Nvwa

0.8

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Chapter 4

Class Documentation

4.1 __debug_new_counter Class Reference

Counter class for on-exit leakage check.

`#include <debug_new.h>`

Public Member Functions

- **__debug_new_counter** ()
  Constructor to increment the count.
- ∼**__debug_new_counter** ()
  Destructor to decrement the count.

4.1.1 Detailed Description

Counter class for on-exit leakage check.

This technique is learnt from *The C++ Programming Language* by Bjarne Stroustup.

4.1.2 Constructor & Destructor Documentation

4.1.2.1 __debug_new_counter()

`__debug_new_counter::__debug_new_counter ( )`

Constructor to increment the count.

4.1.2.2 ~__debug_new_counter()

```
__debug_new_counter::~__debug_new_counter ( )
```

Destructor to decrement the count.

When the count is zero, **check_leaks** (p. 59) will be called.

References check_leaks(), new_autocheck_flag, new_output_fp, and new_verbose_flag.

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

- **debug_new.h**
- **debug_new.cpp**

4.2 __debug_new_recorder Class Reference

Recorder class to remember the call context.

```
#include <debug_new.h>
```

Public Member Functions

- **__debug_new_recorder** (const char *file, int line)
  Constructor to remember the call context.
- template<class _Tp >
  _Tp * **operator->** * (_Tp *pointer)
  Operator to write the context information to memory.

4.2.1 Detailed Description

Recorder class to remember the call context.

The idea comes from `Greg Herlihy's post` in comp.lang.c++.moderated.

4.2.2 Constructor & Destructor Documentation

4.2.2.1 __debug_new_recorder()

```
__debug_new_recorder::__debug_new_recorder (
            const char * file,
            int line )  [inline]
```

Constructor to remember the call context.

The information will be used in __debug_new_recorder::operator->*.

4.2.3 Member Function Documentation

4.2.3.1 operator->*()

```
template<class _Tp >
_Tp* __debug_new_recorder::operator->* (
            _Tp * pointer )  [inline]
```

Operator to write the context information to memory.

`operator->*` is chosen because it has the right precedence, it is rarely used, and it looks good: so people can tell the special usage more quickly.

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

- **debug_new.h**
- **debug_new.cpp**

4.3 __nvwa_compile_time_error< bool > Struct Template Reference

```
#include <static_assert.h>
```

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

- **static_assert.h**

4.4 __nvwa_compile_time_error< true > Struct Template Reference

```
#include <static_assert.h>
```

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

- **static_assert.h**

4.5 mem_pool_base::_Block_list Struct Reference

Structure to store the next available memory block.

```
#include <mem_pool_base.h>
```

Collaboration diagram for mem_pool_base::_Block_list:

Public Attributes

- **_Block_list** * **_M_next**

4.5.1 Detailed Description

Structure to store the next available memory block.

4.5.2 Member Data Documentation

4.5.2.1 _M_next

```
_Block_list* mem_pool_base::_Block_list::_M_next
```

Referenced by static_mem_pool< _Sz, _Gid >::allocate(), static_mem_pool< _Sz, _Gid >::deallocate(), and static_mem_pool< _Sz, _Gid >::recycle().

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

- **mem_pool_base.h**

4.6 bool_array Class Reference

Class to represent a packed boolean array.

`#include <bool_array.h>`

Public Member Functions

- **bool_array** ()
- **bool_array** (unsigned long __size)

  Constructs the packed boolean array with a specific size.
- ~**bool_array** ()
- bool **create** (unsigned long __size)

  Creates the packed boolean array with a specific size.
- void **initialize** (bool __value)

  Initializes all array elements to a specific value optimally.
- _Element **operator[ ]** (unsigned long __idx)

  Creates a reference to an array element.
- bool **at** (unsigned long __idx) const

  Reads the boolean value of an array element via an index.
- void **reset** (unsigned long __idx)

  Resets an array element to `false` via an index.
- void **set** (unsigned long __idx)

  Sets an array element to `true` via an index.
- unsigned long **size** () const
- unsigned long **count** () const

  Counts elements with a `true` value.
- unsigned long **count** (unsigned long __beg, unsigned long __end) const

  Counts elements with a `true` value in a specified range.
- void **flip** ()

  Changes all `true` elements to `false`, and `false` ones to `true`.

4.6.1 Detailed Description

Class to represent a packed boolean array.

This was first written in April 1995, before I knew of any existing implementation of this kind of classes. Of course, the C++ Standard Template Library now demands an implementation of packed boolean array as 'vector<bool>', but the code here should still be useful for the following three reasons: (1) STL support of MSVC 6 did not implement this specialization (nor did it have a 'bit_vector'); (2) I incorporated some useful member functions from the STL bitset into this '**bool_array** (p. 10)', including 'reset', 'set', 'flip', and 'count'; (3) In my tests under MSVC 6 and GCC 2.95.3/3.2.3 my code is really FASTER than vector<bool> or the normal boolean array.

4.6.2 Constructor & Destructor Documentation

4.6.2.1 bool_array() [1/2]

```
bool_array::bool_array ( )  [inline]
```

4.6.2.2 bool_array() [2/2]

```
bool_array::bool_array (
            unsigned long __size )  [inline], [explicit]
```

Constructs the packed boolean array with a specific size.

Parameters

__size	size of the array

Exceptions

std::out_of_range	if *__size* equals 0
std::bad_alloc	if memory is insufficient

References create().

4.6.2.3 ~bool_array()

```
bool_array::~bool_array ( )  [inline]
```

4.6.3 Member Function Documentation

4.6.3.1 at()

```
bool bool_array::at (
            unsigned long __idx ) const  [inline]
```

Reads the boolean value of an array element via an index.

Parameters

__idx	index of the array element to access

Returns

the boolean value of the accessed array element

Exceptions

std::out_of_range	when the index is too big

4.6.3.2 count() [1/2]

```
unsigned long bool_array::count ( ) const
```

Counts elements with a `true` value.

Returns

the count of `true` elements

4.6.3.3 count() [2/2]

```
unsigned long bool_array::count (
            unsigned long __beg,
            unsigned long __end ) const
```

Counts elements with a `true` value in a specified range.

Parameters

__beg	beginning of the range
__end	end of the range (exclusive)

Returns

the count of `true` elements

4.6.3.4 create()

```
bool bool_array::create (
            unsigned long __size )
```

Creates the packed boolean array with a specific size.

Parameters

__size	size of the array

Returns

`false` if *__size* equals `0` or is too big, or if memory is insufficient; `true` if *__size* has a suitable value and memory allocation is successful.

Referenced by bool_array().

4.6.3.5 flip()

```
void bool_array::flip ( )
```

Changes all `true` elements to `false`, and `false` ones to `true`.

4.6.3.6 initialize()

```
void bool_array::initialize (
            bool __value )
```

Initializes all array elements to a specific value optimally.

Parameters

__value	the boolean value to assign to all elements

4.6.3.7 operator[]()

```
bool_array::_Element bool_array::operator[] (
            unsigned long __idx )  [inline]
```

Creates a reference to an array element.

Parameters

__idx	index of the array element to access

4.6.3.8 reset()

```
void bool_array::reset (
            unsigned long __idx )  [inline]
```

Resets an array element to `false` via an index.

Parameters

__idx	index of the array element to access

Exceptions

std::out_of_range	when the index is too big

4.6.3.9 set()

```
void bool_array::set (
            unsigned long __idx )  [inline]
```

Sets an array element to `true` via an index.

Parameters

__idx	index of the array element to access

Exceptions

std::out_of_range	when the index is too big

4.6.3.10 size()

```
unsigned long bool_array::size ( ) const  [inline]
```

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

- **bool_array.h**
- **bool_array.cpp**

4.7 class_level_lock< _Host, _RealLock > Class Template Reference

Helper class for class-level locking.

```
#include <class_level_lock.h>
```

Classes

- class **lock**
  Type that provides locking/unlocking semantics.

Public Types

- typedef volatile _Host **volatile_type**

Friends

- class **lock**

4.7.1 Detailed Description

template<class _Host, bool _RealLock = true>
class class_level_lock< _Host, _RealLock >

Helper class for class-level locking.

This is the multi-threaded implementation. The main departure from Loki ClassLevelLockable is that there is an additional template parameter which can make the lock not lock at all even in multi-threaded environments. See **static_mem_pool.h** (p. 75) for real usage.

4.7.2 Member Typedef Documentation

4.7.2.1 volatile_type

```
template<class _Host , bool _RealLock = true>
typedef volatile _Host  class_level_lock< _Host, _RealLock >::  volatile_type
```

4.7.3 Friends And Related Function Documentation

4.7.3.1 lock

```
template<class _Host , bool _RealLock = true>
friend class  lock  [friend]
```

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

- **class_level_lock.h**

4.8 delete_object Struct Reference

Functor to delete objects pointed by a container of pointers.

```
#include <cont_ptr_utils.h>
```

Public Member Functions

- template<typename _Pointer >
  void **operator()** (_Pointer __ptr) const

4.8.1 Detailed Description

Functor to delete objects pointed by a container of pointers.

A typical usage might be like:

```
list<Object*> l;
...
for_each(l.begin(), l.end(), delete_object());
```

4.8.2 Member Function Documentation

4.8.2.1 operator()()

```
template<typename _Pointer >
void delete_object::operator() (
             _Pointer __ptr ) const  [inline]
```

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

- **cont_ptr_utils.h**

4.9 dereference Struct Reference

Functor to return objects pointed by a container of pointers.

```
#include <cont_ptr_utils.h>
```

Public Member Functions

- template<typename _Tp >
  const _Tp & **operator()** (const _Tp *__ptr) const

4.9.1 Detailed Description

Functor to return objects pointed by a container of pointers.

A typical usage might be like:

```
vector<Object*> v;
...
transform(v.begin(), v.end(),
          ostream_iterator<Object>(cout, " "),
          dereference());
```

4.9.2 Member Function Documentation

4.9.2.1 operator()()

```
template<typename _Tp >
const _Tp& dereference::operator() (
             const _Tp * __ptr ) const  [inline]
```

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

- **cont_ptr_utils.h**

4.10 dereference_less Struct Reference

Functor to compare objects pointed by a container of pointers.

`#include <cont_ptr_utils.h>`

Public Member Functions

- template<typename _Pointer >
  bool **operator()** (_Pointer __ptr1, _Pointer __ptr2) const

4.10.1 Detailed Description

Functor to compare objects pointed by a container of pointers.

```
vector<Object*> v;
...
sort(v.begin(), v.end(), dereference_less());
```

or

```
set<Object*, dereference_less> s;
```

4.10.2 Member Function Documentation

4.10.2.1 operator()()

```
template<typename _Pointer >
bool dereference_less::operator() (
            _Pointer __ptr1,
            _Pointer __ptr2 ) const  [inline]
```

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

- **cont_ptr_utils.h**

4.11 fast_mutex Class Reference

Class for non-reentrant fast mutexes.

`#include <fast_mutex.h>`

Public Member Functions

- **fast_mutex** ()
- ~**fast_mutex** ()
- void **lock** ()
- void **unlock** ()

4.11.1 Detailed Description

Class for non-reentrant fast mutexes.

This is the implementation for POSIX threads.

4.11.2 Constructor & Destructor Documentation

4.11.2.1 fast_mutex()

```
fast_mutex::fast_mutex ( )  [inline]
```

4.11.2.2 ~fast_mutex()

```
fast_mutex::~fast_mutex ( )  [inline]
```

References _FAST_MUTEX_ASSERT.

