tracefctxx

1.1.4

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1.1 Copyright

1.2 Introduction

TraceFct is a class which helps a program keep track of its calling sequence, allowing one to produce a "stack" dump upon error. It also provides a uniform mechanism for printing messages and errors, and provides `assert()` style macros which use these features.

TraceFct prefixes messages and errors with a string which uniquely identifies the process (useful for debugging when running multiple processes concurrently). It support switching the output stream for messages.

- Basic Interface
- Output Streams
- Message Prefix

- Assertions
- hints

2 Assertions

TraceFct provides two types of C style assertions, both implemented as pre-processor macros. Their main benefit is the uniform prefix string.

The first assertion is *always active* (i.e. you can't define it away with NDEBUG). It's available via the tf_assert macro.

The second type may be turned on and off, and comes in five levels. The macros are tf_assert1, tf_assert2, tf_assert3, tf_assert4, tf_assert5, and are controlled by the value of the TF_ASSERT_LEVEL preprocessor macro. TF_ASSERT_LEVEL should be set to an integer; assertions with levels less than or equal to that will be made active.

3 Basic Interface

3.1 Function Stack

Tracking the calling sequence is done by creating a **TraceFct** object in each routine which should be tracked. The sequence is stored as class global – **TraceFct** thus may not reliably be used in a multithreaded program.

The class must be initialized by calling the special, three argument version of the constructor. This is usually done in the main subroutine.

```
int main( int argc, char * argv[] )
{
  TraceFct tf( argv[0], 0, -1 );
```

Thereafter, use the one-argument constructor when entering a new subroutine to be traced.

```
void f2( void )
{
  static int level = 0;
  TraceFct tf( "f2" );
```

3.2 Messages and Exit

TraceFct provides several methods to output warning or diagnostic messages as well as produce a function stack dump upon an error exit. The benefit of using the output

methods is that all output will have a common, unique prefix, which permits easier analysis of complicated log files. Messages may have embedded newlines.

```
tf.message( "message test: %d\n", level );
tf.message( "1. multiline\n2. message test\n" );
```

Currently `TraceFct` does *not* have an overloaded << operator; use the TraceFct::message() and TraceFct::vmessage() methods.

To generate a stack dump upon exit, use the TraceFct::exit() method.

```
tf.exit( 1, "f1 exit: line1\nf1 exit: line2, extra newline\n" );
```

To generate just a stack dump, just call TraceFct::dump_stack().

4 Message Prefix

Messages have the following appearance:

pid: exec-name: *message*

where *pid* is the process id number, *exec-name* is the name of the executable, and *message* is a user provided message.

5 Output Streams

Normally, TraceFct produces output on the `stderr` stream. TraceFct::open() causes it be redirected to an alternative stream. That stream may be closed with TraceFct::close(), after which the output will once again be sent to the `stderr` stream.

Output not written to the `stderr` stream will not have the standard prefix prepended. Messages written by TraceFct::exit() will appear on both the `stderr` and alternative output streams.

6 Directory Hierarchy

6.1 Directories

This directory hierarchy is sorted roughly, but not completely, alphabetically:

7 Class Index

7.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

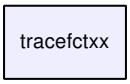
8 File Index

8.1 File List

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

9 Directory Documentation

9.1 /data/macabretmp/dj/tracefctxx/tracefctxx/ Directory Reference



Files

- file **TraceFct.cc**
- file TraceFct.h

10 Class Documentation

10.1 TraceFct Class Reference

`#include <TraceFct.h>`

Public Member Functions

- TraceFct (string name, bool print_it, int num_fct_to_print)
  Class initializer.
- ~TraceFct ()
  - TraceFct (const char *name)
    Function entry constructor.
  - TraceFct (string &name)
    Function entry constructor.

Static Public Member Functions

- static void dump_stack (void)
  Print the current function stack.

Exit

These functions print an error message to `stderr` *as well as the* **tracefct** *output stream (if different from* `stderr`*) and then exits the program with the supplied error code. The error message is passed in the same fashion as the arguments to* `vprintf` *or* `sprintf`*. The message may contain multiple output lines (i.e., multiple newline characters). If a trailing newline character is not specified, it will be appended.*

- static void exit (int exit_code, const char *format,...)
  Exit a program, dumping the function stack.
- static void exit (int exit_code, Exception &ex)
  Exit a program, dumping the function stack.
- static void exit (int exit_code, const string &msg)
  Exit a program, dumping the function stack.
- static void die (const char *format,...)
  Exit a program with error EXIT_FAILURE, dumping the function stack.
- static void die (Exception &ex)
  Exit a program with error EXIT_FAILURE, dumping the function stack.
- static void die (const string &msg)
  Exit a program with error EXIT_FAILURE, dumping the function stack.

