn]</code>	Special treatment for the untied task attribute. The default behavior is to remove the untied


```

attribute, thus making all tasks tied, and print
out a warning.
abort:    Stop instrumentation with an error
          message when encountering a task
          directive with the untied attribute.
keep:     Do not remove the untied attribute.
no-warn:  Do not print out a warning.

[--tpd-mangling=
gnu|intel|sun|pgi|
ibm|cray]    [OPTIONAL] If programming languages are mixed
              (C and Fortran), the <pomp_tpd> needs to use
              the Fortran mangled name also in C files.
              This option specifies to use the mangling
              scheme of the gnu, intel, sun, pgi or ibm
              compiler. The default is to use the mangling
              scheme of the compiler used to build opari2.

[--version]    [OPTIONAL] Prints version information.

[--help]       [OPTIONAL] Prints this help text.

infile         Input file name.

[outfile]      [OPTIONAL] Output file name. If not
                specified, opari2 uses the name
                infile.mod.suffix if the input file is
                called infile.suffix.

```

Report bugs to <scorep-bugs@groups.tu-dresden.de>.

If you run Opari2 on the input file `example.c` it will create two files:

- `example.mod.c` is the instrumented version of `example.c`, i.e. it contains the original code plus calls to the [POMP2 API](#) referencing handles to the OpenMP regions identified by Opari2.
- `example.c.opari.inc` contains the OpenMP region handle definitions accompanied with all the relevant data needed by the handles. This compile time context (CTC) information is encoded into a string for maximum portability. For each region, the tuple (region_handle, ctc_string) is passed to an initializing function ([POMP2_Assign_handle\(\)](#)). All calls to these initializing functions are gathered in a function named `POMP2_Init_regions_XXX_YY`, where `XXX_YY` is unique for each compilation unit.

At some point during the runtime of the instrumented application, the region handles need to be initialized using the information stored in the CTC string. This can be done in one of two ways:

- during *startup* of the measurement/POMP2 system, or
- during *runtime* when a region handle is accessed for the first time.

We *highly* recommend using the first option as it incurs much less runtime overhead than the second one (no locking, no lookup needed). In this case all `POMP2_Init_regions_XXX_YY` functions introduced by opari2 need to be called. See [LINKING \(startup initialization only\)](#) for further details. For runtime initialization the ctc string as argument to the relevant [POMP2 function calls](#) is provided as an argument.

1.3 CTC string decoding

As mentioned above, we pass ctc strings to different POMP2 functions. These functions need to parse the string in order to process the encoded information. With [POMP2_Region_info](#) and [ctcString2RegionInfo\(\)](#) the opari2 package provides means of doing this, see [pomp2_region_info.h](#).

The CTC string is a string in the format "length*key=value*key=value*[key=value]**, for example:

```
*82*regionType=parallel*sscl=xmpl.c:61:61*escl=xmpl.c:66:66*hasIf=1**
```

Mandatory keys are:

- *regionType* Type of the region (here parallel)
- *sscl* First line of the region (usually with full path to file)
- *escl* Last line of the region

Optional keys are

- *hasNumThreads* Set if a numThreads clause is used in the OpenMP directive
- *hasIf* Set if an if clause is used
- *hasOrdered* Set if an ordered clause is used
- *hasReduction* Set if a reduction clause is used
- *hasSchedule* Set if a schedule clause is used
- *hasCollapse* Set if a collapse clause is used

The optional values are set to 0 by default, i.e. the presence of the key denotes the presence of the respective clause.

You can use the function [ctcString2RegionInfo\(\)](#) to decode CTC strings. It can be found in [pomp2_region_info.c](#) and [pomp2_region_info.h](#), installed under <opari-prefix>/share/opari2/devel.

1.4 LINKING (startup initialization only)

For startup initialization all POMP2_Init_regions_XXX_YY functions that can be found in the object files and libraries of the application are called. This is done by creating an additional compilation unit that contains calls to following POMP2 functions:

- [POMP2_Init_regions\(\)](#),
- [POMP2_Get_num_regions\(\)](#), and
- [POMP2_Get_opari2_version\(\)](#).

The resulting object file is linked to the application. During startup of the measurement system the only thing to be done is to call [POMP2_Init_regions\(\)](#) which then calls all POMP2_Init_regions_XXX_YY functions.

In order to create the additional compilation unit (for example `pomp2_init_file.c`) the following command sequence can be used:

```
% `opari2-config --nm` <objs_and_libs> | \
`opari2-config --egrep` -i "pomp2_init_regions" | \
`opari2-config --egrep` " [TN] " | \
`opari2-config --awk-cmd` -f \
`opari2-config --awk-script` > pomp2_init_file.c
```

Here, `<objs_and_libs>` denotes the entire set of object files and libraries that were instrumented by opari2.

Due to portability reasons `nm`, `egrep` and `awk` are not called directly but via the provided `opari2-config` tool.

1.5 POMP user instrumentation

For manual user instrumentation the following pragmas are provided.

C/C++:

```
#pragma pomp inst init
#pragma pomp inst begin(region_name)
#pragma pomp inst altend(region_name)
#pragma pomp inst end(region_name)
```

Fortran:

```
!$POMP INST INIT
!$POMP INST BEGIN(region_name)
!$POMP INST ALTEND(region_name)
!$POMP INST END(region_name)
```

Users can specify code regions, like functions for example, with `INST BEGIN` and `INST END`. If a region contains several exit points like `return/break/exit/...` all but the last need to be marked with `INST ALTEND` pragmas. The `INST INIT` pragma should be used for initialization in the beginning of main, if no other initialization method is used. See the [EXAMPLE](#) section for an example on how to use user instrumentation.