4.11.3 Member Function Documentation

4.11.3.1 lock()

```
void fast_mutex::lock ( )  [inline]
```

References _FAST_MUTEX_ASSERT.

Referenced by fast_mutex_autolock::fast_mutex_autolock(), class_level_lock< _Host, _RealLock >::lock::lock(), and object_level_lock< _Host >::lock::lock().

4.11.3.2 unlock()

```
void fast_mutex::unlock ( )  [inline]
```

References _FAST_MUTEX_ASSERT.

Referenced by fast_mutex_autolock::~fast_mutex_autolock(), class_level_lock< _Host, _RealLock >::lock::~lock(), and object_level_lock< _Host >::lock::~lock().

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

- **fast_mutex.h**

4.12 fast_mutex_autolock Class Reference

An acquistion-on-initialization lock class based on **fast_mutex** (p. 18).

```
#include <fast_mutex.h>
```

Public Member Functions

- **fast_mutex_autolock** (**fast_mutex** &__mtx)
- ~**fast_mutex_autolock** ()

4.12.1 Detailed Description

An acquistion-on-initialization lock class based on **fast_mutex** (p. 18).

4.12.2 Constructor & Destructor Documentation

4.12.2.1 fast_mutex_autolock()

```
fast_mutex_autolock::fast_mutex_autolock (
              fast_mutex & __mtx )  [inline], [explicit]
```

References fast_mutex::lock().

4.12.2.2 ~fast_mutex_autolock()

```
fast_mutex_autolock::~fast_mutex_autolock ( )  [inline]
```

References fast_mutex::unlock().

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

- **fast_mutex.h**

4.13 fixed_mem_pool< _Tp > Class Template Reference

Class template to manipulate a fixed-size memory pool.

```
#include <fixed_mem_pool.h>
```

Public Types

- typedef **class_level_lock**< **fixed_mem_pool**< _Tp > >:: **lock** **lock**

Static Public Member Functions

- static void * **allocate** ()
  Allocates a memory block from the memory pool.
- static void **deallocate** (void *)
  Deallocates a memory block and returns it to the memory pool.
- static bool **initialize** (size_t __size)
  Initializes the memory pool.
- static int **deinitialize** ()
  Deinitializes the memory pool.
- static int **get_alloc_count** ()
  Gets the allocation count.
- static bool **is_initialized** ()
  Is the memory pool initialized?

Static Protected Member Functions

- static bool **bad_alloc_handler** ()
  Bad allocation handler.

4.13.1 Detailed Description

template<**class _Tp**>
class fixed_mem_pool< _Tp >

Class template to manipulate a fixed-size memory pool.

Please notice that only allocate and deallocate are protected by a lock.

Parameters

_Tp	class to use the **fixed_mem_pool** (p. 21)

4.13.2 Member Typedef Documentation

4.13.2.1 lock

```
template<class _Tp >
typedef  class_level_lock< fixed_mem_pool<_Tp> >::  lock  fixed_mem_pool< _Tp >::  lock
```

4.13.3 Member Function Documentation

4.13.3.1 allocate()

```
template<class _Tp >
void *  fixed_mem_pool< _Tp >::allocate ( )  [inline], [static]
```

Allocates a memory block from the memory pool.

Returns

pointer to the allocated memory block

4.13.3.2 bad_alloc_handler()

```
template<class _Tp >
bool  fixed_mem_pool< _Tp >::bad_alloc_handler ( )  [static], [protected]
```

Bad allocation handler.

Called when there are no memory blocks available in the memory pool. If this function returns `false` (default behaviour if not explicitly specialized), it indicates that it can do nothing and **allocate()** (p. 22) should return `NULL`; if this function returns `true`, it indicates that it has freed some memory blocks and **allocate()** (p. 22) should try allocating again.

4.13.3.3 deallocate()

```
template<class _Tp >
void  fixed_mem_pool< _Tp >::deallocate (
            void * __block_ptr )  [inline], [static]
```

Deallocates a memory block and returns it to the memory pool.

Parameters

__block_ptr	pointer to the memory block to return

4.13.3.4 deinitialize()

```
template<class _Tp >
int  fixed_mem_pool< _Tp >::deinitialize ( )  [static]
```

Deinitializes the memory pool.

Returns

0 if all memory blocks are returned and the memory pool successfully freed; or a non-zero value indicating number of memory blocks still in allocation

References mem_pool_base::dealloc_sys().

4.13.3.5 get_alloc_count()

```
template<class _Tp >
int  fixed_mem_pool< _Tp >::get_alloc_count ( )  [inline], [static]
```

Gets the allocation count.

Returns

the number of memory blocks still in allocation

4.13.3.6 initialize()

```
template<class _Tp >
bool  fixed_mem_pool< _Tp >::initialize (
            size_t __size )  [static]
```

Initializes the memory pool.

Parameters

__size	number of memory blocks to put in the memory pool

Returns

`true` if successful; `false` if memory insufficient

References mem_pool_base::alloc_sys().

4.13.3.7 is_initialized()

```
template<class _Tp >
bool  fixed_mem_pool< _Tp >::is_initialized ( )  [inline], [static]
```

Is the memory pool initialized?

Returns

`true` if it is successfully initialized; `false` otherwise

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

- **fixed_mem_pool.h**

4.14 class_level_lock< _Host, _RealLock >::lock Class Reference

Type that provides locking/unlocking semantics.

`#include <class_level_lock.h>`

Public Member Functions

- **lock** ()
- ~**lock** ()

4.14.1 Detailed Description

template<class _Host, bool _RealLock = true>
class class_level_lock< _Host, _RealLock >::lock

Type that provides locking/unlocking semantics.

4.14.2 Constructor & Destructor Documentation

4.14.2.1 lock()

```
template<class _Host , bool _RealLock = true>
class_level_lock< _Host, _RealLock >::lock::lock ( )  [inline]
```

References fast_mutex::lock().

4.14.2.2 ~lock()

```
template<class _Host , bool _RealLock = true>
class_level_lock< _Host, _RealLock >::lock::~lock ( )  [inline]
```

References fast_mutex::unlock().

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

- **class_level_lock.h**

4.15 object_level_lock< _Host >::lock Class Reference

Type that provides locking/unlocking semantics.

```
#include <object_level_lock.h>
```

Public Member Functions

- **lock** (const **object_level_lock** &__host)
- ~**lock** ()
- const **object_level_lock** * **get_locked_object** () const

4.15.1 Detailed Description

template<class _Host>
class object_level_lock< _Host >::lock

Type that provides locking/unlocking semantics.

4.15.2 Constructor & Destructor Documentation

4.15.2.1 lock()

```
template<class _Host >
object_level_lock< _Host >::lock::lock (
            const  object_level_lock & __host )  [inline], [explicit]
```

References fast_mutex::lock().

4.15.2.2 ~lock()

```
template<class _Host >
object_level_lock< _Host >::lock::~lock ( )  [inline]
```

References fast_mutex::unlock().

4.15.3 Member Function Documentation

4.15.3.1 get_locked_object()

```
template<class _Host >
const  object_level_lock*  object_level_lock< _Host >::lock::get_locked_object ( ) const  [inline]
```

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

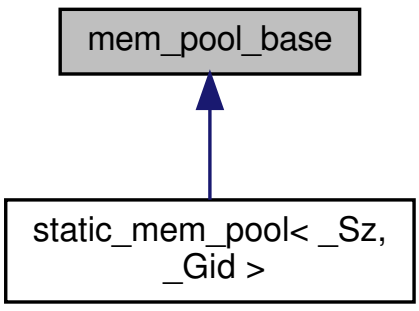
- **object_level_lock.h**

4.16 mem_pool_base Class Reference

Base class for memory pools.

`#include <mem_pool_base.h>`

Inheritance diagram for mem_pool_base:



Classes

- struct **_Block_list**

  Structure to store the next available memory block.

Public Member Functions

- virtual ~**mem_pool_base** ()
- virtual void **recycle** ()=0

Static Public Member Functions

- static void * **alloc_sys** (size_t __size)
- static void **dealloc_sys** (void *__ptr)

4.16.1 Detailed Description

Base class for memory pools.

4.16.2 Constructor & Destructor Documentation

4.16.2.1 ~mem_pool_base()

```
mem_pool_base::~mem_pool_base ( )  [virtual]
```

4.16.3 Member Function Documentation

4.16.3.1 alloc_sys()

```
void * mem_pool_base::alloc_sys (
            size_t __size )  [static]
```

References _MEM_POOL_ALLOCATE.

Referenced by fixed_mem_pool< _Tp >::initialize().

4.16.3.2 dealloc_sys()

```
void mem_pool_base::dealloc_sys (
            void * __ptr )  [static]
```

References _MEM_POOL_DEALLOCATE.

Referenced by fixed_mem_pool< _Tp >::deinitialize().

4.16.3.3 recycle()

```
virtual void mem_pool_base::recycle ( )  [pure virtual]
```

Implemented in **static_mem_pool< _Sz, _Gid >** (p. 35).

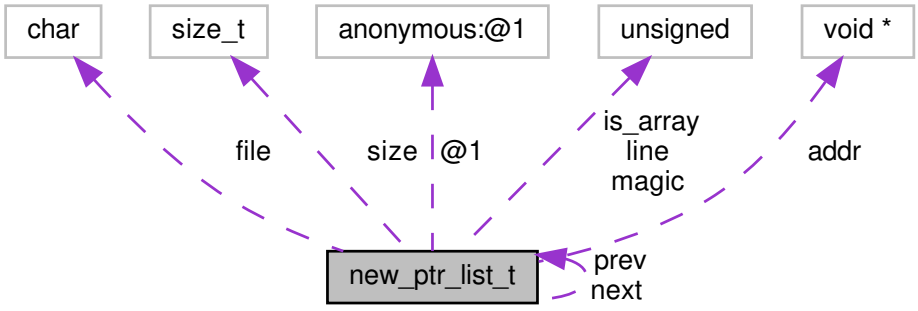
The documentation for this class was generated from the following files:

- **mem_pool_base.h**
- **mem_pool_base.cpp**

4.17 new_ptr_list_t Struct Reference

Structure to store the position information where `new` occurs.

Collaboration diagram for new_ptr_list_t:



Public Attributes

- **new_ptr_list_t** * **next**
- **new_ptr_list_t** * **prev**
- size_t **size**
- union {
  char **file** [**_DEBUG_NEW_FILENAME_LEN**]
  void * **addr**
  };
- unsigned **line**:31
- unsigned **is_array**:1
- unsigned **magic**

4.17.1 Detailed Description

Structure to store the position information where `new` occurs.

4.17.2 Member Data Documentation

4.17.2.1 "@1

```
union { ... }
```

4.17.2.2 addr

```
void* new_ptr_list_t::addr
```

Referenced by alloc_mem(), check_leaks(), and free_pointer().

4.17.2.3 file

```
char new_ptr_list_t::file[ _DEBUG_NEW_FILENAME_LEN]
```

Referenced by alloc_mem(), check_leaks(), and free_pointer().

4.17.2.4 is_array

```
unsigned new_ptr_list_t::is_array
```

Referenced by alloc_mem(), and free_pointer().

4.17.2.5 line

```
unsigned new_ptr_list_t::line
```

Referenced by alloc_mem(), check_leaks(), and free_pointer().

4.17.2.6 magic

```
unsigned new_ptr_list_t::magic
```

Referenced by alloc_mem(), check_leaks(), and free_pointer().

4.17.2.7 next

```
new_ptr_list_t* new_ptr_list_t::next
```

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), and free_pointer().