Messages

The `message` *functions print a user supplied message to the TraceFct output stream, prefixed by the standard TraceFct style prefix string. Unlike TraceFct::exit(), a newline character is* not *appended to the message.*

The `println` *functions are similar, except that they ensure that a newline character* is *appended to the message.*

- static void message (const char *format,...)
  Print a formatted message to the `tracefct` *output stream.*
- static void message (Exception &ex)
  Print a message to the `tracefct` *output stream.*
- static void message (const string &msg)
  Print a message to the `tracefct` *output stream.*
- static void vmessage (const char *format, va_list args)
  Print a formatted message to the `tracefct` *output stream using a* `stdargs` *argument list.*
- static void println (Exception &ex)
  Print a message to the `tracefct` *output stream.*
- static void println (const string &msg)
  Print a message to the `tracefct` *output stream.*
- static void println (const char *msg)
  Print a message to the `tracefct` *output stream.*

Output Stream manipulation

- static void open (const string &filename)
  redirect the `tracefct` *output stream*
- static void close (void)
  reset the `tracefct` *output stream to* `stderr`.

10.1.1 Detailed Description

The TraceFct Class

Examples:

ex1.cc, and ex2.cc.

Definition at line 155 of file TraceFct.h.

10.1.2 Constructor & Destructor Documentation

10.1.2.1 TraceFct::TraceFct (const char * *name*)

Function entry constructor.

Parameters:

name the name of the function

This constructor is used when entering a function which should be registered.

Definition at line 122 of file TraceFct.cc.

References message().

10.1.2.2 TraceFct::TraceFct (string & *name*)

Function entry constructor.

Parameters:

name the name of the function

This constructor is used when entering a function which should be registered.

Definition at line 106 of file TraceFct.cc.

References message().

10.1.2.3 TraceFct::TraceFct (string *prog_name*, bool *print_it*, int *num_fct_to_print*)

Class initializer.

This initializer should be used to initialize the class, and should be called once in the program, before any subsequent calls to the per-function initializers

Parameters:

name the name of the program, preferrably argv[0]. path information (if present) is not stripped.

print_it if true, a message will be output upon entry and exit of a function

num_fct_to_print if positive, only the requested number of function names will be printed. if non-positive, all of the function names will be printed.

The calling routine can also set up some output options which determine the depth of the function stack to print and whether a diagnostic should be printed at every entry and return of a function.

Definition at line 80 of file TraceFct.cc.

10.1.2.4 TraceFct::~TraceFct ()

The destructor.

Definition at line 138 of file TraceFct.cc.

References message().

10.1.3 Member Function Documentation

10.1.3.1 void TraceFct::exit (int *exit_code*, const char * *format*, ...) [static]

Exit a program, dumping the function stack.

Parameters:

exit_code the exit code to be returned to the system

format a printf style format string

... additional arguments

Definition at line 361 of file TraceFct.cc.

Referenced by die(), and exit().

10.1.3.2 void TraceFct::exit (int *exit_code*, Exception & *ex*) [static]

Exit a program, dumping the function stack.

Parameters:

exit_code the exit code to be returned to the system

ex The Exception Stack to print

This version of the exit function will print out the passed `Exception` stack.

Definition at line 398 of file TraceFct.cc.

References dump_stack().

10.1.3.3 static void TraceFct::exit (int *exit_code*, const string & *msg*) [inline, static]

Exit a program, dumping the function stack.

Parameters:

exit_code the exit code to be returned to the system

msg a message to print

Definition at line 166 of file TraceFct.h.

References exit().

10.1.3.4 void TraceFct::die (const char * *format*, ...) [static]

Exit a program with error EXIT_FAILURE, dumping the function stack.

Parameters:

format a printf style format string

... additional arguments

Definition at line 446 of file TraceFct.cc.

10.1.3.5 void TraceFct::die (Exception & *ex*) [inline, static]

Exit a program with error EXIT_FAILURE, dumping the function stack.

Parameters:

ex The Exception Stack to print

This version of the exit function will print out the passed `Exception` stack.

Definition at line 172 of file TraceFct.h.

References exit().

10.1.3.6 void TraceFct::die (const string & *msg*) [inline, static]

Exit a program with error EXIT_FAILURE, dumping the function stack.

Parameters:

msg a message to print

Definition at line 175 of file TraceFct.h.

References exit().