1.6 EXAMPLE

The directory `<prefix>/share/opari2/doc/example` contains the following files:

```
example.c
example.f
Makefile
```

The Makefile contains all required information for building the instrumented and uninstrumented binaries. It demonstrates the compilation and linking steps as described above.

Additional examples which illustrate the use of user instrumentation can be found in `<prefix>/share/opari2/doc/example_user_instrumentation`. The folder contains the following files:

```
example_user_instrumentation.c
example_user_instrumentation.f
Makefile
```

1.7 News

1.7.1 LINK STEP

Opari2 uses a new mechanism to link files. The main advantage is, that no `opari.rc` file is needed anymore. Libraries can now be preinstrumented and parallel builds are supported. To achieve this, the handles for parallel regions are instrumented using a `ctc_string`.

1.7.2 POMP2

The POMP2 interface is not compatible with the original POMP interface. All functions of the new API begin with `POMP2_`. The declaration prototypes can be found in [pomp2_lib.h](#).

1.7.3 POMP2_Parallel_fork

The [POMP2_Parallel_fork\(\)](#) call has an additional argument to pass the requested number of threads to the POMP2 library. This allows the library to prepare data structures and allocate memory for the threads before they are created. The value passed to the library is determined as follows:

- If a `num_threads` clause is present, the expression inside this clause is evaluated into a local variable `pomp_num_threads`. This variable is afterwards passed in the call to [POMP2_Parallel_fork\(\)](#) and in the `num_threads` clause itself.
- If no `num_threads` clause is present, `omp_get_max_threads()` is used to determine the requested value for the next parallel region. This value is stored in `pomp_num_threads` and passed to the [POMP2_Parallel_fork\(\)](#) call.

In Fortran, instead of `omp_get_max_threads()`, a wrapper function `pomp_get_max_threads_XXX_X` is used. This function is needed to avoid multiple definitions of `omp_get_max_threads()` since we do not know whether it is defined in the user code or not. Removing all definitions in the user code would require much more Fortran parsing than is done with opari2, since function definitions cannot easily be distinguished from variable definitions.

1.7.4 `pomp_tpd`

If it is necessary for the POMP2 library to pass information from the master thread to its children, the option `--tpd` can be used. *Opari2* uses the `copyin` clause to pass a threadprivate variable `pomp_tpd` to the newly spawned threads at the beginning of a parallel region. This is a 64 bit integer variable, since Fortran does not allow pointers. However a pointer can be stored in this variable, passed to child threads with the `copyin` clause (in C/C++ or Fortran) and later on be cast back to a pointer in the *pomp* library.

To support mixed programming (C/Fortran) the variable name depends on the name mangling of the Fortran compiler. This means, for GNU, Sun, Intel and PGI C compilers the variable is called `pomp_tpd_` and for IBM it is called `pomp_tpd` in C. In Fortran it is of course always called `pomp_tpd`. The `--tpd-mangling` option can be used to change this. The variable is declared extern in all program units, so the *pomp* library contains the actual variable declaration of `pomp_tpd` as a 64 bit integer.

1.7.5 Tasking construct

In *OpenMP 3.0* the new tasking construct was introduced. All parts of a program are now implicitly executed as tasks and the user gets the possibility of creating tasks that can be scheduled for asynchronous execution. Furthermore these tasks can be interrupted at certain scheduling points and resumed later on (see the OpenMP API 3.0 for more detailed information).

Opari2 instruments functions `POMP2_Task_create_begin` and `POMP2_Task_create_end` to allow the recording of the task creation time. For the task execution time, the functions `POMP2_Task_begin` and `POMP2_Task_end` are instrumented in the code. To correctly record a profile or a trace of a program execution these different instances of tasks need to be differentiated. Since OpenMP does not provide Task ids, the performance measurement system needs to create and maintain own task ids. This cannot be done by code instrumentation as done by *Opari2* alone but requires some administration of task ids during runtime. To allow the measurement system to administrate these ids, additional task id parameters (`pomp_old_task/pomp_new_task`) were added to all functions belonging to OpenMP constructs which are task scheduling points. With this package there is a "dummy" library, which can be used as an adapter to your measurement system. This library contains all the relevant functionality to keep track of the different instances of tasks and it is highly recommended to use it as a template to implement your own adapter for your measurement system.

For more detailed information on this mechanism see:

"How to Reconcile Event-Based Performance Analysis with Tasking in OpenMP"

by Daniel Lorenz, Bernd Mohr, Christian Rössel, Dirk Schmidl, and Felix Wolf

In: Proc. of 6th Int. Workshop of OpenMP (IWOMP), LNCS, vol. 6132, pp. 109121

DOI: 10.1007/978-3-642-13217-9_9

1.8 SUMMARY

The typical usage of OPARI2 consists of the following steps:

1. Call OPARI2 for each input source file

```
% opari2 file1.f90
...
% opari2 fileN.f90
```

2. Compile all modified output files *.mod.* using the OpenMP compiler
3. Generate the initialization file

```
% `opari2-config --nm` file1.mod.o ... fileN.mod.o | \
`opari2-config --egrep` -i "pomp2_init_regions" | \
`opari2-config --egrep` " [TD] " | \
`opari2-config --awk-cmd` -f \
`opari2-config --awk-script` > pomp2_init_file.c
```