4.17.2.8 prev

```
new_ptr_list_t* new_ptr_list_t::prev
```

Referenced by alloc_mem(), and free_pointer().

4.17.2.9 size

```
size_t new_ptr_list_t::size
```

Referenced by alloc_mem(), check_leaks(), check_tail(), and free_pointer().

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

- **debug_new.cpp**

4.18 object_level_lock< _Host > Class Template Reference

Helper class for class-level locking.

```
#include <object_level_lock.h>
```

Classes

- class **lock**

  Type that provides locking/unlocking semantics.

Public Types

- typedef volatile _Host **volatile_type**

Friends

- class **lock**

4.18.1 Detailed Description

template<class _Host>
class object_level_lock< _Host >

Helper class for class-level locking.

This is the multi-threaded implementation.

4.18.2 Member Typedef Documentation

4.18.2.1 volatile_type

```
template<class _Host >
typedef volatile _Host  object_level_lock< _Host >::  volatile_type
```

4.18.3 Friends And Related Function Documentation

4.18.3.1 lock

```
template<class _Host >
friend class  lock  [friend]
```

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

- **object_level_lock.h**

4.19 output_object< _OutputStrm, _StringType > Struct Template Reference

Functor to output objects pointed by a container of pointers.

```
#include <cont_ptr_utils.h>
```

Public Member Functions

- **output_object** (_OutputStrm &__outs, const _StringType &__sep)
- template<typename _Tp >
  void **operator()** (const _Tp *__ptr) const

4.19.1 Detailed Description

template<typename _OutputStrm, typename _StringType = const char*>
struct output_object< _OutputStrm, _StringType >

Functor to output objects pointed by a container of pointers.

A typical usage might be like:

```
list<Object*> l;
...
for_each(l.begin(), l.end(), output_object<ostream>(cout, " "));
```

4.19.2 Constructor & Destructor Documentation

4.19.2.1 output_object()

```
template<typename _OutputStrm, typename _StringType = const char*>
output_object< _OutputStrm, _StringType >::  output_object (
            _OutputStrm & __outs,
            const _StringType & __sep )  [inline]
```

4.19.3 Member Function Documentation

4.19.3.1 operator()()

```
template<typename _OutputStrm, typename _StringType = const char*>
template<typename _Tp >
void  output_object< _OutputStrm, _StringType >::operator() (
            const _Tp * __ptr ) const  [inline]
```

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

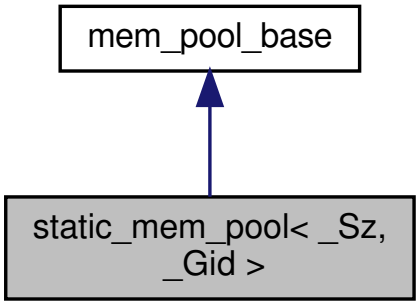
- **cont_ptr_utils.h**

4.20 static_mem_pool< _Sz, _Gid > Class Template Reference

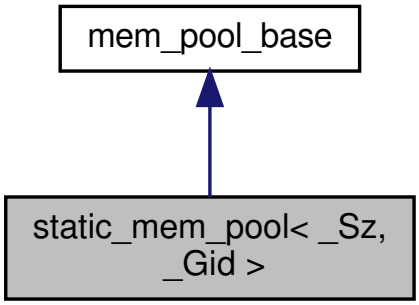
Singleton class template to manage the allocation/deallocation of memory blocks of one specific size.

`#include <static_mem_pool.h>`

Inheritance diagram for static_mem_pool< _Sz, _Gid >:



Collaboration diagram for static_mem_pool< _Sz, _Gid >:



Public Member Functions

- void * **allocate** ()
  Allocates memory and returns its pointer.
- void **deallocate** (void *__ptr)
  Deallocates memory by putting the memory block into the pool.
- virtual void **recycle** ()
  Recycles half of the free memory blocks in the memory pool to the system.

Static Public Member Functions

- static **static_mem_pool** & **instance** ()
  Gets the instance of the static memory pool.
- static **static_mem_pool** & **instance_known** ()
  Gets the known instance of the static memory pool.

4.20.1 Detailed Description

template< size_t _Sz, int _Gid = -1 >
class static_mem_pool< _Sz, _Gid >

Singleton class template to manage the allocation/deallocation of memory blocks of one specific size.

Parameters

_Sz	size of elements in the **static_mem_pool** (p. 33)
_Gid	group id of a **static_mem_pool** (p. 33): if it is negative, simultaneous accesses to this **static_mem_pool** (p. 33) will be protected from each other; otherwise no protection is given

4.20.2 Member Function Documentation

4.20.2.1 allocate()

```
template<size_t _Sz, int _Gid = -1>
void*  static_mem_pool< _Sz, _Gid >::allocate ( )  [inline]
```

Allocates memory and returns its pointer.

The template will try to get it from the memory pool first, and request memory from the system if there is no free memory in the pool.

Returns

pointer to allocated memory if successful; `NULL` otherwise

References mem_pool_base::_Block_list::_M_next.

4.20.2.2 deallocate()

```
template<size_t _Sz, int _Gid = -1>
void  static_mem_pool< _Sz, _Gid >::deallocate (
            void * __ptr )  [inline]
```

Deallocates memory by putting the memory block into the pool.

Parameters

__ptr	pointer to memory to be deallocated

References mem_pool_base::_Block_list::_M_next.

4.20.2.3 instance()

```
template<size_t _Sz, int _Gid = -1>
static  static_mem_pool&  static_mem_pool< _Sz, _Gid >::instance ( )  [inline], [static]
```

Gets the instance of the static memory pool.

It will create the instance if it does not already exist. Generally this function is now not needed.

Returns

reference to the instance of the static memory pool

See also

instance_known (p. 35)

4.20.2.4 instance_known()

```
template<size_t _Sz, int _Gid = -1>
static  static_mem_pool&  static_mem_pool< _Sz, _Gid >::instance_known ( )  [inline], [static]
```

Gets the known instance of the static memory pool.

The instance must already exist. Generally the static initializer of the template guarantees it.

Returns

reference to the instance of the static memory pool

4.20.2.5 recycle()

```
template<size_t _Sz, int _Gid>
void  static_mem_pool< _Sz, _Gid >::recycle ( )  [virtual]
```

Recycles half of the free memory blocks in the memory pool to the system.

It is called when a memory request to the system (in other instances of the static memory pool) fails.

Implements **mem_pool_base** (p. 28).

References mem_pool_base::_Block_list::_M_next, and _STATIC_MEM_POOL_TRACE.

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

- **static_mem_pool.h**

4.21 static_mem_pool_set Class Reference

Singleton class to maintain a set of existing instantiations of **static_mem_pool** (p. 33).

```
#include <static_mem_pool.h>
```

Public Types

- typedef **class_level_lock**< **static_mem_pool_set** >:: **lock** **lock**

Public Member Functions

- void **recycle** ()

  Asks all static memory pools to recycle unused memory blocks back to the system.
- void **add** (**mem_pool_base** *__memory_pool_p)

  *Adds a new memory pool to **static_mem_pool_set** (p. 35).*

Static Public Member Functions

- static **static_mem_pool_set** & **instance** ()

  *Creates the singleton instance of **static_mem_pool_set** (p. 35).*

4.21.1 Detailed Description

Singleton class to maintain a set of existing instantiations of **static_mem_pool** (p. 33).

4.21.2 Member Typedef Documentation

4.21.2.1 lock

```
typedef class_level_lock< static_mem_pool_set>:: lock static_mem_pool_set::lock
```

4.21.3 Member Function Documentation

4.21.3.1 add()

```
void static_mem_pool_set::add (
            mem_pool_base * __memory_pool_p )
```

Adds a new memory pool to **static_mem_pool_set** (p. 35).

Parameters

__memory_pool_p	pointer to the memory pool to add

4.21.3.2 instance()

```
static_mem_pool_set & static_mem_pool_set::instance ( )  [static]
```

Creates the singleton instance of **static_mem_pool_set** (p. 35).

Returns

reference to the instance of **static_mem_pool_set** (p. 35)

4.21.3.3 recycle()

```
void static_mem_pool_set::recycle ( )
```

Asks all static memory pools to recycle unused memory blocks back to the system.

The caller should get the lock to prevent other operations to **static_mem_pool_set** (p. 35) during its execution.

References _STATIC_MEM_POOL_TRACE.

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

- **static_mem_pool.h**
- **static_mem_pool.cpp**

Chapter 5

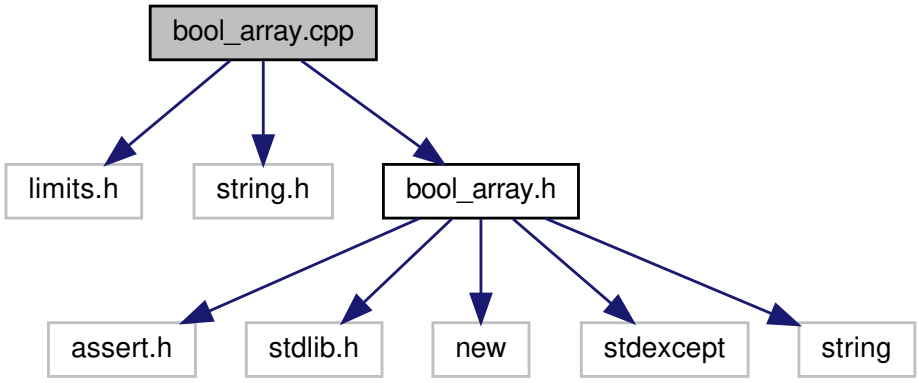
File Documentation

5.1 bool_array.cpp File Reference

Code for class **bool_array** (p. 10) (packed boolean array).

```
#include <limits.h>
#include <string.h>
#include "bool_array.h"
```

Include dependency graph for bool_array.cpp:



5.1.1 Detailed Description

Code for class **bool_array** (p. 10) (packed boolean array).

Version

3.1, 2005/08/25

Author

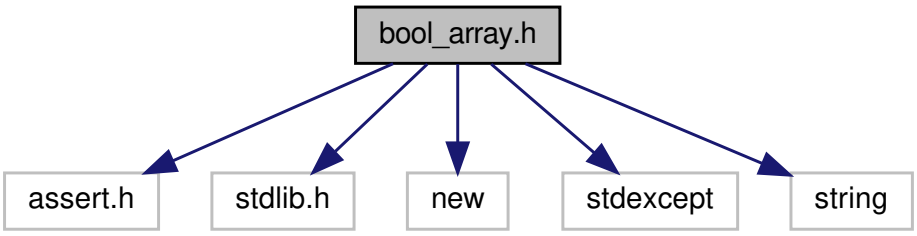
Wu Yongwei

5.2 bool_array.h File Reference

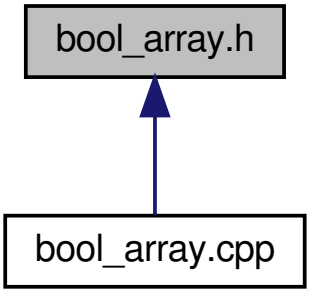
Header file for class **bool_array** (p. 10) (packed boolean array).

```
#include <assert.h>
#include <stdlib.h>
#include <new>
#include <stdexcept>
#include <string>
```

Include dependency graph for bool_array.h:



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



Classes

- class **bool_array**

  Class to represent a packed boolean array.

Macros

- #define **_BYTE_DEFINED**

Typedefs

- typedef unsigned char **BYTE**

5.2.1 Detailed Description

Header file for class **bool_array** (p. 10) (packed boolean array).