10.1.3.7 void TraceFct::message (const char * *format*, ...) [static]

Print a formatted message to the tracefct output stream.

Parameters:

format a printf style format string

... additional arguments

The message is passed in the same fashion as the arguments to printf, allowing formatted output.

Examples:

ex1.cc.

Definition at line 515 of file TraceFct.cc.

Referenced by dump_stack(), message(), TraceFct(), and ~TraceFct().

10.1.3.8 static void TraceFct::message (Exception & *ex*) [inline, static]

Print a message to the tracefct output stream.

Parameters:

ex The exception to print

Definition at line 179 of file TraceFct.h.

10.1.3.9 static void TraceFct::message (const string & *msg*) [inline, static]

Print a message to the tracefct output stream.

Parameters:

msg a message to print

Definition at line 181 of file TraceFct.h.

References message().

10.1.3.10 void TraceFct::vmessage (const char * *format*, va_list *args*) [static]

Print a formatted message to the tracefct output stream using a stdargs argument list.

Parameters:

format a printf style string

args q The error message is passed in the same fashion as the arguments to `vprintf`. Note that `vmessage` expects a `va_list` to be passed, rather than a variable argument list.

Definition at line 543 of file TraceFct.cc.

10.1.3.11 static void TraceFct::println (Exception & *ex*) [inline, static]

Print a message to the `tracefct` output stream.

Parameters:

ex the exception to print

Definition at line 186 of file TraceFct.h.

10.1.3.12 static void TraceFct::println (const string & *msg*) [inline, static]

Print a message to the `tracefct` output stream.

Parameters:

msg a message to print

Definition at line 188 of file TraceFct.h.

10.1.3.13 static void TraceFct::println (const char * *msg*) [inline, static]

Print a message to the `tracefct` output stream.

Parameters:

msg a message to print

Definition at line 190 of file TraceFct.h.

10.1.3.14 void TraceFct::dump_stack (void) [static]

Print the current function stack.

Parameters:

ostr the output file stream

This prints the current function stack to the TraceFct output stream

Examples:

ex1.cc.

Definition at line 272 of file TraceFct.cc.

References message().

Referenced by exit().

10.1.3.15 void TraceFct::open (const string & *file*) [static]

redirect the `tracefct` output stream

Parameters:

file the file to which messages are to be written

serves to change the TraceFct output stream to the specified file. Normally TraceFct writes to `stderr`. TraceFct::exit() *always* writes to `stderr`. To reset the output stream, see TraceFct::close(). If the current output stream is not `stderr`, it is automatically closed.

If the passed filename is the string `stderr`, open() will use `stderr`.

Upon error, it writes and exit to `stderr` and exits.

Definition at line 598 of file TraceFct.cc.

10.1.3.16 void TraceFct::close (void) [static]

reset the `tracefct` output stream to `stderr`.

close() resets the output stream to `stderr`, closing the file previously opened by TraceFct::open().

Definition at line 646 of file TraceFct.cc.

The documentation for this class was generated from the following files:

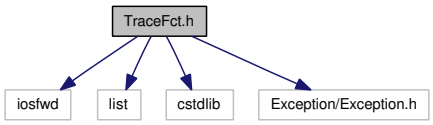
- TraceFct.h
- TraceFct.cc

11 File Documentation

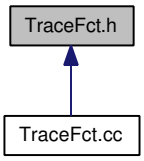
11.1 TraceFct.h File Reference

```
#include <iosfwd>
#include <list>
#include <cstdlib>
#include <Exception/Exception.h>
```

Include dependency graph for TraceFct.h:



This graph shows which files directly or indirectly include this file:



Classes

- class TraceFct

Defines

- #define **_tf_assert**(level, ex)
- #define TF_ASSERT_LEVEL

  This controls the level-based assertion macros. There are five levels; this macro should be assigned an integer corresponding to the maximum level for which assertions should be enabled. All assertions at levels less than or equal to this will be enabled. It is not defined by default.

- #define tf_assert(ex) _tf_assert(990,ex)

  if assertion *is not true, generate a message and exit with an error code of* `990`.

- #define tf_assert1(ex) _tf_assert(991,ex)

  if assertion *is not true and TF_ASSERT_LEVEL is greater or equal to 1, generate a message and exit with an error code of* `991`.

- #define tf_assert2(ex) _tf_assert(992,ex)

  if assertion *is not true and TF_ASSERT_LEVEL is greater or equal to than 1, generate a message and exit with an error code of* `992`.

- #define tf_assert3(ex) _tf_assert(993,ex)

  if assertion *is not true and TF_ASSERT_LEVEL is greater or equal to than 3, generate a message and exit with an error code of* `993`.