4. Link the resulting object files against the pomp2 runtime measurement library.

Chapter 2

Data Structure Index

2.1 Data Structures

Here are the data structures with brief descriptions:

[POMP2_Region_info](#) (This struct stores all information on an OpenMP region, like the region type or corresponding source lines. The function [ctcString2RegionInfo\(\)](#) can be used to fill this struct with data from a ctcString) [13](#)

Chapter 3

File Index

3.1 File List

Here is a list of all documented files with brief descriptions:

pomp2_lib.h (This file contains the declarations of all POMP2 functions) . .	17
pomp2_region_info.h (This file contains function declarations and structs which handle informations on OpenMP regions. POMP2_Region_info is used to store these informations. It can be filled with a ctc-String by ctcString2RegionInfo())	35

Chapter 4

Data Structure Documentation

4.1 POMP2_Region_info Struct Reference

This struct stores all information on an OpenMP region, like the region type or corresponding source lines. The function [ctcString2RegionInfo\(\)](#) can be used to fill this struct with data from a ctcString.

```
#include <pomp2_region_info.h>
```

Data Fields

Required attributes

- [POMP2_Region_type](#) mRegionType
- char * [mStartFileName](#)
- unsigned [mStartLine1](#)
- unsigned [mStartLine2](#)
- char * [mEndFileName](#)
- unsigned [mEndLine1](#)
- unsigned [mEndLine2](#)

Currently not provided by opari

- bool [mHasCopyIn](#)
- bool [mHasCopyPrivate](#)
- bool [mHasIf](#)
- bool [mHasFirstPrivate](#)
- bool [mHasLastPrivate](#)
- bool [mHasNoWait](#)
- bool [mHasNumThreads](#)
- bool [mHasOrdered](#)
- bool [mHasReduction](#)
- bool [mHasCollapse](#)
- bool [mHasUntied](#)
- [POMP2_Schedule_type](#) mScheduleType

- char * [mUserGroupName](#)

Attributes for specific region types

- unsigned [mNumSections](#)
- char * [mCriticalName](#)
- char * [mUserRegionName](#)

4.1.1 Detailed Description

This struct stores all information on an OpenMP region, like the region type or corresponding source lines. The function [ctcString2RegionInfo\(\)](#) can be used to fill this struct with data from a ctcString.

4.1.2 Field Documentation

4.1.2.1 char* POMP2_Region_info::mCriticalName

name of a named critical region

4.1.2.2 char* POMP2_Region_info::mEndFileName

name of the corresponding source file from the closing pragma

4.1.2.3 unsigned POMP2_Region_info::mEndLine1

line number of the first line from the closing pragma

4.1.2.4 unsigned POMP2_Region_info::mEndLine2

line number of the last line from the closing pragma

4.1.2.5 bool POMP2_Region_info::mHasCollapse

true if a collapse clause is present

4.1.2.6 bool POMP2_Region_info::mHasCopyIn

true if a copyin clause is present

4.1.2.7 bool POMP2_Region_info::mHasCopyPrivate

true if a copyprivate clause is present

4.1.2.8 bool POMP2_Region_info::mHasFirstPrivate

true if a firstprivate clause is present

4.1.2.9 bool POMP2_Region_info::mHasIf

true if an if clause is present

4.1.2.10 bool POMP2_Region_info::mHasLastPrivate

true if a lastprivate clause is present

4.1.2.11 bool POMP2_Region_info::mHasNoWait

true if a nowait clause is present

4.1.2.12 bool POMP2_Region_info::mHasNumThreads

true if a numThreads clause is present

4.1.2.13 bool POMP2_Region_info::mHasOrdered

true if an ordered clause is present

4.1.2.14 bool POMP2_Region_info::mHasReduction

true if a reduction clause is present

4.1.2.15 bool POMP2_Region_info::mHasUntied

true if a untied clause was present, even if the task was changed to tied during instrumentation.

4.1.2.16 unsigned POMP2_Region_info::mNumSections

number of sections

4.1.2.17 POMP2_Region_type POMP2_Region_info::mRegionType

type of the OpenMP region

4.1.2.18 POMP2_Schedule_type POMP2_Region_info::mScheduleType

schedule type in the schedule clause

4.1.2.19 char* POMP2_Region_info::mStartFileName

name of the corresponding source file from the opening pragma

4.1.2.20 unsigned POMP2_Region_info::mStartLine1

line number of the first line from the opening pragma

4.1.2.21 unsigned POMP2_Region_info::mStartLine2

line number of the last line from the opening pragma

4.1.2.22 char* POMP2_Region_info::mUserGroupName

user group name

4.1.2.23 char* POMP2_Region_info::mUserRegionName

name of a user defined region

The documentation for this struct was generated from the following file:

- [pomp2_region_info.h](#)

Chapter 5

File Documentation

5.1 pomp2_lib.h File Reference

This file contains the declarations of all POMP2 functions.