Version

3.1, 2005/08/25

Author

Wu Yongwei

5.2.2 Macro Definition Documentation

5.2.2.1 _BYTE_DEFINED

```
#define _BYTE_DEFINED
```

5.2.3 Typedef Documentation

5.2.3.1 BYTE

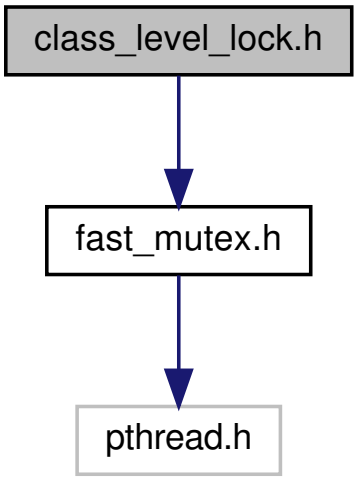
```
typedef unsigned char  BYTE
```

5.3 class_level_lock.h File Reference

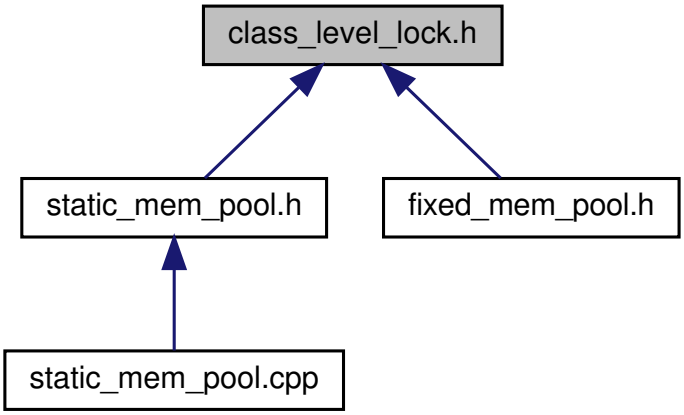
In essence Loki ClassLevelLockable re-engineered to use a **fast_mutex** (p. 18) class.

```
#include "fast_mutex.h"
```

Include dependency graph for class_level_lock.h:



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



Classes

- class **class_level_lock< _Host, _RealLock >**
  Helper class for class-level locking.
- class **class_level_lock< _Host, _RealLock >::lock**
  Type that provides locking/unlocking semantics.

5.3.1 Detailed Description

In essence Loki ClassLevelLockable re-engineered to use a **fast_mutex** (p. 18) class.

Version

1.13, 2007/12/30

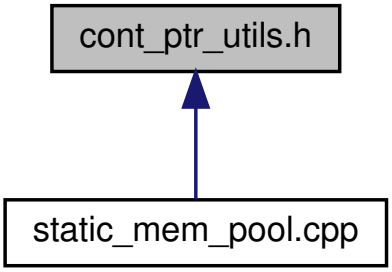
Author

Wu Yongwei

5.4 cont_ptr_utils.h File Reference

Utility functors for containers of pointers (adapted from Scott Meyers' *Effective STL*).

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



Classes

- struct **dereference**

  Functor to return objects pointed by a container of pointers.
- struct **dereference_less**

  Functor to compare objects pointed by a container of pointers.
- struct **delete_object**

  Functor to delete objects pointed by a container of pointers.
- struct **output_object**< **_OutputStrm, _StringType** >

  Functor to output objects pointed by a container of pointers.

5.4.1 Detailed Description

Utility functors for containers of pointers (adapted from Scott Meyers' *Effective STL*).

Version

1.4, 2007/09/12

Author

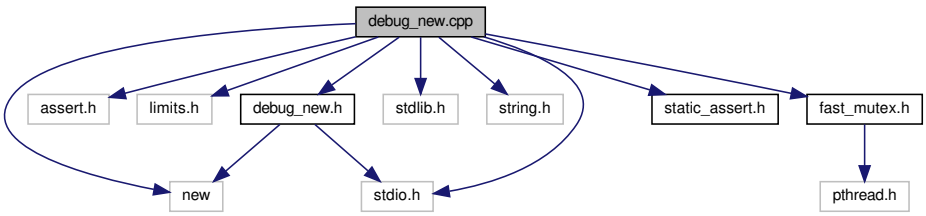
Wu Yongwei

5.5 debug_new.cpp File Reference

Implementation of debug versions of new and delete to check leakage.

```
#include <new>
#include <assert.h>
#include <limits.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "fast_mutex.h"
#include "static_assert.h"
#include "debug_new.h"
```

Include dependency graph for debug_new.cpp:



Classes

- struct **new_ptr_list_t**

  Structure to store the position information where `new` *occurs.*

Macros

- #define **_DEBUG_NEW_ALIGNMENT** 16

  The alignment requirement of allocated memory blocks.
- #define **_DEBUG_NEW_CALLER_ADDRESS** __builtin_return_address(0)

  The expression to return the caller address.
- #define **_DEBUG_NEW_ERROR_ACTION** abort()

  The action to take when an error occurs.
- #define **_DEBUG_NEW_FILENAME_LEN** 44

  The length of file name stored if greater than zero.
- #define **_DEBUG_NEW_PROGNAME** NULL

  The program (executable) name to be set at compile time.
- #define **_DEBUG_NEW_STD_OPER_NEW** 1

  Macro to indicate whether the standard-conformant behaviour of `operator new` is wanted.
- #define **_DEBUG_NEW_TAILCHECK** 0

  Macro to indicate whether a writing-past-end check will be performed.
- #define **_DEBUG_NEW_TAILCHECK_CHAR** 0xCC

  Value of the padding bytes at the end of a memory block.
- #define **_DEBUG_NEW_USE_ADDR2LINE** 1

  Whether to use addr2line to convert a caller address to file/line information.
- #define **_DEBUG_NEW_REDEFINE_NEW** 0

  Macro to indicate whether redefinition of `new` is wanted.
- #define **align**(s) (((s) + **_DEBUG_NEW_ALIGNMENT** - 1) & ~(**_DEBUG_NEW_ALIGNMENT** - 1))

  Gets the aligned value of memory block size.

Functions

- static bool **print_position_from_addr** (const void *addr)

  Tries printing the position information from an instruction address.
- static void **print_position** (const void *ptr, int line)

  Prints the position information of a memory operation point.
- static bool **check_tail** (**new_ptr_list_t** *ptr)

  Checks whether the padding bytes at the end of a memory block is tampered with.
- static void * **alloc_mem** (size_t size, const char *file, int line, bool is_array)

  Allocates memory and initializes control data.
- static void **free_pointer** (void *pointer, void *addr, bool is_array)

  Frees memory and adjusts pointers.
- int **check_leaks** ()

  Checks for memory leaks.
- int **check_mem_corruption** ()

  Checks for heap corruption.
- void * **operator new** (size_t size, const char *file, int line)
- void * **operator new[ ]** (size_t size, const char *file, int line)
- void * **operator new** (size_t size) throw (std::bad_alloc)
- void * **operator new[ ]** (size_t size) throw (std::bad_alloc)
- void * **operator new** (size_t size, const std::nothrow_t &) throw ()
- void * **operator new[ ]** (size_t size, const std::nothrow_t &) throw ()
- void **operator delete** (void *pointer) throw ()
- void **operator delete[ ]** (void *pointer) throw ()
- void **operator delete** (void *pointer, const char *file, int line) throw ()
- void **operator delete[ ]** (void *pointer, const char *file, int line) throw ()
- void **operator delete** (void *pointer, const std::nothrow_t &) throw ()
- void **operator delete[ ]** (void *pointer, const std::nothrow_t &) throw ()

Variables

- const unsigned **MAGIC** = 0x4442474E

  Magic number for error detection.
- const int **ALIGNED_LIST_ITEM_SIZE** = **align**(sizeof(**new_ptr_list_t**))

  The extra memory allocated by `operator new`.
- static **new_ptr_list_t** **new_ptr_list**

  List of all new'd pointers.
- static **fast_mutex** **new_ptr_lock**

  The mutex guard to protect simultaneous access to the pointer list.
- static **fast_mutex** **new_output_lock**

  The mutex guard to protect simultaneous output to ***new_output_fp*** *(p. 54).*
- static size_t **total_mem_alloc** = 0

  Total memory allocated in bytes.
- bool **new_autocheck_flag** = true

  Flag to control whether ***check_leaks*** *(p. 48) will be automatically called on program exit.*
- bool **new_verbose_flag** = false

  Flag to control whether verbose messages are output.
- FILE * **new_output_fp** = stderr

  Pointer to the output stream.
- const char * **new_progname** = **_DEBUG_NEW_PROGNAME**

  Pointer to the program name.

5.5.1 Detailed Description

Implementation of debug versions of new and delete to check leakage.

Version

4.12, 2007/12/31

Author

Wu Yongwei

5.5.2 Macro Definition Documentation

5.5.2.1 _DEBUG_NEW_ALIGNMENT

```
#define _DEBUG_NEW_ALIGNMENT 16
```

The alignment requirement of allocated memory blocks.

It must be a power of two.

Referenced by alloc_mem().

5.5.2.2 _DEBUG_NEW_CALLER_ADDRESS

```
#define _DEBUG_NEW_CALLER_ADDRESS __builtin_return_address(0)
```

The expression to return the caller address.

print_position (p. 52) will later on use this address to print the position information of memory operation points.

Referenced by free_pointer(), operator delete(), operator delete[](), operator new(), and operator new[]().

5.5.2.3 _DEBUG_NEW_ERROR_ACTION

```
#define _DEBUG_NEW_ERROR_ACTION abort()
```

The action to take when an error occurs.

The default behaviour is to call *abort*, unless _DEBUG_NEW_ERROR_CRASH is defined, in which case a segmentation fault will be triggered instead (which can be useful on platforms like Windows that do not generate a core dump when *abort* is called).

Referenced by alloc_mem(), and free_pointer().

5.5.2.4 _DEBUG_NEW_FILENAME_LEN

```
#define _DEBUG_NEW_FILENAME_LEN 44
```

The length of file name stored if greater than zero.

If it is zero, only a const char pointer will be stored. Currently the default behaviour is to copy the file name, because I found that the exit leakage check cannot access the address of the file name sometimes (in my case, a core dump will occur when trying to access the file name in a shared library after a SIGINT). The current default value makes the size of **new_ptr_list_t** (p. 28) 64 on 32-bit platforms.

Referenced by alloc_mem().

5.5.2.5 _DEBUG_NEW_PROGNAME

```
#define _DEBUG_NEW_PROGNAME NULL
```

The program (executable) name to be set at compile time.

It is better to assign the full program path to **new_progname** (p. 54) in *main* (at run time) than to use this (compile-time) macro, but this macro serves well as a quick hack. Note also that double quotation marks need to be used around the program name, i.e., one should specify a command-line option like -D_DEBUG_NEW_PROG↩NAME="a.out" in *bash*, or -D_DEBUG_NEW_PROGNAME="a.exe" in the Windows command prompt.

5.5.2.6 _DEBUG_NEW_REDEFINE_NEW

```
#define _DEBUG_NEW_REDEFINE_NEW 0
```

Macro to indicate whether redefinition of `new` is wanted.

Here it is defined to `0` to disable the redefinition of `new`.

5.5.2.7 _DEBUG_NEW_STD_OPER_NEW

```
#define _DEBUG_NEW_STD_OPER_NEW 1
```

Macro to indicate whether the standard-conformant behaviour of `operator new` is wanted.

It is on by default now, but the user may set it to `0` to revert to the old behaviour.