- #define tf_assert4(ex) _tf_assert(994,ex)

  if assertion *is not true and TF_ASSERT_LEVEL is greater or equal to than 4, generate a message and exit with an error code of* `994`.

- #define tf_assert5(ex) _tf_assert(995,ex)

  if assertion *is not true and TF_ASSERT_LEVEL is greater or equal to than 5, generate a message and exit with an error code of* `995`.

11.1.1 Detailed Description

The class definitions

Definition in file TraceFct.h.

11.1.2 Define Documentation

11.1.2.1 #define _tf_assert(level, ex)

Value:

```
do                                                                      \
  {                                                                     \
    if (!(ex))                                                          \
      TraceFct::exit( level, "Assertion failed: file\"%s\", line %d\n%s\n",     \
            __FILE__, __LINE__, #ex);                                   \
  } while(0)
```

Definition at line 45 of file TraceFct.h.

11.1.2.2 #define tf_assert(ex) _tf_assert(990,ex)

if *assertion* is not true, generate a message and exit with an error code of `990`.

Definition at line 74 of file TraceFct.h.

11.1.2.3 #define tf_assert1(ex) _tf_assert(991,ex)

if *assertion* is not true and TF_ASSERT_LEVEL is greater or equal to 1, generate a message and exit with an error code of `991`.

Definition at line 85 of file TraceFct.h.

11.1.2.4 #define tf_assert2(ex) _tf_assert(992,ex)

if *assertion* is not true and TF_ASSERT_LEVEL is greater or equal to than 1, generate a message and exit with an error code of `992`.

Definition at line 94 of file TraceFct.h.

11.1.2.5 #define tf_assert3(ex) _tf_assert(993,ex)

if *assertion* is not true and TF_ASSERT_LEVEL is greater or equal to than 3, generate a message and exit with an error code of `993`.

Definition at line 103 of file TraceFct.h.

11.1.2.6 #define tf_assert4(ex) _tf_assert(994,ex)

if *assertion* is not true and TF_ASSERT_LEVEL is greater or equal to than 4, generate a message and exit with an error code of `994`.

Definition at line 112 of file TraceFct.h.

11.1.2.7 #define tf_assert5(ex) _tf_assert(995,ex)

if *assertion* is not true and TF_ASSERT_LEVEL is greater or equal to than 5, generate a message and exit with an error code of `995`.

Definition at line 122 of file TraceFct.h.

11.1.2.8 #define TF_ASSERT_LEVEL

This controls the level-based assertion macros. There are five levels; this macro should be assigned an integer corresponding to the maximum level for which assertions should be enabled. All assertions at levels less than or equal to this will be enabled. It is not defined by default.

Definition at line 64 of file TraceFct.h.

12 Example Documentation

12.1 ex1.cc

A simple example

```
using namespace std;
#include "TraceFct.h"


void f2( void )
{
  static int level = 0;
  TraceFct tf( "f2" );

  level++;
  tf.message( "message test: %d\n", level );
  tf.message( "1. multiline\n2. message test\n" );
  tf.message( "f2 stack dump:\n" );
  tf.dump_stack( );

  if ( level < 12 )
    f2();

}

void f1( bool die )
{
  TraceFct tf( "f1" );

  f2();

  if ( die )
    tf.exit( 1, "f1 exit: line1\nf1 exit: line2, extra newline\n" );
}

int main( int argc, char * argv[] )
{
  TraceFct tf( argv[0], 0, -1 );

  if ( argc > 1 )
    tf.open( argv[1] );

  f1( argc > 2 );

  tf.close( );

  tf.message( "main stack dump\n" );
  tf.dump_stack( );

  return EXIT_SUCCESS;
}
```

12.2 ex2.cc

An example using the Exception class

```
using namespace std;

#include <Exception.h>

#include "TraceFct.h"

void f2( )
{
  Exception ex( "My First Problem" );

  ex.set_message( "My Second Problem" );
  ex.set_message( "My Third Problem" );
  ex.set_message( "My Liney\nFourth Problem" );

  throw ex;
}

void f1( )
{
  TraceFct tf( "f1" );

  try {
    f2();
  } catch( Exception& e)
  {
    tf.exit( 1, e );
  }
}

int main( int argc, char * argv[] )
{
  TraceFct tf( argv[0], 0, -1 );

  f1( );

  tf.close( );

  tf.message( "main stack dump\n" );
  tf.dump_stack( );

  return EXIT_SUCCESS;
}
```

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