Typedefs

- typedef void * [POMP2_Region_handle](#)

Functions

- void [POMP2_Assign_handle](#) ([POMP2_Region_handle](#) *pomp2_handle, const char ctc_string[])
- void [POMP2_Atomic_enter](#) ([POMP2_Region_handle](#) *pomp2_handle, const char ctc_string[])
- void [POMP2_Atomic_exit](#) ([POMP2_Region_handle](#) *pomp2_handle)
- void [POMP2_Barrier_enter](#) ([POMP2_Region_handle](#) *pomp2_handle, POMP2_Task_handle *pomp2_old_task, const char ctc_string[])
- void [POMP2_Barrier_exit](#) ([POMP2_Region_handle](#) *pomp2_handle, POMP2_Task_handle pomp2_old_task)
- void [POMP2_Begin](#) ([POMP2_Region_handle](#) *pomp2_handle)
- void [POMP2_Critical_begin](#) ([POMP2_Region_handle](#) *pomp2_handle)
- void [POMP2_Critical_end](#) ([POMP2_Region_handle](#) *pomp2_handle)
- void [POMP2_Critical_enter](#) ([POMP2_Region_handle](#) *pomp2_handle, const char ctc_string[])
- void [POMP2_Critical_exit](#) ([POMP2_Region_handle](#) *pomp2_handle)
- void [POMP2_Destroy_lock](#) (omp_lock_t *s)
- void [POMP2_Destroy_nest_lock](#) (omp_nest_lock_t *s)
- void [POMP2_End](#) ([POMP2_Region_handle](#) *pomp2_handle)
- void [POMP2_Finalize](#) ()

- void [POMP2_Flush_enter](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_Flush_exit](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_For_enter](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_For_exit](#) (POMP2_Region_handle *pomp2_handle)
- POMP2_Task_handle [POMP2_Get_new_task_handle](#) ()
- void [POMP2_Implicit_barrier_enter](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle *pomp2_old_task)
- void [POMP2_Implicit_barrier_exit](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle pomp2_old_task)
- void [POMP2_Init](#) ()
- void [POMP2_Init_lock](#) (omp_lock_t *s)
- void [POMP2_Init_nest_lock](#) (omp_nest_lock_t *s)
- int [POMP2_Lib_get_max_threads](#) ()
- void [POMP2_Master_begin](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_Master_end](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Off](#) ()
- void [POMP2_On](#) ()
- void [POMP2_Ordered_begin](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Ordered_end](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Ordered_enter](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_Ordered_exit](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Parallel_begin](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Parallel_end](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Parallel_fork](#) (POMP2_Region_handle *pomp2_handle, int if_clause, int num_threads, POMP2_Task_handle *pomp2_old_task, const char ctc_string[])
- void [POMP2_Parallel_join](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle pomp2_old_task)
- void [POMP2_Section_begin](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_Section_end](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Sections_enter](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_Sections_exit](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Set_lock](#) (omp_lock_t *s)
- void [POMP2_Set_nest_lock](#) (omp_nest_lock_t *s)
- void [POMP2_Single_begin](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Single_end](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Single_enter](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_Single_exit](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Task_begin](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle pomp2_task)

- void [POMP2_Task_create_begin](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle *pomp2_new_task, POMP2_Task_handle *pomp2_old_task, int pomp2_if, const char ctc_string[])
- void [POMP2_Task_create_end](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle pomp2_old_task)
- void [POMP2_Task_end](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Taskwait_begin](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle *pomp2_old_task, const char ctc_string[])
- void [POMP2_Taskwait_end](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle pomp2_old_task)
- int [POMP2_Test_lock](#) (omp_lock_t *s)
- int [POMP2_Test_nest_lock](#) (omp_nest_lock_t *s)
- void [POMP2_Unset_lock](#) (omp_lock_t *s)
- void [POMP2_Unset_nest_lock](#) (omp_nest_lock_t *s)
- void [POMP2_Untied_task_begin](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle pomp2_task)
- void [POMP2_Untied_task_create_begin](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle *pomp2_new_task, POMP2_Task_handle *pomp2_old_task, int pomp2_if, const char ctc_string[])
- void [POMP2_Untied_task_create_end](#) (POMP2_Region_handle *pomp2_handle, POMP2_Task_handle pomp2_old_task)
- void [POMP2_Untied_task_end](#) (POMP2_Region_handle *pomp2_handle)
- void [POMP2_Workshare_enter](#) (POMP2_Region_handle *pomp2_handle, const char ctc_string[])
- void [POMP2_Workshare_exit](#) (POMP2_Region_handle *pomp2_handle)

Functions generated by the instrumenter

- size_t [POMP2_Get_num_regions](#) ()
- void [POMP2_Init_regions](#) ()
- const char * [POMP2_Get_opari2_version](#) ()

5.1.1 Detailed Description

This file contains the declarations of all POMP2 functions. alpha

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5.1.2 Typedef Documentation

5.1.2.1 typedef void* POMP2_Region_handle

Handles to identify OpenMP regions.

5.1.3 Function Documentation

5.1.3.1 void POMP2.Assign_handle (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Registers a POMP2 region and returns a region handle.

Parameters

<i>pomp2_handle</i>	Returns the handle for the newly registered region.
<i>ctc_string</i>	A string containing the region data.

5.1.3.2 void POMP2.Atomic_enter (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called before an atomic statement.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
<i>ctc_string</i>	Initialization string. May be ignored if < <i>pomp2_handle</i> > is already initialized.

5.1.3.3 void POMP2.Atomic_exit (POMP2_Region_handle * *pomp2_handle*)

Called after an atomic statement.