5.5.2.8 _DEBUG_NEW_TAILCHECK

```
#define _DEBUG_NEW_TAILCHECK 0
```

Macro to indicate whether a writing-past-end check will be performed.

Define it to a positive integer as the number of padding bytes at the end of a memory block for checking.

Referenced by alloc_mem(), check_mem_corruption(), and check_tail().

5.5.2.9 _DEBUG_NEW_TAILCHECK_CHAR

```
#define _DEBUG_NEW_TAILCHECK_CHAR 0xCC
```

Value of the padding bytes at the end of a memory block.

Referenced by alloc_mem(), and check_tail().

5.5.2.10 _DEBUG_NEW_USE_ADDR2LINE

```
#define _DEBUG_NEW_USE_ADDR2LINE 1
```

Whether to use *addr2line* to convert a caller address to file/line information.

Defining it to a non-zero value will enable the conversion (automatically done if GCC is detected). Defining it to zero will disable the conversion.

5.5.2.11 align

```
#define align(
              s ) (((s) +  _DEBUG_NEW_ALIGNMENT - 1) & ~( _DEBUG_NEW_ALIGNMENT - 1))
```

Gets the aligned value of memory block size.

5.5.3 Function Documentation

5.5.3.1 alloc_mem()

```
static void* alloc_mem (
             size_t size,
             const char * file,
             int line,
             bool is_array )  [static]
```

Allocates memory and initializes control data.

Parameters

size	size of the required memory block
file	null-terminated string of the file name
line	line number
is_array	boolean value whether this is an array operation

Returns

pointer to the user-requested memory area; `NULL` if memory allocation is not successful

References _DEBUG_NEW_ALIGNMENT, _DEBUG_NEW_ERROR_ACTION, _DEBUG_NEW_FILENAME_LEN, _DEBUG_NEW_TAILCHECK, _DEBUG_NEW_TAILCHECK_CHAR, new_ptr_list_t::addr, ALIGNED_LIST_ITEM_SIZE, new_ptr_list_t::file, new_ptr_list_t::is_array, new_ptr_list_t::line, new_ptr_list_t::magic, MAGIC, new_output_fp, new_output_lock, new_ptr_list, new_ptr_lock, new_verbose_flag, new_ptr_list_t::next, new_ptr_list_t::prev, print_position(), new_ptr_list_t::size, STATIC_ASSERT, and total_mem_alloc.

Referenced by operator new(), and operator new[]().

5.5.3.2 check_leaks()

```
int check_leaks ( )
```

Checks for memory leaks.

Returns

zero if no leakage is found; the number of leaks otherwise

References new_ptr_list_t::addr, ALIGNED_LIST_ITEM_SIZE, check_tail(), new_ptr_list_t::file, new_ptr_list_t::line, new_ptr_list_t::magic, MAGIC, new_output_fp, new_output_lock, new_ptr_list, new_ptr_lock, new_verbose_flag, new_ptr_list_t::next, print_position(), and new_ptr_list_t::size.

Referenced by __debug_new_counter::~__debug_new_counter().

5.5.3.3 check_mem_corruption()

```
int check_mem_corruption ( )
```

Checks for heap corruption.

Returns

zero if no problem is found; the number of found memory corruptions otherwise

References _DEBUG_NEW_TAILCHECK, ALIGNED_LIST_ITEM_SIZE, check_tail(), MAGIC, new_output_fp, new_output_lock, new_ptr_list, new_ptr_lock, new_ptr_list_t::next, and print_position().

Referenced by free_pointer().

5.5.3.4 check_tail()

```
static bool check_tail (
            new_ptr_list_t * ptr )  [static]
```

Checks whether the padding bytes at the end of a memory block is tampered with.

Parameters

ptr	pointer to a **new_ptr_list_t** (p. 28) struct

Returns

`true` if the padding bytes are untouched; `false` otherwise

References _DEBUG_NEW_TAILCHECK, _DEBUG_NEW_TAILCHECK_CHAR, ALIGNED_LIST_ITEM_SIZE, and new_ptr_list_t::size.

Referenced by check_leaks(), check_mem_corruption(), and free_pointer().

5.5.3.5 free_pointer()

```
static void free_pointer (
            void * pointer,
            void * addr,
            bool is_array )  [static]
```

Frees memory and adjusts pointers.

Parameters

pointer	pointer to delete
addr	pointer to the caller
is_array	flag indicating whether it is invoked by a `delete[]` call

References _DEBUG_NEW_CALLER_ADDRESS, _DEBUG_NEW_ERROR_ACTION, new_ptr_list_t::addr, A↩ LIGNED_LIST_ITEM_SIZE, check_mem_corruption(), check_tail(), new_ptr_list_t::file, new_ptr_list_t::is_array, new_ptr_list_t::line, new_ptr_list_t::magic, MAGIC, new_output_fp, new_output_lock, new_ptr_lock, new_verbose↩ _flag, new_ptr_list_t::next, new_ptr_list_t::prev, print_position(), new_ptr_list_t::size, and total_mem_alloc.

Referenced by operator delete(), and operator delete[]().

5.5.3.6 operator delete() [1/3]

```
void operator delete (
            void * pointer ) throw )
```

References _DEBUG_NEW_CALLER_ADDRESS, and free_pointer().

5.5.3.7 operator delete() [2/3]

```
void operator delete (
            void * pointer,
            const char * file,
            int line ) throw )
```

References new_output_fp, new_output_lock, new_verbose_flag, and print_position().

5.5.3.8 operator delete() [3/3]

```
void operator delete (
            void * pointer,
            const std::nothrow_t &  ) throw )
```

References _DEBUG_NEW_CALLER_ADDRESS.

5.5.3.9 operator delete[]() [1/3]

```
void operator delete[] (
            void * pointer ) throw )
```

References _DEBUG_NEW_CALLER_ADDRESS, and free_pointer().

5.5.3.10 operator delete[]() [2/3]

```
void operator delete[] (
            void * pointer,
            const char * file,
            int line ) throw )
```

References new_output_fp, new_output_lock, new_verbose_flag, and print_position().

5.5.3.11 operator delete[]() [3/3]

```
void operator delete[] (
            void * pointer,
            const std::nothrow_t &  ) throw )
```

References _DEBUG_NEW_CALLER_ADDRESS.

5.5.3.12 operator new() [1/3]

```
void* operator  new (
            size_t size,
            const char * file,
            int line )
```

References alloc_mem().

5.5.3.13 operator new() [2/3]

```
void* operator  new (
            size_t size ) throw std::bad_alloc)
```

References _DEBUG_NEW_CALLER_ADDRESS.

5.5.3.14 operator new() [3/3]

```
void* operator  new (
            size_t size,
            const std::nothrow_t &  ) throw )
```

References _DEBUG_NEW_CALLER_ADDRESS, and alloc_mem().

5.5.3.15 operator new[]() [1/3]

```
void* operator  new[] (
            size_t size,
            const char * file,
            int line )
```

References alloc_mem().

5.5.3.16 operator new[]() [2/3]

```
void* operator  new[] (
            size_t size ) throw std::bad_alloc)
```

References _DEBUG_NEW_CALLER_ADDRESS.

5.5.3.17 operator new[]() [3/3]

```
void* operator  new[] (
            size_t size,
            const std::nothrow_t &  ) throw )
```

References _DEBUG_NEW_CALLER_ADDRESS, and alloc_mem().

5.5.3.18 print_position()

```
static void print_position (
            const void * ptr,
            int line )  [static]
```

Prints the position information of a memory operation point.

When _DEBUG_NEW_USE_ADDR2LINE is defined to a non-zero value, this function will try to convert a given caller address to file/line information with *addr2line*.

Parameters

ptr	source file name if *line* is non-zero; caller address otherwise
line	source line number if non-zero; indication that *ptr* is the caller address otherwise

References new_output_fp, and print_position_from_addr().

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), free_pointer(), operator delete(), and operator delete[]().

5.5.3.19 print_position_from_addr()

```
static bool print_position_from_addr (
            const void * addr )  [static]
```

Tries printing the position information from an instruction address.

This is the version that uses *addr2line*.

Parameters

addr	the instruction address to convert and print

Returns

`true` if the address is converted successfully (and the result is printed); `false` if no useful information is got (and nothing is printed)

References new_output_fp, and new_progname.

Referenced by print_position().

5.5.4 Variable Documentation

5.5.4.1 ALIGNED_LIST_ITEM_SIZE

```
const int ALIGNED_LIST_ITEM_SIZE =  align(sizeof( new_ptr_list_t))
```

The extra memory allocated by `operator new`.

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), check_tail(), and free_pointer().

5.5.4.2 MAGIC

```
const unsigned MAGIC = 0x4442474E
```

Magic number for error detection.

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), and free_pointer().

5.5.4.3 new_autocheck_flag

```
bool new_autocheck_flag = true
```

Flag to control whether **check_leaks** (p. 48) will be automatically called on program exit.

Referenced by __debug_new_counter::~__debug_new_counter().

5.5.4.4 new_output_fp

```
FILE* new_output_fp = stderr
```

Pointer to the output stream.

The default output is *stderr*, and one may change it to a user stream if needed (say, **new_verbose_flag** (p. 55) is `true` and there are a lot of (de)allocations).

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), free_pointer(), operator delete(), operator delete[](), print_position(), print_position_from_addr(), and __debug_new_counter::~__debug_new_counter().

5.5.4.5 new_output_lock

```
fast_mutex new_output_lock  [static]
```

The mutex guard to protect simultaneous output to **new_output_fp** (p. 54).

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), free_pointer(), operator delete(), and operator delete[]().

5.5.4.6 new_progname

```
const char* new_progname =  _DEBUG_NEW_PROGNAME
```

Pointer to the program name.

Its initial value is the macro **_DEBUG_NEW_PROGNAME** (p. 46). You should try to assign the program path to it early in your application. Assigning `argv[0]` to it in *main* is one way. If you use *bash* or *ksh* (or similar), the following statement is probably what you want: '`new_progname = getenv("_");`'.

Referenced by print_position_from_addr().

5.5.4.7 new_ptr_list

```
new_ptr_list_t new_ptr_list  [static]
```

Initial value:

```
= {
    &new_ptr_list,
    &new_ptr_list,
    0,
    {


        ""

    },
    0,
    0,
    MAGIC
}
```

List of all new'd pointers.

Referenced by alloc_mem(), check_leaks(), and check_mem_corruption().

5.5.4.8 new_ptr_lock

```
fast_mutex new_ptr_lock  [static]
```

The mutex guard to protect simultaneous access to the pointer list.

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), and free_pointer().

5.5.4.9 new_verbose_flag

```
bool new_verbose_flag = false
```

Flag to control whether verbose messages are output.

Referenced by alloc_mem(), check_leaks(), free_pointer(), operator delete(), operator delete[](), and __debug_↩ new_counter::~__debug_new_counter().

5.5.4.10 total_mem_alloc

```
size_t total_mem_alloc = 0  [static]
```

Total memory allocated in bytes.

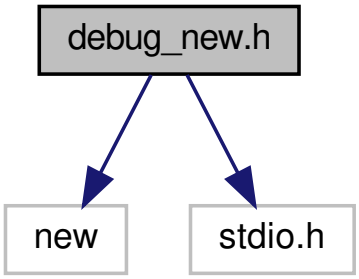
Referenced by alloc_mem(), and free_pointer().

