

# Threads in NMM

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**April 2010**

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## 1. Class Thread

This Class Thread is a wrapper for the correspond platform dependent threading library. The start-method creates a new thread of control that executes concurrently with the calling thread. The methods and the arguments are similar to the corresponding low-level methods. The following example shows how to create a new Thread.

```
void* thread_method(void* argument) {  
    ....  
    return 0;  
}
```

```

class Foo::foo() {
    Thread new_thread;
    new_thread.start(thread_method,0); //runs the method thread_method in a new thread,
                                     //with no arguments.
    ...

    new_thread.join()                // blocks until the thread terminates
}

```

## 2. Class ThreadMutex

This class is a wrapper for mutex variables. All resources are allocated and deallocated in the constructor/destructor. It provides the same methods like a typical mutex, i.e. lock(), unlock(), trylock(). The ThreadMutex implements two kinds of Mutexes, 'Fast' (default value) and 'Recursive'. The kind of a mutex determines whether it can be locked again by a thread that already owns it or not. Here is a little example, how to use this class.

```

class Foo {
    ....
private:
    ThreadMutex mutex; //the new Mutex.
}

int Foo::foo() {
    mutex.lock();
    ....
    mutex.unlock();
}

```

If the same thread should lock the ThreadMutex again, you must use a ThreadMutex with kind 'Recursive' or you cause a deadlock.

```

class Foo{
    ....
private:
    ThreadMutex* mutex;
}

Foo::Foo() {
    mutex = new ThreadMutex(ThreadMutex::Recursive); //Now the mutex can be locked again.
}

int Foo::foo() {
    mutex->lock(); //locks the mutex
    mutex->lock(); //locks it again.
    ....
}

```

```

mutex->unlock(); //unlocks the second lock
mutex->unlock(); //unlocks the first lock
}

```

### 3. Class ThreadCondition

A ThreadCondition is a synchronization device that allows threads to suspend execution and relinquish the processors until some predicate on shared data is satisfied. The basic operations on conditions are: notify the condition and wait for the condition. A ThreadCondition must always be associated with a mutex, to avoid the race condition where a thread prepares to wait on a condition variable and another thread signals the condition just before the first thread actually waits on it. The following example shows how to use a ThreadCondition.

```

class Foo {
private:
    ThreadCondition* condition;
    ThreadMutex mutex;
};

Foo::Foo() {
    condition = new ThreadCondition(mutex);
}

int Foo::foo_1() {
    if ( !data_available)    // if no data available
        condition->wait();  //wait for a condition.
}

int Foo::foo_2() {
    condition->notify();      //if this method is called, new data are available and
                             //waiting conditions are notified.
}

```

### 4. Class MutexGuard

If you write threadsafe code you must ensure that locked mutex-variables are also unlocked. This class can be used to ensure that a locked mutex is automatic unlocked at the end of a method. The constructor of this class locks the mutex and the destructor unlocks it. So you can create a MutexGuard, when you enter

a critical section and the `MutexGuard` unlocks the `Mutex` if it leaves the scope. A little example shows how to use this class.

```
int Foo::foo() {
    MutexGuard m(&mutex); //mutex is the internal ThreadMutex to ensure mutual exclusion.
                          //The constructor locks the mutex.

    .....
    .....

    return 0;
} //Leave the scope, which unlocks the mutex
```