Parameters

<i>pomp2_handle</i>	The handle of the ended region.
---------------------	---------------------------------

5.1.3.4 void POMP2.Barrier_enter (POMP2_Region_handle * *pomp2_handle*, POMP2.Task_handle * *pomp2_old_task*, const char *ctc_string*[])

Called before a barrier.

OpenMP 3.0: Barriers can be used as scheduling points for tasks. When entering a barrier the task id of the currently executing task (*pomp2_current_task*) is saved in *pomp2_old_task*, which is defined inside the instrumented user code.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
---------------------	-----------------------------------

<i>pomp2_old_task</i>	Pointer to a "taskprivate" variable where the current task id is stored.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.5 void POMP2_Barrier_exit (POMP2_Region_handle * *pomp2_handle*, POMP2_Task_handle *pomp2_old_task*)

Called after a barrier.

OpenMP 3.0: When a task exits a barrier the variable *pomp2_old_task* (defined in the instrumented user code) holds the id of the task that entered the barrier. The value is stored in the adapter (in *pomp2_current_task*) to be made available for the measurement system for the following regions.

Parameters

<i>pomp2_handle</i>	The handle of the ended region.
<i>pomp2_old_task</i>	"Taskprivate" variable storing the id of the task the barrier is located in.

5.1.3.6 void POMP2_Begin (POMP2_Region_handle * *pomp2_handle*)

Called at the begin of a user defined POMP2 region.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
---------------------	-----------------------------------

5.1.3.7 void POMP2_Critical_begin (POMP2_Region_handle * *pomp2_handle*)

Called at the start of a critical region.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
---------------------	-----------------------------------

5.1.3.8 void POMP2_Critical_end (POMP2_Region_handle * *pomp2_handle*)

Called at the end of a critical region.

Parameters

<i>pomp2_- handle</i>	The handle of the ended region.
---------------------------	---------------------------------

5.1.3.9 void POMP2.Critical_enter (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called before a critical region.

Parameters

<i>pomp2_- handle</i>	The handle of the started region.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.10 void POMP2.Critical_exit (POMP2_Region_handle * *pomp2_handle*)

Called after a critical region.

Parameters

<i>pomp2_- handle</i>	The handle of the region.
---------------------------	---------------------------

5.1.3.11 void POMP2.Destroy_lock (omp_lock_t * *s*)

Wraps the omp_destroy_lock function.

Parameters

<i>s</i>	The OpenMP lock to destroy.
----------	-----------------------------

5.1.3.12 void POMP2.Destroy_nest_lock (omp_nest_lock_t * *s*)

Wraps the omp_destroy_nest_lock function.

Parameters

<i>s</i>	The nested OpenMP lock to destroy.
----------	------------------------------------

5.1.3.13 void POMP2.End (POMP2_Region_handle * *pomp2_handle*)

Called at the begin of a user defined POMP2 region.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
---------------------	-----------------------------------

5.1.3.14 void POMP2_Finalize ()

Finalizes the POMP2 adapter. It is inserted at the #pragma pomp inst end.

5.1.3.15 void POMP2_Flush_enter (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called before an flush.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.16 void POMP2_Flush_exit (POMP2_Region_handle * *pomp2_handle*)

Called after an flush.

Parameters

<i>pomp2_handle</i>	The handle of the ended region.
---------------------	---------------------------------

5.1.3.17 void POMP2_For_enter (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called before a for loop.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.18 void POMP2_For_exit (POMP2_Region_handle * *pomp2_handle*)

Called after a for loop.

Parameters

<i>pomp2_- handle</i>	The handle of the region.
---------------------------	---------------------------

5.1.3.19 POMP2_Task_handle POMP2_Get_new_task_handle ()

Function that returns a new task handle.

Returns

new task handle

5.1.3.20 size_t POMP2_Get_num_regions ()

Returns the number of instrumented regions.

The instrumenter scans all opari-created include files with nm and greps the POMP2_INIT_uuid_numRegions() function calls. Here we return the sum of all numRegions.

Returns

number of instrumented regions

5.1.3.21 const char* POMP2_Get_opari2_version ()

Returns the opari version.

Returns

version string

5.1.3.22 void POMP2_Implicit_barrier_enter (POMP2_Region_handle * *pomp2.handle*, POMP2_Task_handle * *pomp2.old_task*)

Called before an implicit barrier.

OpenMP 3.0: Barriers can be used as scheduling points for tasks. When entering a barrier the task id of the currently executing task (*pomp2_current_task*) is saved in *pomp2_old_task*, which is defined inside the instrumented user code.

Parameters

<i>pomp2_- handle</i>	The handle of the started region.
<i>pomp2_- old_task</i>	Pointer to a "taskprivate" variable where the current task id is stored.

5.1.3.23 void POMP2_Implicit_barrier_exit (POMP2_Region_handle * *pomp2_handle*,
POMP2_Task_handle *pomp2_old_task*)

Called after an implicit barrier.

OpenMP 3.0: When a task exits a barrier the variable *pomp2_old_task* (defined in the instrumented user code) holds the id of the task that entered the barrier. The value is stored in the adapter (in *pomp2_current_task*) to be made available for the measurement system for the following regions.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
<i>pomp2_old_task</i>	"Taskprivate" variable storing the id the task the implicit barrier is used in.

5.1.3.24 void POMP2_Init ()

Initializes the POMP2 adapter. It is inserted at the #pragma pomp inst begin.

5.1.3.25 void POMP2_Init_lock (omp_lock_t * *s*)

Wraps the omp_init_lock function.