5.6 debug_new.h File Reference

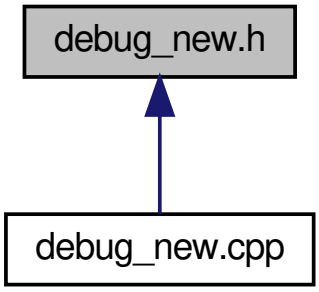
Header file for checking leaks caused by unmatched new/delete.

```
#include <new>
#include <stdio.h>
```

Include dependency graph for debug_new.h:



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



Classes

- class **__debug_new_recorder**

  Recorder class to remember the call context.
- class **__debug_new_counter**

  Counter class for on-exit leakage check.

Macros

- #define **HAVE_PLACEMENT_DELETE** 1

  Macro to indicate whether placement delete operators are supported on a certain compiler.
- #define **_DEBUG_NEW_REDEFINE_NEW** 1

  Macro to indicate whether redefinition of `new` *is wanted.*
- #define **DEBUG_NEW** **__debug_new_recorder**(__FILE__, __LINE__) ->* **new**

  Macro to catch file/line information on allocation.
- #define **new** **DEBUG_NEW**

Functions

- int **check_leaks** ()

  Checks for memory leaks.
- int **check_mem_corruption** ()

  Checks for heap corruption.
- void * **operator new** (size_t size, const char *file, int line)
- void * **operator new[ ]** (size_t size, const char *file, int line)
- void **operator delete** (void *pointer, const char *file, int line) throw ()
- void **operator delete[ ]** (void *pointer, const char *file, int line) throw ()

Variables

- bool **new_autocheck_flag**

  Flag to control whether ***check_leaks*** *(*p. 48*) will be automatically called on program exit.*
- bool **new_verbose_flag**

  Flag to control whether verbose messages are output.
- FILE * **new_output_fp**

  Pointer to the output stream.
- const char * **new_progname**

  Pointer to the program name.
- static **__debug_new_counter** **__debug_new_count**

  Counting object for each file including ***debug_new.h*** *(*p. 56*).*

5.6.1 Detailed Description

Header file for checking leaks caused by unmatched new/delete.

Version

4.4, 2007/12/31

Author

Wu Yongwei

5.6.2 Macro Definition Documentation

5.6.2.1 _DEBUG_NEW_REDEFINE_NEW

```
#define _DEBUG_NEW_REDEFINE_NEW 1
```

Macro to indicate whether redefinition of `new` is wanted.

If one wants to define one's own `operator new`, to call `operator new` directly, or to call placement `new`, it should be defined to `0` to alter the default behaviour. Unless, of course, one is willing to take the trouble to write something like:

```
# ifdef new
#   define _NEW_REDEFINED
#   undef new
# endif

// Code that uses new is here

# ifdef _NEW_REDEFINED
#   ifdef DEBUG_NEW
#     define new DEBUG_NEW
#   endif
#   undef _NEW_REDEFINED
# endif
```

5.6.2.2 DEBUG_NEW

```
#define DEBUG_NEW  __debug_new_recorder(__FILE__, __LINE__) ->*  new
```

Macro to catch file/line information on allocation.

If **_DEBUG_NEW_REDEFINE_NEW** (p. 58) is `0`, one can use this macro directly; otherwise `new` will be defined to it, and one must use `new` instead.

5.6.2.3 HAVE_PLACEMENT_DELETE

```
#define HAVE_PLACEMENT_DELETE 1
```

Macro to indicate whether placement delete operators are supported on a certain compiler.

Some compilers, like Borland C++ Compiler 5.5.1 and Digital Mars Compiler 8.42, do not support them, and the user must define this macro to `0` to make the program compile. Also note that in that case memory leakage will occur if an exception is thrown in the initialization (constructor) of a dynamically created object.

5.6.2.4 new

```
#define new  DEBUG_NEW
```

5.6.3 Function Documentation

5.6.3.1 check_leaks()

```
int check_leaks ( )
```

Checks for memory leaks.

Returns

zero if no leakage is found; the number of leaks otherwise

References new_ptr_list_t::addr, ALIGNED_LIST_ITEM_SIZE, check_tail(), new_ptr_list_t::file, new_ptr_list_t::line, new_ptr_list_t::magic, MAGIC, new_output_fp, new_output_lock, new_ptr_list, new_ptr_lock, new_verbose_flag, new_ptr_list_t::next, print_position(), and new_ptr_list_t::size.

Referenced by __debug_new_counter::~__debug_new_counter().

5.6.3.2 check_mem_corruption()

```
int check_mem_corruption ( )
```

Checks for heap corruption.

Returns

zero if no problem is found; the number of found memory corruptions otherwise

References _DEBUG_NEW_TAILCHECK, ALIGNED_LIST_ITEM_SIZE, check_tail(), MAGIC, new_output_fp, new_output_lock, new_ptr_list, new_ptr_lock, new_ptr_list_t::next, and print_position().

Referenced by free_pointer().

5.6.3.3 operator delete()

```
void operator delete (
            void * pointer,
            const char * file,
            int line ) throw )
```

References new_output_fp, new_output_lock, new_verbose_flag, and print_position().

5.6.3.4 operator delete[]()

```
void operator delete[] (
            void * pointer,
            const char * file,
            int line ) throw )
```

References new_output_fp, new_output_lock, new_verbose_flag, and print_position().

5.6.3.5 operator new()

```
void* operator  new (
            size_t size,
            const char * file,
            int line )
```

References alloc_mem().

5.6.3.6 operator new[]()

```
void* operator  new[] (
            size_t size,
            const char * file,
            int line )
```

References alloc_mem().

5.6.4 Variable Documentation

5.6.4.1 __debug_new_count

```
__debug_new_counter __debug_new_count  [static]
```

Counting object for each file including **debug_new.h** (p. 56).

5.6.4.2 new_autocheck_flag

```
bool new_autocheck_flag
```

Flag to control whether **check_leaks** (p. 48) will be automatically called on program exit.

Referenced by __debug_new_counter::~__debug_new_counter().

5.6.4.3 new_output_fp

```
FILE* new_output_fp
```

Pointer to the output stream.

The default output is *stderr*, and one may change it to a user stream if needed (say, **new_verbose_flag** (p. 55) is `true` and there are a lot of (de)allocations).

Referenced by alloc_mem(), check_leaks(), check_mem_corruption(), free_pointer(), operator delete(), operator delete[](), print_position(), print_position_from_addr(), and __debug_new_counter::~__debug_new_counter().

5.6.4.4 new_progname

```
const char* new_progname
```

Pointer to the program name.

Its initial value is the macro **_DEBUG_NEW_PROGNAME** (p. 46). You should try to assign the program path to it early in your application. Assigning `argv[0]` to it in *main* is one way. If you use *bash* or *ksh* (or similar), the following statement is probably what you want: '`new_progname = getenv("_");`'.

Referenced by print_position_from_addr().

5.6.4.5 new_verbose_flag

```
bool new_verbose_flag
```

Flag to control whether verbose messages are output.

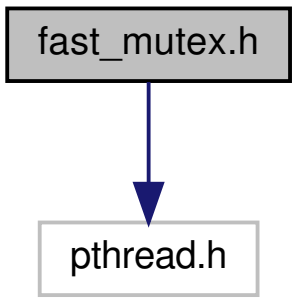
Referenced by alloc_mem(), check_leaks(), free_pointer(), operator delete(), operator delete[](), and __debug_↩ new_counter::~__debug_new_counter().

5.7 fast_mutex.h File Reference

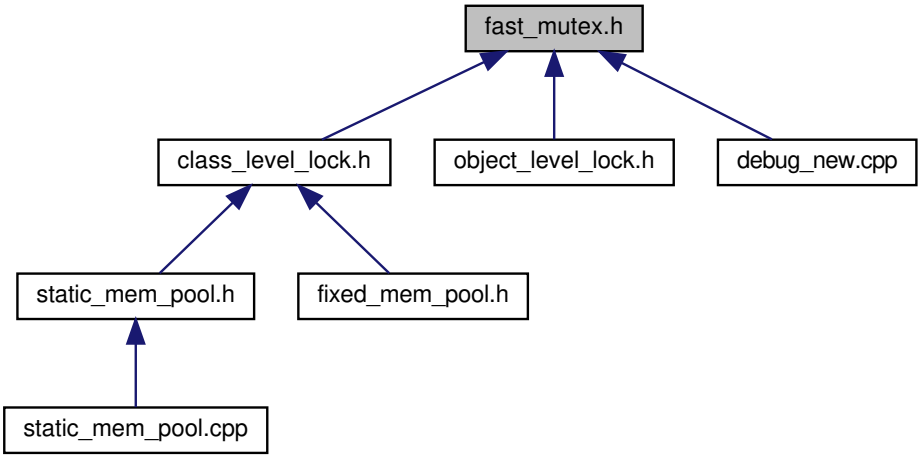
A fast mutex implementation for POSIX and Win32.

```
#include <pthread.h>
```

Include dependency graph for fast_mutex.h:



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



Classes

- class **fast_mutex**

  Class for non-reentrant fast mutexes.
- class **fast_mutex_autolock**

  *An acquistion-on-initialization lock class based on **fast_mutex** (p. 18).*

Macros

- #define **_FAST_MUTEX_CHECK_INITIALIZATION** 1

  Macro to control whether to check for initialization status for each lock/unlock operation.
- #define **_FAST_MUTEX_ASSERT**(_Expr, _Msg) ((void)0)

  *Macro for **fast_mutex** (p. 18) assertions.*
- #define **__VOLATILE** volatile

  Macro alias to 'volatile' semantics.

5.7.1 Detailed Description

A fast mutex implementation for POSIX and Win32.

Version

1.18, 2005/05/06

Author

Wu Yongwei

5.7.2 Macro Definition Documentation

5.7.2.1 __VOLATILE

```
#define __VOLATILE volatile
```

Macro alias to 'volatile' semantics.

Here it is truly volatile since it is in a multi-threaded (POSIX threads) environment.

5.7.2.2 _FAST_MUTEX_ASSERT

```
#define _FAST_MUTEX_ASSERT(
              _Expr,
              _Msg ) ((void)0)
```

Macro for **fast_mutex** (p. 18) assertions.

Fake version (for release mode).

Referenced by fast_mutex::lock(), fast_mutex::unlock(), and fast_mutex::~fast_mutex().

5.7.2.3 _FAST_MUTEX_CHECK_INITIALIZATION

```
#define _FAST_MUTEX_CHECK_INITIALIZATION 1
```

Macro to control whether to check for initialization status for each lock/unlock operation.

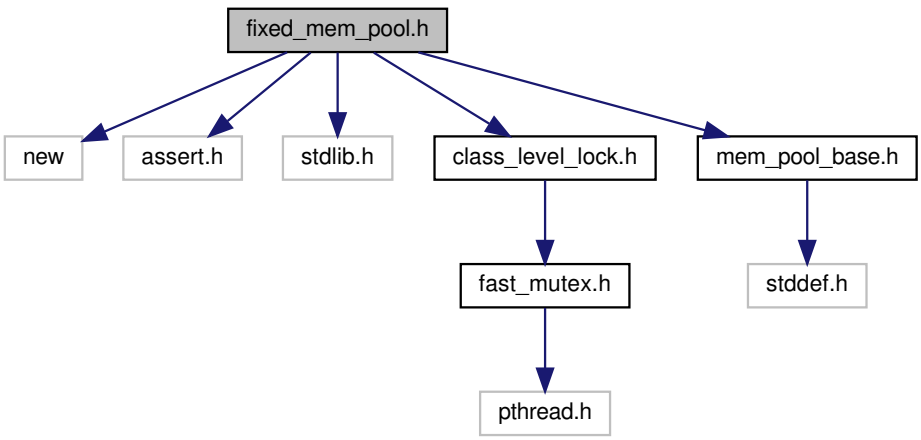
Defining it to a non-zero value will enable the check, so that the construction/destruction of a static object using a static **fast_mutex** (p. 18) not yet constructed or already destroyed will work (with lock/unlock operations ignored). Defining it to zero will disable to check.

5.8 fixed_mem_pool.h File Reference

Definition of a fixed-size memory pool template for structs/classes.

```
#include <new>
#include <assert.h>
#include <stdlib.h>
#include "class_level_lock.h"
#include "mem_pool_base.h"
```

Include dependency graph for fixed_mem_pool.h:



Classes

- class **fixed_mem_pool< _Tp >**

  Class template to manipulate a fixed-size memory pool.

Macros

- #define **MEM_POOL_ALIGNMENT** 4

  Defines the alignment of memory blocks.
- #define **DECLARE_FIXED_MEM_POOL**(_Cls)

  *Declares the normal (exceptionable) overload of **operator new** and **operator delete**.*
- #define **DECLARE_FIXED_MEM_POOL__NOTHROW**(_Cls)

  *Declares the non-exceptionable overload of **operator new** and **operator delete**.*
- #define **DECLARE_FIXED_MEM_POOL__THROW_NOCHECK**(_Cls)

  *Declares the exceptionable, non-checking overload of **operator new** and **operator delete**.*

5.8.1 Detailed Description

Definition of a fixed-size memory pool template for structs/classes.

This is a easy-to-use class template for pre-allocated memory pools. The client side needs to do the following things:

- Use one of the macros **DECLARE_FIXED_MEM_POOL** (p. 64), **DECLARE_FIXED_MEM_POOL__NOT↩HROW** (p. 65), and **DECLARE_FIXED_MEM_POOL__THROW_NOCHECK** (p. 66) at the end of the class (say, `class _Cls`) definitions
- Call **fixed_mem_pool<_Cls>::initialize** (p. 23) at the beginning of the program
- Optionally, specialize **fixed_mem_pool<_Cls>::bad_alloc_handler** (p. 22) to change the behaviour when all memory blocks are allocated
- Optionally, call **fixed_mem_pool<_Cls>::deinitialize** (p. 23) at exit of the program to check for memory leaks
- Optionally, call **fixed_mem_pool<_Cls>::get_alloc_count** (p. 23) to check memory usage when the program is running

Version

1.14, 2005/09/19

Author

Wu Yongwei

5.8.2 Macro Definition Documentation

5.8.2.1 DECLARE_FIXED_MEM_POOL

```
#define DECLARE_FIXED_MEM_POOL(
              _Cls )
```

Value:

```
public: \
    static void* operator new(size_t __size) \
    { \
        assert(__size == sizeof(_Cls)); \
        if (void* __ptr = fixed_mem_pool<_Cls>::allocate()) \
            return __ptr; \
        else \
            throw std::bad_alloc(); \
    } \
    static void  operator delete(void* __ptr) \
    { \
        if (__ptr != NULL)              fixed_mem_pool<_Cls>::deallocate(__ptr); \
    }
```

Declares the normal (exceptionable) overload of **operator new** and **operator delete**.

Parameters

_Cls	class to use the **fixed_mem_pool** (p. 21)

See also

DECLARE_FIXED_MEM_POOL__THROW_NOCHECK (p. 66), which, too, defines an **operator new (p. 58)** that will never return NULL, but requires more discipline on the programmer's side.

5.8.2.2 DECLARE_FIXED_MEM_POOL__NOTHROW

```
#define DECLARE_FIXED_MEM_POOL__NOTHROW(
              _Cls )
```

Value:

```
public: \
    static void* operator new(size_t __size) throw() \
    { \
        assert(__size == sizeof(_Cls)); \
        return fixed_mem_pool<_Cls>::allocate(); \
    } \
    static void  operator delete(void* __ptr) \
    { \
        if (__ptr != NULL)              fixed_mem_pool<_Cls>::deallocate(__ptr); \
    }
```

Declares the non-exceptionable overload of **operator new** and **operator delete**.

Parameters

_Cls	class to use the **fixed_mem_pool** (p. 21)

5.8.2.3 DECLARE_FIXED_MEM_POOL__THROW_NOCHECK

```
#define DECLARE_FIXED_MEM_POOL__THROW_NOCHECK(
              _Cls )
```

Value:

```
public: \
    static void* operator new(size_t __size) \
    { \
        assert(__size == sizeof(_Cls)); \
        return fixed_mem_pool<_Cls>::allocate(); \
    } \
    static void  operator delete(void* __ptr) \
    { \
        if (__ptr != NULL)              fixed_mem_pool<_Cls>::deallocate(__ptr); \
    }
```

Declares the exceptionable, non-checking overload of **operator new** and **operator delete**.

N.B. Using this macro *requires* users to explicitly specialize **fixed_mem_pool::bad_alloc_handler** (p. 22) so that it shall never return `false` (it may throw exceptions, say, `std::bad_alloc`, or simply abort). Otherwise a segmentation fault might occur (instead of returning a `NULL` pointer).

Parameters

_Cls	class to use the **fixed_mem_pool** (p. 21)

5.8.2.4 MEM_POOL_ALIGNMENT

```
#define MEM_POOL_ALIGNMENT 4
```

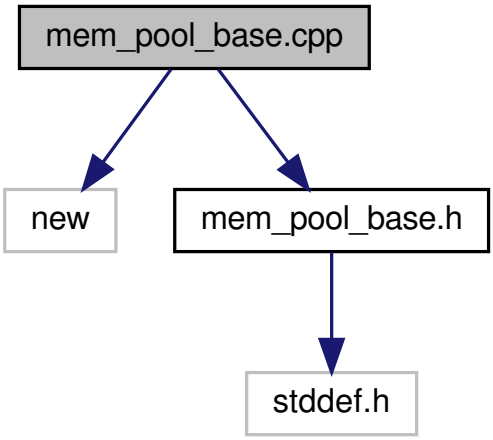
Defines the alignment of memory blocks.

5.9 mem_pool_base.cpp File Reference

Implementation for the memory pool base.

```
#include <new>
#include "mem_pool_base.h"
```

Include dependency graph for mem_pool_base.cpp:



Macros

- #define **_MEM_POOL_ALLOCATE**(_Sz) ::operator **new**((_Sz), std::nothrow)
- #define **_MEM_POOL_DEALLOCATE**(_Ptr) ::operator delete(_Ptr)

5.9.1 Detailed Description

Implementation for the memory pool base.

Version

1.2, 2004/07/26

Author

Wu Yongwei

5.9.2 Macro Definition Documentation

5.9.2.1 _MEM_POOL_ALLOCATE

```
#define _MEM_POOL_ALLOCATE(
            _Sz ) ::operator  new((_Sz), std::nothrow)
```

Referenced by mem_pool_base::alloc_sys().

5.9.2.2 _MEM_POOL_DEALLOCATE

```
#define _MEM_POOL_DEALLOCATE(
              _Ptr ) ::operator delete(_Ptr)
```

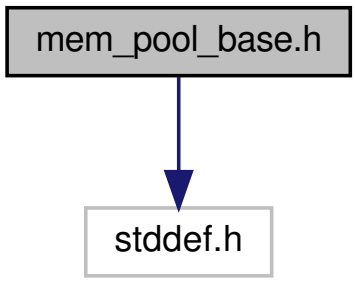
Referenced by mem_pool_base::dealloc_sys().

5.10 mem_pool_base.h File Reference

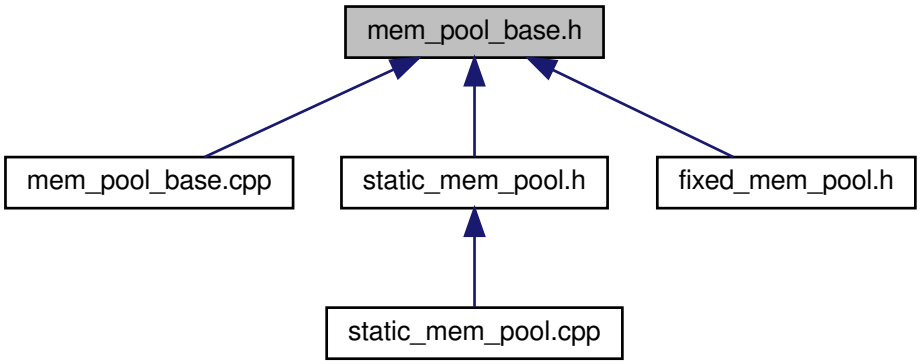
Header file for the memory pool base.

```
#include <stddef.h>
```

Include dependency graph for mem_pool_base.h:



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



Classes

- class **mem_pool_base**

  Base class for memory pools.
- struct **mem_pool_base::_Block_list**

  Structure to store the next available memory block.

5.10.1 Detailed Description

Header file for the memory pool base.

Version

1.1, 2004/07/26

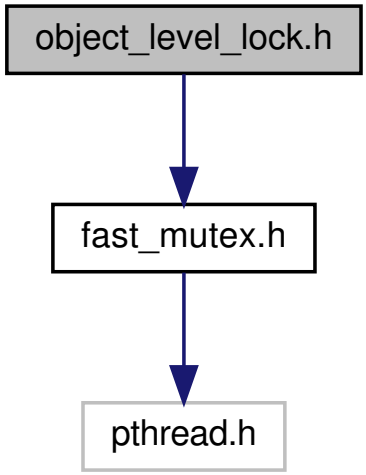
Author

Wu Yongwei

5.11 object_level_lock.h File Reference

In essence Loki ObjectLevelLockable re-engineered to use a **fast_mutex** (p. 18) class.

`#include "fast_mutex.h"`
Include dependency graph for object_level_lock.h:



Classes

- class **object_level_lock**< **_Host** >
  Helper class for class-level locking.
- class **object_level_lock**< **_Host** >**::lock**
  Type that provides locking/unlocking semantics.

5.11.1 Detailed Description

In essence Loki ObjectLevelLockable re-engineered to use a **fast_mutex** (p. 18) class.

Check also Andrei Alexandrescu's article "`Multithreading and the C++ Type System`" for the ideas behind.

Version

1.4, 2004/05/09

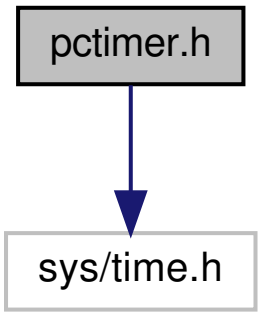
Author

Wu Yongwei

5.12 pctimer.h File Reference

Function to get a high-resolution timer for Win32/Cygwin/Unix.

`#include <sys/time.h>`
Include dependency graph for pctimer.h:



Typedefs

- typedef double **pctimer_t**

Functions

- __inline **pctimer_t** **pctimer** (void)

5.12.1 Detailed Description

Function to get a high-resolution timer for Win32/Cygwin/Unix.