Parameters

<i>s</i>	The OpenMP lock to initialize.
----------	--------------------------------

5.1.3.26 void POMP2_Init_nest_lock (omp_nest_lock_t * *s*)

Wraps the omp_init_nest_lock function.

Parameters

<i>s</i>	The nested OpenMP lock to initialize.
----------	---------------------------------------

5.1.3.27 void POMP2_Init_regions ()

Init all opari-created regions.

The instrumentor scans all opari-created include files with nm and greps the POMP2_INIT_uuid_numRegions() function calls. The instrumentor then defines these functions by calling all grepped functions.

5.1.3.28 `int POMP2_Lib_get_max_threads ()`

Wraps the `omp_get_max_threads` function.

Needed for the instrumentation of parallel regions where the `num_threads` clause is used with the return value of the `omp_get_max_threads` function. This can't be used directly because the user may have declared it himself. Double declarations are not allowed.

5.1.3.29 `void POMP2_Master_begin (POMP2_Region_handle * pomp2_handle, const char ctc_string[])`

Called at the start of a master region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>ctc_string</i>	Initialization string. May be ignored if <code><pomp2_handle></code> is already initialized.

5.1.3.30 `void POMP2_Master_end (POMP2_Region_handle * pomp2_handle)`

Called at the end of a master region.

Parameters

<i>pomp2_handle</i>	The handle of the ended region.
---------------------	---------------------------------

5.1.3.31 `void POMP2_Off ()`

Disables the POMP2 adapter.

5.1.3.32 `void POMP2_On ()`

Enables the POMP2 adapter.

5.1.3.33 `void POMP2_Ordered_begin (POMP2_Region_handle * pomp2_handle)`

Called at the start of an ordered region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.34 void POMP2_Ordered_end (POMP2_Region_handle * *pomp2_handle*)

Called at the end of an ordered region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.35 void POMP2_Ordered_enter (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called before an ordered region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>ctc_string</i>	Initialization string. Ignored.

5.1.3.36 void POMP2_Ordered_exit (POMP2_Region_handle * *pomp2_handle*)

Called after an ordered region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.37 void POMP2_Parallel_begin (POMP2_Region_handle * *pomp2_handle*)

Called at the start of a parallel region.

OpenMP 3.0: When a new parallel region is entered, each thread taking part in that region is executed as a task. These tasks are assigned a new unique task id which is stored in *pomp2_current_task*.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.38 void POMP2_Parallel_end (POMP2_Region_handle * *pomp2_handle*)

Called at the end of a parallel region.

Parameters

<i>pomp2_- handle</i>	The handle of the region.
---------------------------	---------------------------

5.1.3.39 void POMP2.Parallel.fork (POMP2_Region_handle * *pomp2_handle*, int *if_clause*, int *num_threads*, POMP2_Task_handle * *pomp2_old_task*, const char *ctc_string*[])

Called before a parallel region.

OpenMP 3.0: The task id of the currently executing task (*pomp2_current_task*) is saved in *pomp2_old_task*, which is defined inside the instrumented user code. In each of the threads taking part in the following parallel region a newly defined unique task id is assigned (see [POMP2_Parallel_begin](#))

Parameters

<i>pomp2_- handle</i>	The handle of the region.
<i>if_clause</i>	Value of the argument of an if clause (if present).
<i>num_- threads</i>	Upper bound for number of child threads.
<i>pomp2_- old_task</i>	The task id of the region from which the parallel region was started.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.40 void POMP2.Parallel.join (POMP2_Region_handle * *pomp2_handle*, POMP2_Task_handle *pomp2_old_task*)

Called after a parallel region.

OpenMP 3.0: When a task exits a parallel region the variable *pomp2_old_task* (defined in the instrumented user code) holds the id of the task that entered the region. The value is stored in the adapter (in *pomp2_current_task*) to be made available for the measurement system for the following regions.

Parameters

<i>pomp2_- handle</i>	The handle of the region.
<i>pomp2_- old_task</i>	The task id of the region inside of which the parallel region was executed.

5.1.3.41 void POMP2_Section_begin (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called at the start of a section.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.42 void POMP2_Section_end (POMP2_Region_handle * *pomp2_handle*)

Called at the end of a section.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.43 void POMP2_Sections_enter (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called before a set of sections.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.44 void POMP2_Sections_exit (POMP2_Region_handle * *pomp2_handle*)

Called after a set of sections.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.45 void POMP2_Set_lock (omp_lock_t * *s*)

Wraps the omp_set_lock function.

Parameters

<i>s</i>	The OpenMP lock to set.
----------	-------------------------

5.1.3.46 void POMP2_Set_nest_lock (omp_nest_lock_t * s)

Wraps the omp_set_nest_lock function

Parameters

<i>s</i>	The nested OpenMP lock to set.
----------	--------------------------------

5.1.3.47 void POMP2_Single_begin (POMP2_Region_handle * pomp2_handle)

Called at the start of a single region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.48 void POMP2_Single_end (POMP2_Region_handle * pomp2_handle)

Called at the end of a single region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.1.3.49 void POMP2_Single_enter (POMP2_Region_handle * pomp2_handle, const char ctc_string[])

Called before a single region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.50 void POMP2_Single_exit (POMP2_Region_handle * pomp2_handle)

Called after a single region.