Version

1.6, 2004/08/02

Author

Wu Yongwei

5.12.2 Typedef Documentation

5.12.2.1 pctimer_t

`typedef double` **`pctimer_t`**

5.12.3 Function Documentation

5.12.3.1 pctimer()

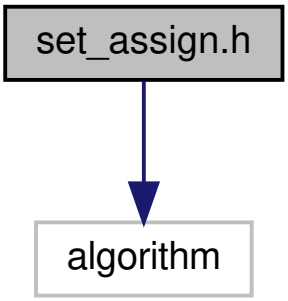
```
__inline  pctimer_t pctimer (
            void  )
```

5.13 set_assign.h File Reference

Definition of template functions set_assign_union and set_assign_difference.

```
#include <algorithm>
```

Include dependency graph for set_assign.h:



Functions

- template<class _Container , class _InputIter >
  _Container & **set_assign_union** (_Container &__dest, _InputIter __first, _InputIter __last)
- template<class _Container , class _InputIter , class _Compare >
  _Container & **set_assign_union** (_Container &__dest, _InputIter __first, _InputIter __last, _Compare __comp)
- template<class _Container , class _InputIter >
  _Container & **set_assign_difference** (_Container &__dest, _InputIter __first, _InputIter __last)
- template<class _Container , class _InputIter , class _Compare >
  _Container & **set_assign_difference** (_Container &__dest, _InputIter __first, _InputIter __last, _Compare __comp)

5.13.1 Detailed Description

Definition of template functions set_assign_union and set_assign_difference.

Version

1.5, 2004/07/26

Author

Wu Yongwei

5.13.2 Function Documentation

5.13.2.1 set_assign_difference() [1/2]

```
template<class _Container , class _InputIter >
_Container& set_assign_difference (
            _Container & __dest,
            _InputIter __first,
            _InputIter __last )
```

5.13.2.2 set_assign_difference() [2/2]

```
template<class _Container , class _InputIter , class _Compare >
_Container& set_assign_difference (
            _Container & __dest,
            _InputIter __first,
            _InputIter __last,
            _Compare __comp )
```

5.13.2.3 set_assign_union() [1/2]

```
template<class _Container , class _InputIter >
_Container& set_assign_union (
            _Container & __dest,
            _InputIter __first,
            _InputIter __last )
```

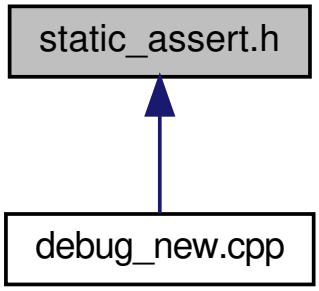
5.13.2.4 set_assign_union() [2/2]

```
template<class _Container , class _InputIter , class _Compare >
_Container& set_assign_union (
            _Container & __dest,
            _InputIter __first,
            _InputIter __last,
            _Compare __comp )
```

5.14 static_assert.h File Reference

Template class to check validity duing compile time (adapted from Loki).

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



Classes

- struct **__nvwa_compile_time_error**< **bool** >
- struct **__nvwa_compile_time_error**< **true** >

Macros

- #define **STATIC_ASSERT**(_Expr, _Msg)

5.14.1 Detailed Description

Template class to check validity duing compile time (adapted from Loki).

Version

1.2, 2005/11/22

Author

Wu Yongwei

5.14.2 Macro Definition Documentation

5.14.2.1 STATIC_ASSERT

```
#define STATIC_ASSERT(
              _Expr,
              _Msg )
```

Value:

```
{ \
        __nvwa_compile_time_error<((_Expr) != 0)> ERROR_##_Msg; \
        (void)ERROR_##_Msg; \
    }
```

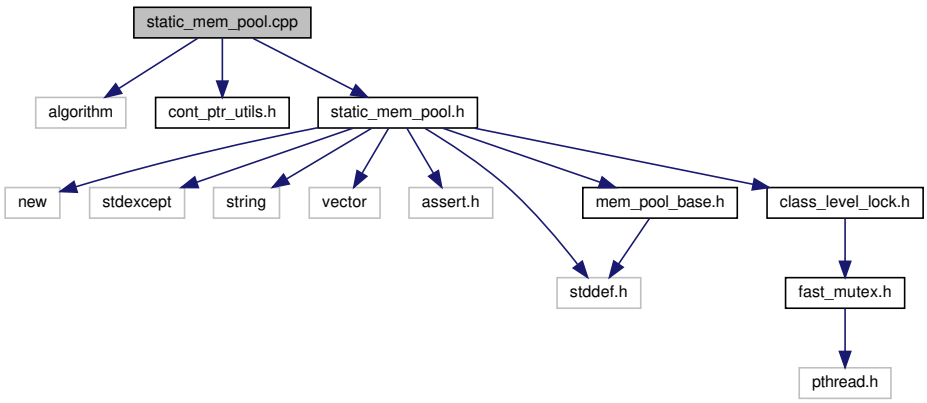
Referenced by alloc_mem().

5.15 static_mem_pool.cpp File Reference

Non-template and non-inline code for the 'static' memory pool.

```
#include <algorithm>
#include "cont_ptr_utils.h"
#include "static_mem_pool.h"
```

Include dependency graph for static_mem_pool.cpp:



5.15.1 Detailed Description

Non-template and non-inline code for the 'static' memory pool.

Version

1.7, 2006/08/26

Author

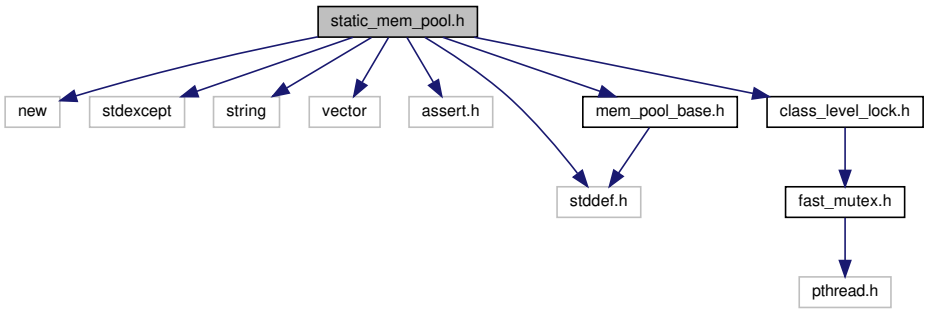
Wu Yongwei

5.16 static_mem_pool.h File Reference

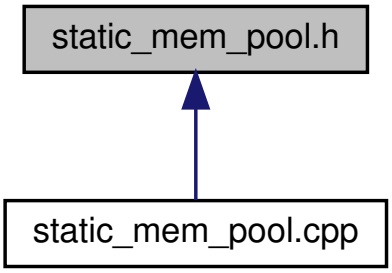
Header file for the 'static' memory pool.

```
#include <new>
#include <stdexcept>
#include <string>
#include <vector>
#include <assert.h>
#include <stddef.h>
#include "class_level_lock.h"
#include "mem_pool_base.h"
```

Include dependency graph for static_mem_pool.h:



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



Classes

- class **static_mem_pool_set**

  *Singleton class to maintain a set of existing instantiations of **static_mem_pool*** (p. 33).
- class **static_mem_pool**< **_Sz, _Gid** >

  Singleton class template to manage the allocation/deallocation of memory blocks of one specific size.

Macros

- #define **__PRIVATE** private
- #define **_STATIC_MEM_POOL_TRACE**(_Lck, _Msg) ((void)0)
- #define **DECLARE_STATIC_MEM_POOL**(_Cls)
- #define **DECLARE_STATIC_MEM_POOL__NOTHROW**(_Cls)
- #define **DECLARE_STATIC_MEM_POOL_GROUPED**(_Cls, _Gid)
- #define **DECLARE_STATIC_MEM_POOL_GROUPED__NOTHROW**(_Cls, _Gid)
- #define **PREPARE_STATIC_MEM_POOL**(_Cls) std::cerr << "PREPARE_STATIC_MEM_POOL is obsolete!\n";
- #define **PREPARE_STATIC_MEM_POOL_GROUPED**(_Cls, _Gid) std::cerr << "PREPARE_STATIC_M↩ EM_POOL_GROUPED is obsolete!\n";

5.16.1 Detailed Description

Header file for the 'static' memory pool.

Version

1.20, 2007/10/20

Author

Wu Yongwei

5.16.2 Macro Definition Documentation

5.16.2.1 __PRIVATE

```
#define __PRIVATE private
```

5.16.2.2 _STATIC_MEM_POOL_TRACE

```
#define _STATIC_MEM_POOL_TRACE(
              _Lck,
              _Msg ) ((void)0)
```

Referenced by static_mem_pool_set::recycle(), and static_mem_pool< _Sz, _Gid >::recycle().

5.16.2.3 DECLARE_STATIC_MEM_POOL

```
#define DECLARE_STATIC_MEM_POOL(
              _Cls )
```

Value:

```
public: \
    static void* operator new(size_t __size) \
    { \
        assert(__size == sizeof(_Cls)); \
        void* __ptr; \
        __ptr = static_mem_pool<sizeof(_Cls)>:: \
                                instance_known().allocate(); \
        if (__ptr == NULL) \
            throw std::bad_alloc(); \
        return __ptr; \
    } \
    static void operator delete(void* __ptr) \
    { \
        if (__ptr) \
            static_mem_pool<sizeof(_Cls)>:: \
                            instance_known().deallocate(__ptr); \
    }
```

5.16.2.4 DECLARE_STATIC_MEM_POOL__NOTHROW

```
#define DECLARE_STATIC_MEM_POOL__NOTHROW(
              _Cls )
```

Value:

```
public: \
    static void* operator new(size_t __size) throw() \
    { \
        assert(__size == sizeof(_Cls)); \
        return static_mem_pool<sizeof(_Cls)>:: \
                               instance_known().allocate(); \
    } \
    static void operator delete(void* __ptr) \
    { \
        if (__ptr) \
            static_mem_pool<sizeof(_Cls)>:: \
                            instance_known().deallocate(__ptr); \
    }
```

5.16.2.5 DECLARE_STATIC_MEM_POOL_GROUPED

```
#define DECLARE_STATIC_MEM_POOL_GROUPED(
              _Cls,
              _Gid )
```

Value:

```
public: \
    static void* operator new(size_t __size) \
    { \
        assert(__size == sizeof(_Cls)); \
        void* __ptr; \
        __ptr = static_mem_pool<sizeof(_Cls), (_Gid)>:: \
                                instance_known().allocate(); \
        if (__ptr == NULL) \
            throw std::bad_alloc(); \
        return __ptr; \
    } \
    static void operator delete(void* __ptr) \
    { \
        if (__ptr) \
            static_mem_pool<sizeof(_Cls), (_Gid)>:: \
                            instance_known().deallocate(__ptr); \
    }
```

5.16.2.6 DECLARE_STATIC_MEM_POOL_GROUPED__NOTHROW

```
#define DECLARE_STATIC_MEM_POOL_GROUPED__NOTHROW(
              _Cls,
              _Gid )
```

Value:

```
public: \
    static void* operator new(size_t __size) throw() \
    { \
        assert(__size == sizeof(_Cls)); \
        return static_mem_pool<sizeof(_Cls), (_Gid)>:: \
                               instance_known().allocate(); \
    } \
    static void operator delete(void* __ptr) \
    { \
        if (__ptr) \
            static_mem_pool<sizeof(_Cls), (_Gid)>:: \
                            instance_known().deallocate(__ptr); \
    }
```

5.16.2.7 PREPARE_STATIC_MEM_POOL

```
#define PREPARE_STATIC_MEM_POOL(
             _Cls ) std::cerr << "PREPARE_STATIC_MEM_POOL is obsolete!\n";
```

5.16.2.8 PREPARE_STATIC_MEM_POOL_GROUPED

```
#define PREPARE_STATIC_MEM_POOL_GROUPED(
             _Cls,
             _Gid ) std::cerr << "PREPARE_STATIC_MEM_POOL_GROUPED is obsolete!\n";
```

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