Parameters

<i>pomp2_-handle</i>	The handle of the region.
----------------------	---------------------------

5.1.3.51 void POMP2_Task_begin (POMP2_Region_handle * *pomp2.handle*,
POMP2_Task_handle *pomp2.task*)

OpenMP 3.0: Marks the beginning of the execution of a task.

Parameters

<i>pomp2_-handle</i>	The region handle.
<i>pomp2_task</i>	handle of task.

5.1.3.52 void POMP2_Task_create_begin (POMP2_Region_handle * *pomp2.handle*,
POMP2_Task_handle * *pomp2.new_task*, POMP2_Task_handle * *pomp2.old_task*, int
pomp2.if, const char *ctc.string*[])

OpenMP 3.0: When a task encounters a task construct it creates a new task. The task may be scheduled for later execution or executed immediately. In both cases the pomp-adapter assigns the id of the currently active task to *pomp2_old_task* which is defined in the instrumented user code.

Parameters

<i>pomp2_-handle</i>	The handle of the region.
<i>pomp2_-old_task</i>	Pointer to the task id in the instrumented user code
<i>pomp2_if</i>	If an if clause is present on the task directive this variable holds the evaluated result of the argument of the if clause. Else it is 1.
<i>ctc_string</i>	The initialization string.

5.1.3.53 void POMP2_Task_create_end (POMP2_Region_handle * *pomp2.handle*,
POMP2_Task_handle *pomp2.old_task*)

OpenMP 3.0: After the code region which is executed as a separate task, the task id of the creating task is restored from *pomp2_old_task* (defined in the instrumented user code) and stored in *pomp2_current_task* inside the adapter.

Parameters

<i>pomp2_-handle</i>	The region handle.
<i>pomp2_-old_task</i>	The task id of the task inside of which the task was created. This is stored inside the instrumented user code.

5.1.3.54 void POMP2_Task_end (POMP2_Region_handle * *pomp2_handle*)

OpenMP 3.0: Marks the end of the execution of a task.

Parameters

<i>pomp2_handle</i>	The region handle.
---------------------	--------------------

5.1.3.55 void POMP2_Taskwait_begin (POMP2_Region_handle * *pomp2_handle*, POMP2_Task_handle * *pomp2_old_task*, const char *ctc_string*[])

Called before a taskwait.

OpenMP 3.0: Taskwait directives can be used as scheduling points for tasks. When entering a taskwait region the task id of the currently executing task (*pomp2_current_task*) is saved in *pomp2_old_task*, which is defined inside the instrumented user code.

Parameters

<i>pomp2_handle</i>	The handle of the started region.
<i>pomp2_old_task</i>	Pointer to a "taskprivate" variable where the current task id is stored.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.56 void POMP2_Taskwait_end (POMP2_Region_handle * *pomp2_handle*, POMP2_Task_handle *pomp2_old_task*)

Called after a barrier.

OpenMP 3.0: When a task exits a taskwait region the variable *pomp2_old_task* (defined in the instrumented user code) holds the id of the task that entered the taskwait. The value is stored in the adapter (in *pomp2_current_task*) to be made available for the measurement system for the following regions.

Parameters

<i>pomp2_handle</i>	The handle of the ended region.
<i>pomp2_old_task</i>	"Taskprivate" variable storing the id of the task the barrier is located in.

5.1.3.57 int POMP2_Test_lock (omp_lock_t * *s*)

Wraps the `omp_test_lock` function

Parameters

<i>s</i>	the OpenMP lock to test for.
----------	------------------------------

Returns

result of omp_test_lock

5.1.3.58 int POMP2_Test_nest_lock (omp_nest_lock_t * *s*)

Wraps the omp_test_nest_lock function

Parameters

<i>s</i>	The nested OpenMP lock to test for.
----------	-------------------------------------

Returns

result of omp_test_nest_lock

5.1.3.59 void POMP2_Unset_lock (omp_lock_t * *s*)

Wraps the omp_unset_lock function.

Parameters

<i>s</i>	the OpenMP lock to unset.
----------	---------------------------

5.1.3.60 void POMP2_Unset_nest_lock (omp_nest_lock_t * *s*)

Wraps the omp_unset_nest_lock function

Parameters

<i>s</i>	The nested OpenMP lock to unset.
----------	----------------------------------

5.1.3.61 void POMP2_Untied_task_begin (POMP2_Region_handle * *pomp2_handle*, POMP2_Task_handle *pomp2_task*)

OpenMp 3.0: Marks the beginning of the execution of an untied task.

Parameters

<i>pomp2_handle</i>	The region handle.
<i>pomp2_task</i>	Handle of this task.

5.1.3.62 void POMP2_Untied_task_create_begin (POMP2_Region_handle * *pomp2_handle*, POMP2_Task_handle * *pomp2_new_task*, POMP2_Task_handle * *pomp2_old_task*, int *pomp2_if*, const char *ctc_string*[])

OpenMP 3.0: When a task encounters a task construct it creates a new task. If the untied clause is specified the task is executed as an untied task. The task may be scheduled for later execution or executed immediately. In both cases the pomp-adapter assigns the id of the currently active task to *pomp2_old_task* which is defined in the instrumented user code.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>pomp2_old_task</i>	Pointer to the task id in the instrumented user code.
<i>pomp2_if</i>	If an if clause is present on the task directive this variable holds the evaluated result of the argument of the if clause. Else it is 1.
<i>ctc_string</i>	The initialization string.

5.1.3.63 void POMP2_Untied_task_create_end (POMP2_Region_handle * *pomp2_handle*, POMP2_Task_handle *pomp2_old_task*)

OpenMP 3.0: After the code region which is executed as a separate untied task, the task id of the creating task is restored from *pomp2_old_task* (defined in the instrumented user code) and stored in *pomp2_current_task* inside the adapter.

Parameters

<i>pomp2_handle</i>	The region handle.
<i>pomp2_old_task</i>	The id of the task from which the untied task was created. This is stored in the instrumented user code.

5.1.3.64 void POMP2_Untied_task_end (POMP2_Region_handle * *pomp2_handle*)

OpenMP 3.0: Marks the end of the execution of a task.

Parameters

<i>pomp2_handle</i>	The region handle.
---------------------	--------------------

5.1.3.65 void POMP2_Workshare_enter (POMP2_Region_handle * *pomp2_handle*, const char *ctc_string*[])

Called before a workshare region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
<i>ctc_string</i>	Initialization string. May be ignored if <pomp2_handle> is already initialized.

5.1.3.66 void POMP2_Workshare_exit (POMP2_Region_handle * *pomp2_handle*)

Called after a workshare region.

Parameters

<i>pomp2_handle</i>	The handle of the region.
---------------------	---------------------------

5.2 pomp2_region_info.h File Reference

This file contains function declarations and structs which handle informations on OpenMP regions. [POMP2_Region_info](#) is used to store these informations. It can be filled with a ctcString by [ctcString2RegionInfo\(\)](#).

Data Structures

- struct [POMP2_Region_info](#)
This struct stores all information on an OpenMP region, like the region type or corresponding source lines. The function [ctcString2RegionInfo\(\)](#) can be used to fill this struct with data from a ctcString.

Enumerations

- enum [POMP2_Region_type](#)
- enum [POMP2_Schedule_type](#)

Functions

- void [ctcString2RegionInfo](#) (const char ctcString[], [POMP2_Region_info](#) *regionInfo)
- void [freePOMP2RegionInfoMembers](#) ([POMP2_Region_info](#) *regionInfo)
- const char * [pomp2RegionType2String](#) ([POMP2_Region_type](#) regionType)
- const char * [pomp2ScheduleType2String](#) ([POMP2_Schedule_type](#) scheduleType)

5.2.1 Detailed Description

This file contains function declarations and structs which handle informations on OpenMP regions. [POMP2_Region_info](#) is used to store these informations. It can be filled with a `ctcString` by [ctcString2RegionInfo\(\)](#).

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5.2.2 Enumeration Type Documentation

5.2.2.1 enum POMP2_Region_type

`POMP2_Region_type`

5.2.2.2 enum POMP2_Schedule_type

type to store the scheduling type of a for worksharing construct

5.2.3 Function Documentation

5.2.3.1 void ctcString2RegionInfo (const char *ctcString*[], POMP2_Region_info * *regionInfo*)

[ctcString2RegionInfo\(\)](#) fills the [POMP2_Region_info](#) object with data read from the `ctcString`. If the `ctcString` does not comply with the specification, the program aborts with exit code 1.

Rationale: [ctcString2RegionInfo\(\)](#) is used during initialization of the measurement system. If an error occurs, it is better to abort than to struggle with undefined behaviour or *guessing* the meaning of the broken string.

Note

Can be called from multiple threads concurrently, assuming `malloc` is thread-safe. [ctcString2RegionInfo\(\)](#) will assign memory to the members of *regionInfo*. You are supposed to release this memory by calling [freePOMP2RegionInfoMembers\(\)](#).

Parameters

<i>ctcString</i>	A string in the format "length*key=value*[key=value]*". The length field is parsed but not used by this implementation. Possible values for key are listed in <code>ctcTokenMap</code> . The string must at least contain values for the keys <code>regionType</code> , <code>sscl</code> and <code>escl</code> . Possible values for the key <code>regionType</code> are listed in <code>regionTypesMap</code> . The format for <code>sscl</code> resp. <code>escl</code> values is "filename:lineNo1;lineNo2".
------------------	--

<i>regionInfo</i>	must be a valid object
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Postcondition

At least the required attributes (see [POMP2_Region_info](#)) are set.

All other members of *regionInfo* are set to 0 resp. false resp. POMP2_No_schedule.

If *regionType*=sections than [POMP2_Region_info::mNumSections](#) has a value > 0.

If *regionType*=region than [POMP2_Region_info::mUserRegionName](#) has a value != 0.

If *regionType*=critical than [POMP2_Region_info::mCriticalName](#) may have a value != 0.

5.2.3.2 void freePOMP2RegionInfoMembers (POMP2_Region_info * *regionInfo*)

Free the memory of the *regionInfo* members.

Parameters

<i>regionInfo</i>	The regioninfo to be freed.
-------------------	-----------------------------

5.2.3.3 const char* pomp2RegionType2String (POMP2_Region_type *regionType*)

converts *regionType* into a string

Parameters

<i>regionType</i>	The <i>regionType</i> to be converted.
-------------------	--

Returns

string representation of the region type

5.2.3.4 const char* pomp2ScheduleType2String (POMP2_Schedule_type *scheduleType*)

converts *scheduleType* into a string

Parameters

<i>schedule-Type</i>	The <i>scheduleType</i> to be converted.
----------------------	--

Returns

string representation of the *scheduleType*

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